

Interpreting the assessment criteria

Criterion A: research question

In a biology extended essay, the research question is best stated in the form of a question. The research question should not be understood as a statement of the topic but rather as a precisely formulated question that the research will attempt to answer. For example, a statement of the topic of an essay might be “Factors that affect bacterial growth in agar plate cultures”; the research question based on this topic could be “How are the growth rates of three strains of *E. coli* affected by temperature?”. The research question can then be used to formulate a hypothesis, or hypotheses, which can be tested. The research question should be identified clearly and set out prominently in the introduction. A broad statement of the topic of the essay or a statement of the hypothesis is **not sufficient** on its own to meet the requirement for a research question in a biology extended essay.

Criterion B: introduction

The purpose of the introduction is to set the research question into context. It is usually appropriate to include the general background biological theory required to understand how the research question has arisen. Students are not expected to explain basic biology forming part of the Diploma Programme biology course, but they are expected to be able to show that they fully understand it and can apply it correctly. Some research questions may require background from other disciplines. This should be kept to a minimum, as the essay will be judged on its biological content.

Criterion C: investigation

The way in which the investigation is written will depend very much on whether or not the essay is based on experimental work performed by the student. For essays that are based on data taken from written sources, the student should explain clearly how the data has been selected and should comment on its reliability. For experimental work, sufficient information on the methodology should be provided to allow the work to be repeated. Students should demonstrate that they understand the theory behind any techniques or apparatus used. They are also expected to show an awareness of any limitations or uncertainties inherent in their techniques and apparatus.

Criterion D: knowledge and understanding of the topic studied

A biology extended essay should be based on specific, relevant and clearly defined aspects of the biological study of living organisms. The information and ideas should be presented in a way that provides evidence that these have been understood and applied correctly. Material extracted from the sources should be referenced and incorporated into the main body of the essay in a way that demonstrates the student’s understanding.

Criterion E: reasoned argument

Because of the nature of the subject, students writing a biology extended essay must make a special effort to maintain a reasoned, logical argument that focuses on the research question. Essays that attempt to deal with a large number of variables are unlikely to be focused and coherent. A clear and logical argument can be achieved by making repeated reference to the research question and to the hypotheses derived from it. An assessment of the extent to which the hypotheses are supported, or the question is answered, by the data or information accessed should form part of the argument.

Criterion F: application of analytical and evaluative skills appropriate to the subject

The stated conclusion(s) must be based on the data, information and/or evidence presented in the essay. The data must be analysed and presented in such a way that the argument leading to the conclusion is supported and clarified. Tables of raw data will generally not achieve this on their own. Raw data must be analysed, processed and presented in a way that relates clearly and directly to the central argument of the essay. Where appropriate, this analysis should allow for an assessment of the validity of the hypothesis. Errors and uncertainties arising from the methodology, instruments and/or techniques should be analysed and critically evaluated.

Criterion G: use of language appropriate to the subject

Students writing in biology need to show a mastery of, and fluency in, the use of appropriate terminology. At the same time, students need to avoid excessive use of jargon. Any technical terms that are used should be explained and the student must demonstrate an understanding of these terms by using them appropriately within the text. The student must try to maintain a consistent linguistic style throughout the essay.

Criterion H: conclusion

The conclusion should relate directly to the research question and should point out the main findings of the research. Biological research often reveals unexpected outcomes and these should be pointed out, even if they were not part of the original plan. The original research question may not be fully answered by the investigation. In these cases, the student should point out unresolved issues and make suggestions as to how these might be further investigated.

Criterion I: formal presentation

Biological investigations often require the support of referenced material, not only in the form of text or data, but also as diagrams or drawings. Care must be taken to supply references for illustrations taken from sources. Students must avoid the temptation to supply illustrations for their own sake. Illustrative material should only be included if it enhances the argument or supplies information that cannot be easily provided in another way. Original photographs, photocopies or downloaded images that are not labelled or put into the context of the investigation are unlikely to enhance the essay.

Biological investigations often result in large quantities of raw data. Large tables of raw data are best included in an appendix. Processed data that is central to the argument of the essay should be included in the body of the essay, as close as possible to its first reference.

Criterion J: abstract

For a biological investigation, the abstract must include the research question and a conclusion that directly relates to the research question. In addition, the description of how the research was conducted must include a description of the methodology and the scope of the study.

Criterion K: holistic judgment

Qualities that are rewarded under this criterion include the following.

- Intellectual initiative: Ways of demonstrating this in biology essays include the choice of topic and research question, and the use of novel or innovative approaches to address the research question.
- Insight and depth of understanding: These are most likely to be demonstrated as a consequence of detailed research and thorough reflection, and by well-informed and reasoned argument that consistently and effectively addresses the research question.
- Originality and creativity: These will be apparent by clear evidence of a personal approach backed up by solid research and reasoning.