

Extended Essay. Comment and Assessment Rubric - Biology

Criterion A: Focus and method

This criterion focuses on the topic, the research question and the methodology. It assesses the explanation of the focus of the research (this includes the topic and the research question), how the research will be undertaken, and how the focus is maintained throughout the essay.

(Strands: Topic, Research question, Methodology)

The topic of the biology EE must be outlined at the start of the essay and should clearly establish the context of the research question. This should include the area of the research and the purpose and focus of the essay.

It is usually appropriate also to include the general background biological theory required to understand how the research question has arisen. For example, an essay's topic may be "Factors affecting the distribution of seagrass in Californian bays". The explanation of this topic may include reference to inshore ecosystems, pollution, the decline in seagrasses and the possible relationship to sea otter populations.

The research question must be expressed in the form of a question. It should be the precisely formulated question that the research will attempt to answer. The research question based on factors affecting the distribution of seagrass in Californian bays could be: "How do different concentrations of ammonium nitrate in sea water tanks affect the growth of seagrass (*Zostera* spp) over a three-month period?"

The research question must be:

- answerable within the limitations of resources, time and words at the student's disposal
- identified clearly
- clearly set within the academic framework of biology
- set out prominently at the start of the essay.

The student can then use the research question to formulate a hypothesis, or hypotheses, which can be tested.

Students need to demonstrate within the essay that the research has been well planned. They should show that they have researched the topic and selected an appropriate biological approach to address the research question. This applies both to their literature research and to practical data collection.

Students must demonstrate that their chosen methods and materials are appropriate for addressing the research question. They should explain their rationale for choosing practical methods. If they undertake experimental work, they must include sufficient information on their methodology for the work to be repeated.

The sources consulted must be sufficient and each must contribute to the research focus of the essay. If the study is based on the research of secondary data, students need to ensure that their selection of sources is sufficiently wide and reliable.

If students have undertaken an investigation under guidance in an external laboratory, they must clearly demonstrate:

- their understanding of the methods and materials applied
- their role in choosing and applying them.

If students are investigating a well-documented or standard topic, they should attempt to look for a new perspective on the issue.

Criterion A: Focus and method. *The Assessment Criteria*

Level	Descriptor
0	The work does not reach a standard outlined by the descriptors below.
1–2	<p>The topic is communicated unclearly and incompletely</p> <ul style="list-style-type: none">- Identification and explanation of the topic is limited; the purpose and focus of the research is unclear, or does not lend itself to a systematic investigation in the subject for which it is registered. <p>The research question is stated but not clearly expressed or too broad</p> <ul style="list-style-type: none">- The research question is too broad in scope to be treated effectively within the word limit and requirements of the task, or does not lend itself to a systematic investigation in the subject for which it is registered.- The intent of the research question is understood but has not been clearly expressed and/or the discussion of the essay is not focused on the research question. <p>Methodology of the research is limited</p> <ul style="list-style-type: none">- The source(s) and/or method(s) to be used are limited in range given the topic and research question.- There is limited evidence that their selection was informed.
3–4	<p>The topic is communicated</p> <ul style="list-style-type: none">- Identification and explanation of the research topic is communicated; the purpose and focus of the research is adequately clear, but only partially appropriate. <p>The research question is clearly stated but only partially focused</p> <ul style="list-style-type: none">- The research question is clear but the discussion in the essay is only partially focused and connected to the research question. <p>Methodology of the research is mostly complete</p> <ul style="list-style-type: none">- Source(s) and/or method(s) to be used are generally relevant and appropriate given the topic and research question.- There is some evidence that their selection(s) was informed. <p>If the topic or research question is deemed inappropriate for the subject in which the essay is registered no more than four marks can be awarded for this criterion.</p>
5–6	<p>The topic is communicated accurately and effectively</p> <ul style="list-style-type: none">- Identification and explanation of the research topic is effectively communicated; the purpose and focus of the research is clear and appropriate. <p>The research question is clearly stated and focused</p> <ul style="list-style-type: none">- The research question is clear and addresses an issue of research that is appropriately connected to the discussion in the essay. <p>Methodology of the research is complete</p> <ul style="list-style-type: none">- An appropriate range of relevant source(s) and/or method(s) have been applied in relation to the topic and research question.- There is evidence of effective and informed selection of sources and/or methods.

Criterion B: Knowledge and understanding

This criterion assesses the extent to which the research relates to the subject area/discipline used to explore the research question, or in the case of the world studies extended essay, the issue addressed and the two disciplinary perspectives applied, and additionally the way in which this knowledge and understanding is demonstrated through the use of appropriate terminology and concepts.

(Strands: Process, Research focus)

This criterion assesses the student's engagement with their research focus and the research process. It will be applied by the examiner at the end of the assessment of the essay, after considering the student's Reflections on planning and progress Form (RPPF).

Students are expected to provide reflections on the decision-making and planning process undertaken in completing the essay. Students must demonstrate how they arrived at a topic as well as the methods and approach used. This criterion assesses the extent to which a student has evidenced the rationale for decisions made throughout the planning process and the skills and understandings developed.

For example, students may reflect on:

- the approach and strategies they chose, and their relative success
- the Approaches to learning skills they have developed and their effect on the student as a learner
- how their conceptual understandings have developed or changed as a result of their research
- setbacks they faced in their research and how they overcame these
- questions that emerged as a result of their research
- what they would do differently if they were to undertake the research again.

Effective reflection highlights the journey the student has engaged in through the EE process. Students must show evidence of critical and reflective thinking that goes beyond simply describing the procedures that have been followed.

The reflections must provide the examiner with an insight into student thinking, creativity and originality within the research process. The student voice must be clearly present and demonstrate the learning that has taken place.

Criterion B: Knowledge and understanding. *The Assessment Criteria*

Level	Descriptor
0	The work does not reach a standard outlined by the descriptors below.
1–2	<p>Knowledge and understanding is limited.</p> <ul style="list-style-type: none">- The selection of source material has limited relevance and is only partially appropriate to the research question.- Knowledge of the topic/discipline(s)/issue is anecdotal, unstructured and mostly descriptive with sources not effectively being used. <p>Use of terminology and concepts is unclear and limited.</p> <ul style="list-style-type: none">- Subject-specific terminology and/or concepts are either missing or inaccurate, demonstrating limited knowledge and understanding.
3–4	<p>Knowledge and understanding is good.</p> <ul style="list-style-type: none">- The selection of source material is mostly relevant and appropriate to the research question.- Knowledge of the topic/discipline(s)/issue is clear; there is an understanding of the sources used but their application is only partially effective. <p>Use of terminology and concepts is adequate.</p> <ul style="list-style-type: none">- The use of subject-specific terminology and concepts is mostly accurate, demonstrating an appropriate level of knowledge and understanding. <p>If the topic or research question is deemed inappropriate for the subject in which the essay is registered no more than four marks can be awarded for this criterion.</p>
5–6	<p>Knowledge and understanding is excellent.</p> <ul style="list-style-type: none">- The selection of source materials is clearly relevant and appropriate to the research question.- Knowledge of the topic/discipline(s)/issue is clear and coherent and sources are used effectively and with understanding. <p>Use of terminology and concepts is good.</p> <ul style="list-style-type: none">- The use of subject-specific terminology and concepts is accurate and consistent, demonstrating effective knowledge and understanding.

Criterion C: Critical thinking

This criterion assesses the extent to which critical-thinking skills have been used to analyse and evaluate the research undertaken.

(Strands: Research, Analysis and Discussion and evaluation)

The “research” refers to both literature sources and data collected and processed by the students themselves. This research must be consistently relevant to the research question.

Presentation and use of data

The student is expected to appropriately present and analyse the data and sources and related uncertainties. This analysis will often include:

- mathematical transformations
- statistical analysis such as standard deviations and t-tests
- tables of processed data
- graphs.

If the data are analysed statistically, the student must clearly show understanding in the body of the essay of:

- why that particular measure or test was chosen
- how it was applied
- what the results mean in this context.

If graphs are used, they must be correctly selected and drawn to illustrate key elements of the analysis. They should only be included if they improve communication.

Students must analyse and present their data in such a way that they support and clarify the argument leading to the conclusion.

Students 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. The stated conclusion(s) must be based on, and consistent with, the research presented in the essay. Biological research often reveals unexpected outcomes and these should be pointed out.

The original research question may not be fully answered by the investigation. In these cases, the student may point out unresolved issues and may make suggestions as to how these might be further investigated.

The student must comment on the quality, balance and quantity of the secondary sources and data used. They are also expected to show an awareness of any limitations or uncertainties inherent in their approach. In particular, they should critically comment on the validity and reliability of their data relative to their management of variables within the investigation.

Criterion C: Critical thinking. *The Assessment Criteria*

Level	Descriptor
0	The work does not reach a standard outlined by the descriptors below.
1–3	<p>The research is limited.</p> <ul style="list-style-type: none">- The research presented is limited and its application is not clearly relevant to the RQ. <p>Analysis is limited.</p> <ul style="list-style-type: none">- There is limited analysis.- Where there are conclusions to individual points of analysis these are limited and not consistent with the evidence. <p>Discussion/evaluation is limited.</p> <ul style="list-style-type: none">- An argument is outlined but this is limited, incomplete, descriptive or narrative in nature.- The construction of an argument is unclear and/or incoherent in structure hindering understanding.- Where there is a final conclusion, it is limited and not consistent with the arguments/evidence presented.- There is an attempt to evaluate the research, but this is superficial. <p>If the topic or research question is deemed inappropriate for the subject in which the essay is registered no more than three marks can be awarded for this criterion.</p>
4–6	<p>The research is adequate.</p> <ul style="list-style-type: none">- Some research presented is appropriate and its application is partially relevant to the Research question. <p>Analysis is adequate.</p> <ul style="list-style-type: none">- There is analysis but this is only partially relevant to the research question; the inclusion of irrelevant research detracts from the quality of the argument.- Any conclusions to individual points of analysis are only partially supported by the evidence. <p>Discussion/evaluation is adequate.</p> <ul style="list-style-type: none">- An argument explains the research but the reasoning contains inconsistencies.- The argument may lack clarity and coherence but this does not significantly hinder understanding.- Where there is a final or summative conclusion, this is only partially consistent with the arguments/evidence presented.- The research has been evaluated but not critically.

7-9	<p>The research is good.</p> <ul style="list-style-type: none"> - The majority of the research is appropriate and its application is clearly relevant to the research question. <p>Analysis is good.</p> <ul style="list-style-type: none"> - The research is analysed in a way that is clearly relevant to the research question; the inclusion of less relevant research rarely detracts from the quality of the overall analysis. - Conclusions to individual points of analysis are supported by the evidence but there are some minor inconsistencies. <p>Discussion/evaluation is good.</p> <ul style="list-style-type: none"> - An effective reasoned argument is developed from the research, with a conclusion supported by the evidence presented. - This reasoned argument is clearly structured and coherent and supported by a final or summative conclusion; minor inconsistencies may hinder the strength of the overall argument. - The research has been evaluated, and this is partially critical.
10-12	<p>The research is excellent.</p> <ul style="list-style-type: none"> - The research is appropriate to the research question and its application is consistently relevant. <p>Analysis is excellent.</p> <ul style="list-style-type: none"> - The research is analysed effectively and clearly focused on the research question; the inclusion of less relevant research does not significantly detract from the quality of the overall analysis. - Conclusions to individual points of analysis are effectively supported by the evidence. <p>Discussion/evaluation is excellent.</p> <ul style="list-style-type: none"> - An effective and focused reasoned argument is developed from the research with a conclusion reflective of the evidence presented. - This reasoned argument is well structured and coherent; any minor inconsistencies do not hinder the strength of the overall argument or the final or summative conclusion. - The research has been critically evaluated.

Criterion D: Presentation

This criterion assesses the extent to which the presentation follows the standard format expected for academic writing and the extent to which this aids effective communication.

(Strands: Structure, Layout)

This criterion relates to the extent to which the essay conforms to accepted academic standards in relation to how research papers should be presented. It also relates to how well these elements support the reading, understanding and evaluation of the essay.

Structure

Students may use numbered and headed paragraphs to impose a clear structure. sub-headings should not distract from the overall structure of the essay or argument presented.

Recording experiments

Students should aim for scientific paper style, rather than a cookery book recipe approach. The record should include:

- a scientific annotated diagram to introduce key elements of the set-up
- relevant details of key equipment
- a summary of the essential procedural steps.

Students should avoid including minor or irrelevant details and repetitions, but must include those elements needed for reliability and replicability.

Charts, images, graphs and tables

- Any graphs, figures or tables generated by students or taken from literature sources must be carefully selected and labelled. They should only be used if they are directly relevant to the research question, contribute towards the understanding of the argument and are of a good graphic quality.
- Students must accompany images, charts and tables with analysis and discussion to show how they further the essay's argument.
- Only 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.
- Tables should enhance a written explanation but not themselves include significant bodies of text. If they do, then these words must be included in the word count.
- Clarity in tables and graphs (legend) is important and students should not use unnecessary "over-formatting" that may detract from communication.
- A representative sample of raw data collected in large amounts by the student must be included in the core of the essay in a data table, including uncertainties and units. Any table should be designed to clearly display the information in the most appropriate form.
- Large tables of raw data collected by the student are best included in an appendix, where they should be carefully labelled.
- Graphs or charts drawn from the analysed data should be selected to highlight only the most pertinent aspects related to the argument. Too many graphs, charts and tables will detract from the overall quality of the communication.
- The use of a summary table and the combination of multiple graphs into one graph (family of curves) will avoid unnecessary repetitions.
- Students should illustrate key mathematical transformations with examples. Equations referred to in the text should be numbered.

Any material that is not original must be carefully acknowledged, with specific attention paid to the acknowledgment and referencing of quotes and ideas. This acknowledgment and referencing is applicable to audio-visual material, text, graphs and data published in print and electronic sources. If the referencing does not meet the minimum standard as indicated in the guide (name of author, date of publication, title of source and page numbers as applicable), and is not consistently applied, work will be considered as a case of possible academic misconduct.

A bibliography is essential and has to be presented in a standard format. Title page, table of contents, page numbers, etc must contribute to the quality of presentation.

The essay must not exceed 4,000 words of narrative. Graphs, figures, calculations, diagrams, formulas and equations are not included in the word count. Students must be aware that examiners will not read beyond the 4,000-word limit, nor assess any material presented past this.

Criterion D: Presentation. *The Assessment Criteria*

Level	Descriptor
0	The work does not reach a standard outlined by the descriptors below.
1–2	<p>Presentation is acceptable.</p> <ul style="list-style-type: none">- The structure of the essay is generally appropriate in terms of the expected conventions for the topic, argument and subject in which the essay is registered.- Some layout considerations may be missing or applied incorrectly.- Weaknesses in the structure and/or layout do not significantly impact the reading, understanding or evaluation of the extended essay.
3–4	<p>Presentation is good.</p> <ul style="list-style-type: none">- The structure of the essay clearly is appropriate in terms of the expected conventions for the topic, the argument and subject in which the essay is registered.- Layout considerations are present and applied correctly.- The structure and layout support the reading, understanding and evaluation of the extended essay.

Criterion E: Engagement

This criterion assesses the student's engagement with their research focus and the research process. It will be applied by the examiner at the end of the assessment of the essay, after considering the student's *Reflections on planning and progress form*.

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Criterion E: Engagement. *The Assessment Criteria*

Level	Descriptor
0	The work does not reach a standard outlined by the descriptors below.
1–2	Engagement is limited. <ul style="list-style-type: none">- Reflections on decision-making and planning are mostly descriptive.- These reflections communicate a limited degree of personal engagement with the research focus and/or research process.
3–4	Engagement is good. <ul style="list-style-type: none">- Reflections on decision-making and planning are analytical and include reference to conceptual understanding and skill development.- These reflections communicate a moderate degree of personal engagement with the research focus and process of research, demonstrating some intellectual initiative.
5–6	Engagement is excellent. <ul style="list-style-type: none">- Reflections on decision-making and planning are evaluative and include reference to the student’s capacity to consider actions and ideas in response to setbacks experienced in the research process.- These reflections communicate a high degree of intellectual and personal engagement with the research focus and process of research, demonstrating authenticity, intellectual initiative and/or creative approach in the student voice.