

Biology Extended Essay – A Student's Guide.

Why Biology?

A biology extended essay (EE) allows students to explore a personally interesting topic in the field of biology while applying a range of skills. Biology, as the science of living organisms and life processes, should be the foundation of a biology EE, incorporating relevant biological theory and emphasizing its essential nature.

What topic do I choose?

The topic of the extended essay must pertain specifically to biology. If a topic can be approached from different perspectives, the treatment of the material must have a clear biological focus. For instance, interdisciplinary areas like biochemistry, registered under biology, will be evaluated solely based on their biological content.

Essays concerning human diseases should primarily focus on biological aspects rather than medical diagnosis and treatment, even though multiple perspectives are possible. Similarly, essays on sports physiology and physical fitness must emphasize the biological viewpoint, providing biological explanations for the results.

What topics are not suitable?

Certain topics may be deemed inappropriate due to unethical means of investigation. For instance, investigations involving experiments that inflict pain or stress on living organisms, or potentially harm health, such as culturing micro-organisms at body temperature (37°C), are not permissible. Additionally, access to or publication of confidential medical information is also not allowed unless proper informed consent is obtained following IB guidelines, especially when human subjects are involved.

Topics may also be considered unsuitable due to safety concerns. Experiments involving hazardous substances like toxic or dangerous biologicals, carcinogenic substances, or radioactive materials require adequate safety measures and qualified supervision.

Furthermore, topics that have already been extensively documented in standard textbooks may be unsuitable due to the well-known and predetermined outcomes.

How does it differ from my IA?

It is important to distinguish between the extended essay (EE) in biology and the internal assessment (IA) task.

- The IA primarily focuses on syllabus content, whereas the EE could explore aspects of biology not covered in the syllabus.
- The IA must include data collection and analysis (from hands-on experiments, databases, simulations, or modelling) and cannot purely be a literature review.
- The EE must construct a theoretical framework for the underlying biology of the chosen topic, whereas the IA focuses on the application of the scientific method to a problem of interest and will only include some background information.
- The EE explicitly assesses the students' ability to analyse and evaluate scientific arguments.

Students must ensure that their extended essay (EE) does not duplicate any other work they are submitting for the Diploma Programme.

Can I use secondary data?

Students can incorporate data collected from external sources in their extended essay (EE). i.e. databases

However, to achieve high marks, students must develop their own method of analysing the secondary data to directly address their research question. In any biology EE, students must showcase their understanding of the underlying theory and state any assumptions made during experimental work. Students should critically evaluate inadequate experimental design, limitations of the experimental method, and potential systematic errors.

Encouraging students to explore unresolved questions and propose new areas for investigation is essential.

What are some examples of experimental RQ's

Remember, it's highly recommended that you answer something not syllabus related.

- What evidence is there for the antibacterial properties of commercially available mouthwash on *Streptococcus mutans* (or other safe/approved strain) grown at 20°C?
- How does the level of urease activity differ between dried and fresh soy beans?
- Analysing the antimicrobial properties of plant extracts against common pathogens.

What are some examples of data/literature based RQ's?

Data Base:

To what extent does light pollution impact the reproductive behaviour of [a nocturnal animal species]?

Literature:

What is the effectiveness of phytoremediation in mitigating soil and water pollution, and what are its limitations?

Biology Extended Essay – Breaking Down the Assessment Criteria

Criterion A – Focus and Method

The extended essay (EE) in biology should have a distinct focus on biology and center around the biological aspects of the investigation. It should incorporate fundamental biological principles.

- The topic for the EE can be chosen from the core, the Additional Higher Level (AHL) topics, or one of the IB biology options outlined in the syllabus. However, the primary emphasis should always be on biology.
- When formulating the research question, it is essential to present it as an actual question. For example, "Can the presence of spectator ions influence the rate of oxidation-reduction reactions?"
- To address the research question, students must conduct a thorough literature review on the chosen topic and select an appropriate methodology for their investigation. This can involve conducting experiments in the laboratory or basing the research on existing data.
- If practical work is carried out, it is important to clearly explain the rationale behind the chosen experimental procedure. In cases where the investigation takes place in an external laboratory, students need to demonstrate a comprehensive understanding of the methods, materials, and their role in data collection.

Criterion B – Focus and Method

- Students must exhibit comprehension of relevant biological principles and accurately apply them. The essay should provide a clear explanation of the biology underlying the research question and chosen techniques.
- Source materials used should be relevant, appropriately referenced, and effectively integrated into the essay to demonstrate the student's understanding. Scientific sources should be predominantly cited in the literature.
- Consistency in linguistic style is expected throughout the essay, and biological nomenclature and terminology should be used consistently and effectively.

Criterion C – Critical Thinking

In a biology EE, research refers to relevant literature sources and student-collected data. Students must effectively apply their selected sources and methods to support their argument.

- Data analysis should include mathematical transformations, statistical analysis, and tables/graphs. Graphs should only be included if they improve communication and accurately illustrate key elements of the analysis.
- A reasoned, logical argument focused on the research question should be maintained. The extent to which the question is answered by the data or accessed information should be assessed. The conclusion must align with the research presented.
- Unresolved issues and suggestions for further investigation should be addressed if the original research question is not fully answered. Inadequate experimental design and systematic errors should be exposed, and measurement uncertainties evaluated and discussed.
- The quality, balance, and quantity of sources should be commented upon. Limitations and uncertainties in the approach should be acknowledged, and the validity and reliability of data in relation to variable management should be critically assessed.

Criterion D – Presentation

Criterion D assesses the adherence to academic standards in presenting the essay and how well these elements contribute to its readability, understanding, and evaluation.

- Students should use numbered and headed paragraphs to provide a clear structure, ensuring that subheadings do not detract from the overall essay structure or argument.
- When including charts, images, or tables from literature sources, students should carefully select and label them, ensuring they directly relate to the research question, enhance understanding, and have good graphic quality. Raw data tables are best placed in an appendix, while processed data tables and graphs should highlight pertinent aspects related to the argument.
- Bibliographies are essential and should visually contribute to criterion D, along with other presentation requirements like title page, table of contents, and page numbers.

Criterion E – Engagement

This criterion evaluates the student's engagement with their research focus and process.

Students should reflect on:

- The chosen approach and strategies and their success
- The impact of Approaches to learning skills on their learning
- How their conceptual understanding has evolved through research
- Overcoming research challenges
- Emerging questions from the research
- Lessons learned for future research.