

## May 2018 extended essay reports

### Biology

#### Overall grade boundaries

<b>Grade:</b>	E	D	C	B	A
<b>Mark range:</b>	0-6	7-13	14-20	21-26	27-34

#### The range and suitability of the work submitted

In this session examiners report that essays were submitted across a wide range of biological topics. These included microbiological studies, plant germination and growth, ecological studies, studies relating to human health and physiology, as well as studies based on specific diseases, biochemical topics and topics related to genetics. The vast majority of essays were based on a suitably biological topic. In some exceptional cases the topic could have been suitable but was not given a biological treatment. This resulted in a poor performance against the criteria. Studies involving human subjects were carried out appropriately for the most part with candidates paying careful attention to the ethical requirements including the requirement for informed consent. The biggest difficulty here is that these essays are often based on very small sample sizes with the result that statistical analysis becomes inappropriate. Essays based on the antibacterial effects of various oils and extracts were in abundance and most were done carefully. However, a significant number failed to follow the instructions in the guide regarding incubation temperature and the need to safeguard against exposure to pathogens. The vast majority of essays were based at least in part on some kind of practical investigation involving data collection either through experimentation, interview or survey. A small number of library based essays based on published data or using online databases were also submitted.

#### Candidate performance against each criterion

##### Criterion A: Focus and method.

Topics were suitably biology in most cases and candidates were able to generate research questions that could be investigated and answered effectively for the most part. Candidates had more difficulty presenting clear, detailed accounts of the methodology in a way that would allow the study to be repeated. In some cases, it was clear that a standard protocol had been accessed and used. In these instances, it is difficult for the candidate to justify the steps taken and show any evidence of informed choices or judgements about the data to be collected or

the information to be accessed. Few candidates made an effort to outline the thought process involved in the experimental methodology or to present justification for the approach. More attention needs to be paid to conducting suitable positive and negative controls when performing experiments since without these the line of argument is often very weak. Students rarely wrote about the process used for the selection of published sources so that evidence that the selection was “informed” was often lacking. This weakness affected library based essays significantly and often was coupled with a failure to critically evaluate either the sources themselves or the process of selection (affecting criterion C).

### Criterion B: Knowledge and understanding.

Using sources effectively and with understanding is often challenging judging by the difficulties apparent in many essays. Knowledge can be displayed by presenting the appropriate kind of material, gleaned from the sources, and showing how this links to the investigation. This can also be the avenue to displaying a command of the terminology. Doing this with understanding requires diligent and detailed in-text referencing. This is often a weakness in the discussion. Candidates rarely neglect to reference the ideas presented in the background but seem to find more difficulty doing this well in the discussion that follows the data. This is where the real understanding will emerge: How do the data and/or ideas gleaned from the data relate to the published works that have been accessed? Weak essays tend not to use any biological language or to present sophisticated language with no explanation. The use of direct quotation from published sources does not indicate any real understanding on the part of the candidate and rarely improves to overall quality of the essay.

### Criterion C: Critical thinking.

Analysis is often a strength of biology essays with many students able to perform and interpret sophisticated statistics. Occasionally statistics are presented with little understanding. More often the justification for the choice of statistical approach is missing. Graphical and/or statistical analysis on their own, are not sufficient to achieve high levels on this criterion. Some explanation and justification is also needed. Weak essays do not go beyond presenting tabulated raw data in the form of graphs. Relegating important data to an appendix is also a weakness. The discussion and evaluation thread is very challenging. Since it carries “extra weight” any weakness in this aspect of the essay can have a big impact. A well-researched essay and thoroughly analysed set of data will not achieve high levels if the discussion and evaluation are not strong. Many candidates proceed straight into a section that they call “conclusion” at the end of the data analysis section. This leads to some weak thinking and the failure to develop a line of argument. A better approach is to have a section called “discussion” where the analysis of the data is elaborated upon and where preliminary ideas / conclusion are presented. Strong essays present an “evaluation” section before the “conclusion”. This approach strengthens the argument since the conclusion drawn at the end can be seen and judged in the light of the evaluation. It is a weakness to leave the evaluation of the research to the end since it then becomes a more or less trivial look and “what did I do well” type thinking rather than what are the strengths and weakness of the data and line of argument (the latter is rarely addressed even in strong essays). Evaluations rarely deal with sources or give and justification as to how sources were selected and how their suitability and/or reliability was judged.

### Criterion D: Presentation.

Poor presentation of data in tables and graphs are a feature of weak essays. Strong essays use scientific graphing software and pay attention to significant aspects of the data with clear evidence of choices made by the candidate about how the data appears. Weak essays simply use whatever the software will do to the data “at a click” and present no evidence of choices having been made. Most essays, even weak ones, were able to access a reasonable layout and structure. A recurring weakness is the placement of the bibliography after an appendix.

### Criterion E: Engagement.

Reflections are mostly descriptive with the candidate describing the meetings they had with the supervisor and the outcomes of these meetings. This style of reflection is often confined to a description of what the supervisor “told the candidate to do” or what agreements about future work were made. The quality of the reflection seems to improve through the three stages with more analytical and more evaluative statements in the later reflections. In some cases, the third reflection is more comprehensive and as a result has a bigger impact on the overall judgement of the level. It is difficult to judge engagement from the reflective statements alone and in some cases the supervisor comment gives important context, as does the essay itself. In the case of weaker essays there can be a mismatch between the claims regarding engagement and reflection made by the candidate and the message in the supervisor comment. It is difficult to ignore such a mismatch when arriving at the final level to be awarded.

## Recommendations for the supervision of future candidates

Candidates are in need of ongoing guidance about a number of issues:

- The EE is not an IA and requires a different approach. The EE must be firmly based on published research and must integrate ideas and information gleaned from published sources into the argument.
- Candidates (and supervisors) need to pay attention to the changes in the EE that are in place and be familiar with the current EE guide.
- The best essays are school based laboratory studies that use a straightforward approach and present a clear well supported argument based on a significant body of data.
- Candidates need guidance on how to reflect in a meaningful way, moving beyond simple descriptive reflection to more analytical and evaluative ideas.

## Further comments

A similar range of topics and approaches was apparent in this session although some examiners reported that the range seemed to be narrower with many microbiology essays and few truly creative pieces of work. It seems that there are fewer entirely inappropriate or very weak essays although there is a tendency for weaker essays to stray away from biology and become more aligned with human sciences. Some centres submitted essays that addressed aspects of the previous EE model including the submission of an abstract. In other cases, essays are clearly and unduly aligned with the protocol for internal assessment.

Practical investigations of this type do not score highly against B and C in particular. In the case of B not enough attention is placed on the knowledge surrounding the investigation as gleaned from the sources either in the introduction or in the discussion. While this “IA” approach can lead to a strong assessment for some aspects of C (analysis in particular) critical evaluation is often confined to an assessment of the sources of experimental error and rarely addresses broader issues such as the overall research approach or the nature and selection process for the sources accessed. Fewer essays use an extensive appendix, a welcome development.

Many of the same issues continue to be apparent in weaker essays. Failure to adhere to protocols involving incubating microorganisms at a safe temperature, failure to seek and provide evidence of informed consent, failure to provide a cover letter when the data are collected at an outside institution. In some cases, the letters or consent forms provided are inadequate. Weak essays are often based on a small number of sources or inadequate data.

Strong essays in terms of the clarity of the work and strength of the line of argument were often but not always accompanied by strong reflections. In some cases, weak essays were able to perform better overall because of some strong analytic and or evaluative reflection. This is certainly a better process than the old “holistic judgement” criterion which was often strongly influenced by the supervisor comment.