May 2015 extended essay reports

Biology

Overall grade boundaries

Grade:	E	D	C	B	A
Mark range:	0-7	8-15	16-22	23-28	29-36

The range and suitability of the work submitted

In this session essays were submitted in a wide range of appropriate topics including microbiology, factors affecting germination and growth of seedlings, biochemical investigations, molecular genetics, behavioural studies in invertebrates, fish and mammals, a variety of human biology topics (including behaviour, memory, perception of stimuli, and nutrition), studies based on a particular disease and ecological studies based on particular local phenomena or environmental issues.

Topics that do not have a strong biological basis such as ethical issues related to particular kinds of research, different approaches to medicine, surveys of attitudes to biological issues or the treatment of biological issues in the media rarely lead to successful essays.

Coordinators and supervisors should be aware of the particular problems related to essays dealing with the impact of a particular diet or of consumer products such as caffeine, coffee, energy drinks, and vitamin supplements on athletic performance and/or memory. Many of these studies rely on small sample sizes and short time frames and are therefore unlikely to lead to meaningful outcomes. Students should also steer clear of topics such as creationism, intelligent design, personal injuries and alternative medicines.

Essays based on practical work carried out at a university or other research institution, have become less common but continue to be submitted. The current guide makes it very clear that essays of this type must be accompanied by a covering letter from a qualified person at the external institution but examiners continue to report that in many of cases, this requirement is not met. A cover letter should outline the role of the candidate in deciding the research approach as well as the type and extent of guidance provided at the institution. Clear evidence must be provided (in the form of a covering letter), that the candidate has had a sufficient level of input into decisions about the research approach and selection of methodology and sources. The candidate should justify these decisions within the text of the

essay. The person(s) responsible at the outside institution should be made aware of the requirements and be asked to ensure that the candidate will have ample opportunity to plan and work independently.

Essays that are essentially literature-based narratives, where the student's contribution is confined to assembling the information from (usually) popular literature or web-based sources, continue to be submitted. While examiners search for qualities in these essays that show some merit, and try to reward these, it is often difficult for work of this type to perform well against the assessment criteria (particularly D, E and F). Students at this level rarely have the knowledge or skills to provide a critical evaluation of the methodologies used or the findings that have been presented. As a result they often end up simply repeating the perspective of the expert whose work they find most persuasive, and reaching a conclusion that is essentially their personal opinion.

Extended essays in biology must comply with the IB experimentation policy. These are minimum standards related to working with animal and human subjects and they should be adhered to at all times. These standards apply regardless of whether the work is carried out on site or at a research institution or university. Incubating microorganisms at or near body temperature is inappropriate due to the dangers of exposure to pathogenic strains. Candidate performance against each criterion

Criterion A: research question

A good research question (RQ) forms the foundation for a successful essay, and in most cases candidates have based their work on a clearly formulated, focused question. Problems also arise when the RQ is presented in different parts of the essay (title, abstract, introduction) using slightly different wording. This should be avoided.

Criterion B: introduction

In order to demonstrate the biological context and significance of the research question the candidate needs to present a summary of literature and other sources that have been accessed.

Criterion C: investigation

There must be clear evidence that the investigation has been planned by the candidate. Candidates can achieve this by explaining how information obtained from the sources helped to guide their decisions about which approach to follow.

Criterion D: knowledge and understanding of the topic studied

Understanding can be demonstrated by providing explanations and justifications for decisions about the research direction (why was something included, why was something else omitted) and methods.

Criterion E: reasoned argument

In order to achieve a fluent and coherent argument, candidates need to be explicit about their reasoning. A clear line of argument can be established and sustained when there is regular reference to the research question throughout the essay.

Criterion F: application of analytical and evaluative skills

While candidates should be encouraged to use statistical analysis where appropriate, they must also be selective about the techniques used and should be encouraged to explain and justify their approach.

Criterion G: use of language appropriate to the subject:

There are two aspects to this criterion: the use of clear and precise language on the one hand and the use of terminology appropriate to the topic on the other. Candidates need to adopt and sustain a clear and precise formal style and show an understanding of and fluency with the main technical terms associated with the topic.

Criterion H: conclusion

In an effective conclusion the candidate restates the research question and outlines the extent to which it has been answered, dealing also with issues that have not been resolved. Candidates should express the conclusions concisely and not overstate the findings.

Criterion I: formal presentation

The extended essay is a research report with its own formal requirements, different to those that apply to Internal Assessment. Candidates should be discouraged from using the IA criteria designations as chapter headings. There is a trend amongst candidates who take this approach to present a critical evaluation as the last section of the essay – after the conclusion. This does not make sense in terms of the scientific argument, conclusions can only be reached in the light of the identified weaknesses of the study and as such, the conclusion should be the last section of the Essay. All of the sources accessed must be included in the bibliography and for the majority of these there should be some corresponding in-text reference.

Candidates also need to be selective about whether to include in an appendix as the essay should make sense without any reference to the appendix.

Large tables of raw data can also be presented in an appendix but should be referred to in the text of the essay.

Criterion J: abstract

The most common problem is the failure to deal adequately with the scope of the essay. It is expected that the abstract will outline the methods that were used as well as the type and quantity of data collected.

Criterion K: holistic judgement

Supervisors should be aware that the comments they write on the extended essay cover sheet (on the circumstances surrounding the research and level of personal involvement of the candidate) can be of considerable assistance to the examiners in assessing criterion K.

Recommendations for the supervision of future candidates

The most successful essays are those that are based on a small number of variables that are clearly defined and easily manipulated and measured. Successful essays often use basic equipment of the type that can be normally found in a school, and can be out in the school laboratory or in the local environment. In addition successful essays have a clear academic, biological context and the relevance of published data and or information is explored.

Poor essays are produced when there has not been early intervention by a supervisor. Candidates can be encouraged to engage more fully with the writing process and to communicate more with the supervisor by agreeing on a detailed timetable with internal deadlines for various stages of the research process. This will also help to avoid time being wasted on unsuitable or overambitious investigations.

The number of supervisors who make no comment on the cover sheet has decreased and this is a pleasing development. However other points from previous reports remain valid. Candidates continue to be in need of guidance on the following:

- establishing, refining and using the research question (this is a requirement)
- providing a clear academic context for the research
- sustaining an effective argument
- displaying a command of the language of the topic
- bibliographic entries and in-text references
- structuring the essay (headings and sub headings)
- incorporating and integrating diagrams and illustrations
- selecting material for inclusion in an appendix.
- writing an abstract
- sample size
- statistical approaches
- avoiding bias
- dealing appropriately with ethical issues (related to animal and human subjects)

Further comments

Biology continues to be one of the most popular subject choices for the extended essay. Given the demands in terms of equipment, space and time that this involves, supervisors in many schools may be stretched to meet the needs of their students. However effective supervision is a crucial part of the learning process involved in writing the extended essay. Without effective ongoing supervision the process becomes a chore for the candidate and a fruitless exercise in the end. It is also obvious that the majority of supervisors had worked hard in guiding and encouraging their students.

The importance of careful supervision and clear guidance to the success of a biology extended essay cannot be overstated. Candidates need guidance at all stages of the process from establishing the RQ to deciding on the best research approach, finding related research materials, establishing a valid argument, deciding on the best analytical approach and dealing with ethical and health issues. Candidates should not be left to their own devices to deal with these issues. In fact these topics should form the basis for the meetings that take place between the candidate and the supervisor.