

Essay writing guidelines for the School of Biological Sciences

General

Our aim in setting an essay as part of your assessment is for you to learn

1. to obtain information from the scientific literature,
2. to synthesize information from diverse sources,
3. to use it to critically evaluate and discuss arguments or ideas, and
4. then to communicate these to the reader.

Most scientific communication is by means of published papers. It is important, therefore, that you learn to communicate effectively by the written word. As with all English writing, a scientific essay should be clear, concise, pertinent and written with clarity of expression and accuracy of facts.

Developing an ability to communicate ideas on paper is a crucial part of your education. For the majority of people this is a creative art that is painstakingly developed over many years and experience is the only way to achieve proficiency. We strongly recommend that you purchase a copy of the following book to guide you in the techniques of writing about biology:

Pechenik JA (2007) 'A short guide to writing about biology.' 6th edn. (Longman: New York) Hargrave-Andrew Library Call No: 808.06657 P365S

There are numerous other books on the subject (in the Hargrave-Andrew Library) that you will also find helpful. Look for call numbers around 808.0665. Some examples are:

Barass R (2002) 'Scientists must write.' 2nd edn. (Routledge: London)

Clanchy J, Ballard B (1997) 'Essay writing for students: a practical guide.' 3rd edn. (Longman Cheshire: Melbourne)

Expectations of a scientific essay are quite different from a VCE assignment. Firstly, you are expected to make your own search of the literature, using mostly material found in the Hargrave-Andrew Library (or any other library at a tertiary education or research institute). This is a time-consuming task and we urge you to start as soon as possible after you have received your topic. If you are unfamiliar with library search techniques, register for the relevant tutorials and workshops that are regularly on offer from the Hargrave-Andrew Library staff, to teach you how to find your way around the library, its facilities, the catalogue and how to search the library database for suitable journal articles.

Style

Obviously an untidy presentation is unlikely to impress the reader. You are expected to type your essay using size twelve font. If its to be submitted in hard copy each line should be double-spaced and generous margins (say 3 - 4 cm) should be provided to allow for comments. Remember to include your student details on the front page and number your pages. For electronic submissions, also include your details in the file name (see your unit specific instructions/requirements).

Write at least one draft of your essay before preparing your paper to be submitted. Leave it alone for one or two days, or preferably a week and then read it again. You may be able to improve it! Once you have completed your final draft, spell-check and proof-read it to correct any omissions and grammatical errors. Punctuation is especially important: omission of a single comma can turn a useful sentence into an ambiguous and perplexing one. These considerations are critical and inattention to them is viewed very seriously by markers. Capitalization, punctuation, paragraphing and sentence construction must conform to the usual conventions of English grammar. If you are not fully conversant with English spelling and grammar, please ask someone to read your manuscript and help you correct any mistakes before you hand it in. You may also ask the staff from the Learning Skills Unit in the Hargrave-Andrew Library for advice on any form of writing.

Formal generic and specific names must be italicized (or underlined), and the name of the genus started with a capital letter, e.g. *Eucalyptus regnans*, but names used informally should be given thus: eucalypts. Once the name of the genus has been indicated, and it is quite clear to which genus a species belongs, it is permissible to use the format: *E. regnans*. Family names used as nouns begin with a capital letter but lower case is used when they are adjectives (e.g. Tubificidae becomes tubificid worms).

It is standard to spell out the numbers one through nine in essays, but use Arabic numerals for 10 and above, unless they come at the beginning of a sentence. Another exception to this rule occurs when a measurement is followed by its standard unit, e.g., '1 m', '10 g', '100°C'. In these cases Arabic numerals are always used.

Headings are not necessary, but sometimes help with clarity and the organisation of the essay if they are used appropriately. Headings refer to the content, not to the stage of the essay, e.g. not 'Development of Subject Matter', or 'Introduction'. Be careful not to use too many headings and subheadings. For instance, in an essay of 1000 words it might be appropriate to include 2-3 headings, whereas for an essay that's ≥ 2500 words in length it may be appropriate to use more.

Accessing source material

It is important that you use high quality references (specialized scientific books and journal articles). You should, wherever possible, go to the primary literature, i.e. the original papers reporting the information for the first time. Books, in most cases, are secondary sources and include the authors' interpretations of the primary literature. Such interpretations may not always be the only interpretations - hence the need to consult primary literature. Journal articles have been refereed by other scientists, i.e. they have been sent to other scientists for critical comments prior to publication. This is important in maintaining high standards in scientific literature. **Encyclopedias, newspapers and popular magazines are not acceptable sources. They are rarely written by scientists and have not been refereed for the scientific validity of their contents.** Nor is much of the information that you will find on the internet. When you read this type of information, ask yourself questions about the material that is presented. Be critical of all you read and always check for consistency of argument. Avoid using web-based information unless you have been specifically advised by your lecturer that it is acceptable (**Check first!**), or you are using refereed scientific journals. Journal articles are becoming more widely available electronically, than in their traditional hard copy form. For instance, many journals that can be found in the library, are also now available on the web. Make sure you give the proper journal citation for these (see the section on citations and referencing below) and not the web address.

Remember to attend a library tutorial on how to use search databases such as 'Biological abstracts'. This is an essential skill if you wish to continue with any tertiary study!

Organisation

An essay should introduce the topic, discuss it, and lead to a conclusion. Treat it as a structural argument, so that succeeding paragraphs show some degree of continuity. When you have read enough about your topic to feel confident that you have thought of all of the issues that need to be covered in your essay, you should form a clear plan and then start writing. The audience you will write for comprises biologists who are not necessarily specialists in your topic.

Scientific essays may conveniently be divided into four parts to aid the logical communication of facts and ideas. These four parts may be separated as follows.

1. Introduction

An introduction is used to define the scope of the essay and to give such background information as is necessary for the discussion of the topic. It should be brief (no more than about one-tenth of the essay length). It should include the following, not necessarily in this order.

- (A) Background: - A brief survey of relevant introductory information to a topic (often historical) serves to place that topic in context for the reader. Depending on the topic, it may also be necessary to define important technical terms, or special uses of words.
- (B) Scope: - A statement of your interpretation of the topic (that explains how you intend to cover it) can also be included.

2. Development of the Subject Matter *(Note: Please do not use this as a heading in your essay)*

In this section, the logical development of the subject matter must be made apparent to the reader. We do not want long descriptions of a topic, but **your critical analysis of the topic**. This means that we expect you to **read widely about the topic**, and to select the best references. A good essay at second or third year level would usually use at least 10, and preferably closer to 20 references comprising a mix of primary research and recent review articles. At first year level 5-8 are expected.

In all technical writing there are literary conventions to be met in acknowledging sources of information. Not only are you ethically bound to acknowledge any facts or ideas that are not your own using citations in the text (unless of course they are well-known and accepted), but a complete reference list of your sources is also required by readers wishing to pursue the topic. **Make sure you read the section on plagiarism at the end of this guide.** We emphasize that failure to use citations in your text and list all references at the end of your essay will lower your final mark.

One or two figures or tables may be used in support of the text, as it is often possible to convey information more accurately and concisely this way. This does not mean that your essay should be full of irrelevant diagrams and figures that are not referred to in the text. Only the most relevant information should be used to support your argument (i.e. the evidence to support your interpretation of the topic). Always refer to any figures or tables in the text and cite your source for them in their captions.

3. *Conclusion*

The conclusion should:

- (1) Integrate the major points presented in the body of the essay.
- (2) Provide a summary.

It may also suggest further lines of research that might provide the answers to as yet unsolved problems. The conclusion is usually around one-tenth of the essay's length.

4. *References*

The editors of different scientific journals have different requirements with regard to referencing. There are also changes with time in what is regarded as standard; for example it is now becoming common to give the title of a journal in full rather than an abbreviation. Although there are many ways of referencing correctly, the examples shown below are taken from the Australian Journal of Botany published by C.S.I.R.O. The C.S.I.R.O. publish a number of other journals including the Australian Journals of Zoology, Plant Physiology, Chemistry, Physics, Primary Health and Marine & Freshwater, Soil and Wildlife Research. The following examples should guide you through most referencing situations.

How to use citations:

In other disciplines, foot-notes are often used. However, this is less common in biology and should be avoided in work submitted for units in this school. A one author paper should be cited in the text as (surname date), a two author paper as (surname and surname date) and a paper with three or more authors should be cited as (first author surname *et al.* date). If the information comes from more than one paper each citation is divided with a semicolon. Here are some examples of how references can be cited in the text of your essay:

Exposing the leaf surfaces of shaded understorey plants to sunlight without giving them a sufficient period for acclimation can result in a reduced rate of photosynthesis (Levitt 1980).

In a little-known Russian paper on the effects of day length on seedling growth in *Eucalyptus*, Shaposhnikov (1935) suggested that the long-day responses of two species and the short-day responses of two others were linked to the geographical ranges of each of the species in Australia. More than 25 years after this early investigation, quantitative long-day responses were again reported for seedlings of several species (Scurfield 1961; Miles 1965). At about the same time Vaartaja (1963) noted that photoperiodic responses were totally absent in seedlings of four additional species. Since then, the trend towards minimising the importance of day length effects in the genus has continued. Green (1967) and especially some more recent authors (Ashton 1975; Cremer 1975; Specht and Brouwer 1975), have all concluded that seasonal shoot development in the field involves temperature responses rather than weak photoperiodic responses which affect growth in some species.

In a previous report we described the various forms of leaf anatomy found in the Chenopodiaceae (Carolin *et al.* 1975).

Note that the citations are **in the sentence**. They are **not** after the sentence, that is, not after the full stop. If similar information comes from multiple papers, they should all be cited in chronological order. If multiple papers are cited from the same year put then in alphabetical order.

If you have no choice but to rely on one author's citation from another author because you could not obtain a copy of the original work to read:

As shown by Morgan (1944) (cited in Smith 1957) ... or Morgan (1944, cited by Smith 1957) showed that.... [**Note: both authors should be listed in the bibliography.**]

Quote directly from a reference **only if highly pertinent**, and then use quotation marks and cite the author. It is rare to need to use a direct quote — avoid it where possible.

How to write your reference list:

At the end of your essay you should include a list of the references you used to gather your information for your essay (listed under the heading: **References**). **All and only those authors** that you have cited in the text must appear in the reference list. They should be listed in **alphabetical order** (using the first author's surname). If two or more articles have the same first author surname they should be listed in the order in which they were published (earliest to most recent). The format for several types of references (e.g. journal articles, chapters from books) is as follows. Note that the different types are **not** separated in the list and we do not use dot points, or number each.

For a paper:

One author: cited in text as (author surname date)

Reis PJ (1978) Effectiveness of intravenous and abomasal doses of mimosine for defleecing sheep and effects on subsequent wool growth. *Australian Journal of Agricultural Research* **29**, 1043-1055.

Two authors: cited in text as (author surname and author surname date)

Stover LE, Partridge AD (1973) Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, south-eastern Australia. *Proceedings Royal Society Victoria* **85**, 237-286.

Three authors: cited in text as (first author surname *et al.* date)

Connor DJ, Legge NC, Turner NC (1977) Water relations of mountain ash (*Eucalyptus regnans* F. Muell.) forests. *Australian Journal of Plant Physiology* **4**, 753-762.

Many authors: cited in text as (first author surname *et al.* date).

Please note here and in the three author example shown above that although the abbreviation *et al.* is used for three or more authors in the citation, the names of all the authors of a publication must appear in the reference list e.g. the reference below would be cited in your essay as (Coding *et al.* 1987) but written in your reference list in the following format.

Coding JR, Catt KT, Brown JM, Kaltenback CC, Cumming IA, Mole BJ (1987)
Radioimmunoassay for ovine luteinizing hormone. Secretion of luteinizing hormone during estrus and following estrogen administration in the sheep. *Endocrinology* **85**, 133-142.

For a book: cited in text as (author surname/s date), the date being the date of publication of the edition used, not the reprint date (if given).

Burrell H (1927) 'The platypus.' (Angus and Robertson: Sydney)

Jones DL, Clemesha SC (1993) 'Australian ferns and fern allies.' (The Currawong Press: Sydney)

For a chapter in a book: cited in text as (surname of the person/s who wrote the chapter date).

Shiel RJ (1980) Billabongs of the Murray-Darling system. In 'An ecological basis for water resource management.' (Ed. WD Williams) pp. 376-390. (Australian National University Press: Canberra)

This would be cited in the text as (Shiel 1980), not (Williams 1980).

Hauck RD (1983) Agronomic and technological approaches to minimizing gaseous nitrogen losses from croplands. In 'Gaseous loss of nitrogen from plant-soil systems.' (Eds JR Freney, JR Simpson) pp. 285-312. (Kluwer: Boston)

This would be cited in the text as (Hauck 1983).

For a thesis

Phillips RA (1967) Stomatal characteristics throughout a tree crown. MSc. Thesis (University of Washington: Seattle)

For reports/bulletins/conference proceedings

Ball PR, Keeney DR (1983) Nitrogen losses from urine-affected areas of a New Zealand pasture, under contrasting seasonal conditions. In 'Proceedings of the XIV International Grassland Congress.' pp. 342-344. (Westview Press: Boulder)

Chippendale GM, Wolf L (1981) The natural distribution of *Eucalyptus* in Australia. Australian National Parks and Wildlife Service, Special Publication No. 6, Canberra.

All references are listed alphabetically and were just sectioned into different types above for the purpose of clarity. Occasionally an author will publish more than one article in the same year. Use a, b, etc., to distinguish the references in the sequence of references in the text.

Lavery TM (1994a) Costs to foraging bumble bees of switching plant species. *Canadian Journal of Zoology* **72**, 1293-1301.

Lavery TM (1994b) Bumble bee learning and flower morphology. *Animal Behaviour* **36**, 733-740.

There is an increasing tendency to use the whole journal title in the biological literature and this is our preferred format for referencing in your essays. If you want to know what journal name that an abbreviation stands for, a list of standard abbreviations for journals may be found in the Hargrave-Andrew Library.

e.g. *Ann. Bot.* is the abbreviation for *Annals of Botany*
 Ann. Rev. Pl. Physiol. is the abbreviation for *Annual Review of Plant Physiology*

Plagiarism and cheating:

"The submission of essays, assignments and homework is an essential part of the learning process and a vital way of assessing students' understanding of a subject. The submitted work must therefore be a student's own work. This does not mean that students may not make use of the work of others. However, in quoting or paraphrasing material from other sources, those sources must be acknowledged in full. It may be useful to seek the help of a tutor, lecturer or demonstrator in preparing the piece of work, and to enlist the help of fellow students in sorting out ideas, but the final product must be written by the student in his or her own words. Plagiarism occurs when students fail to acknowledge that ideas have been borrowed. Specifically, it occurs when:

- phrases and passages are used verbatim without quotation marks and without a reference to the author
- an author's work is paraphrased and presented without a reference
- other students' work is copied or partly copied
- other people's designs, codes and images are presented as the student's own work
- laboratory results of someone else are used without appropriate attribution
- items for assessment are written in conjunction with other students (without prior permission of the relevant staff member)
- a piece of work has already been submitted for assessment in another unit."

Source: <http://www.monash.edu.au/teaching/academic-integrity/student/whatisplag.html>

If in doubt, seek the advice of your lecturer.

See also:

<http://www.monash.edu.au/lis/lionline/writing/general/plagiarism/1.xml>

<http://www.policy.monash.edu/policy-bank/academic/education/conduct/plagiarism-policy.html>

(Revised: January 2013)