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Examiners' Report

Summer 2013

GCE Biology (6BI06) Paper 1A/1B: INDIVIDUAL INVESTIGATION

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Examiners / Moderators Report – Biology 6BI06 1A / 1B
June 2013

Whilst there continues to be a very wide range of excellent investigations, which provide clear evidence of candidates' individual 'How Science Works' skills, there is still a significant minority who attempt to follow a fixed pathway rather than think carefully for themselves. This often leads to attempts to meet criteria without regard to basic scientific principles. Many candidates could improve their reports by demonstrating better progression to A2 level in key criteria. These have been consistently highlighted in previous publications and hence all internal assessors and those preparing candidates for this unit are strongly recommended to review the following;

1. The Examiners / Moderators Reports for June 2011 and June 2012.

2. The 'Internal Assessment Guide' published Dec 2012

All of these documents are available to download from the biology pages of the Edexcel web site
http://www.edexcel.com/quals/gce/gce08/biology/Pages/default.aspx

In this report a summary of important features which were common in candidates' reports is given at the end of each section.

A great many reports were excessively long. This was frequently caused by unnecessary repetition and the inclusion of much irrelevant material. This is not penalised directly but must represent a significant waste of students' time and frequently results in long sections which gain little credit.

Choice of investigations

Provided that there is significant practical and biological content, then the options for investigations are extremely wide. All of the most successful investigations have an interesting question with a sound biological basis at their core. Those which seek to demonstrate a well-known or obvious 'fact' or meaninglessly copy a core practical are less likely to achieve higher marks. This is best exemplified by common attempts to repeat the bacterial lawn technique without any biological basis for what is tested. E.g. comparing different handwashes, where there is not the slightest attempt to control variables, such as their different contents, is often biologically meaningless as no scientific conclusions can be drawn. Similarly, simplistically measuring height of seedlings, without consideration of the events of early germination or what is meant by 'growth' shows very little progression to A2 level.

Research & Rationale

Rationale does mean that candidates are expected to place their investigation into a context of 'why might this be of interest to biologists?' but they are expected to show objectivity and scientific realism. Numerous attempts to link investigations to reducing global warming or suggest that

garlic/honey etc are the answer to antibiotic resistance did not display these characteristics.

This section of reports was often too long where it contained accounts of basic factual information not clearly linked to the actual hypothesis. Many candidates used a good range of references but their explanations were not clear and concise.

R(b) To award a mark above 6 then the criteria clearly state that information gathered must be used to inform planning and interpretation of results. Hence it is important that sources are clearly indicated in I(b).

Useful points

- Long copies of A2 notes of the biochemistry of photosynthesis or respiration were rarely useful or relevant.
- Common A-level texts are not credited as research.
- Research & rationale must be clearly linked to the actual hypothesis, not just vague background information.

Planning

Once again P(a) was often very long. A number of candidates gave unnecessary lists of common laboratory apparatus and often with illustrations! The emphasis here must be not just on listing variables but considering exactly how they are to be controlled or mitigated. P(b) was often covered well but simple basic laboratory rules were not given credit. As always, the design and execution of well-thought out trials for P(c) was most often the limiting factor in this section. Reports lacked evidence for higher marks where trials were simple repeats of main data collection and nothing of importance was tested. This was a particular problem where core practical techniques were simply repeated. Others simply carried out trials on unimportant details. This section was sometimes generously credited by internal assessors when, although present, trials did little to inform the main methodology. The examiners would like to stress that this is a key HSW skill for which each candidate is expected to provide evidence. Where large numbers of candidates carry out identical trials it is not possible for examiners to determine the contribution of each individual and there are therefore significant difficulties in supporting higher marks.

Useful points

- Simply adding different concentrations will change colorimeter readings and needs to be accounted for in planning.
- It is accepted that not all variables can be controlled or trialled , but it is expected that the most important ones are discussed.
- The examiners have repeatedly recommended that testing the reliability and precision of measurements of the main dependent and independent variables is an excellent place to begin thinking about what to trial.
- Repeated accounts of final methods are not required. A summary of main changes, informed by the trials, with reasons, is more sensible.

Observing

Data was often recorded accurately with correct units but there were a significant number of careless errors.
The examiners accept a wide variation of interpretation of 'anomalies' for O(b). They look for sound scientific reasoning within the limits of what can be expected at this level. What is really important is that candidates give some evidence of their thinking in brief comments. The pattern of assessment for O(b) is given below.

Useful points

- Where no comments are made, but there are no obvious anomalies, then a maximum of 6 marks can be considered as some evidence of meeting these criteria is required.
- If there are very obvious anomalies which are not recognised then a maximum of O(b)2 can be awarded as this is a requirement for O(b) 4-6
- To award O(b) 7-8 then the candidate will have repeated readings, or where this is not possible, they will explain the action they have taken. This might be to retain the data or to remove it, but brief reasoning is expected.

Interpreting & evaluation

Many candidates were able to complete their statistical tests with evidence of calculations and interpretations of 5% confidence levels. Clear null hypotheses were less common but overall I(a) was a high-scoring section. The examiners commented in June 2011 that the use of researched information to interpret and explain was often weak. This appeared to improve in 2012 but there were a surprising number of reports in 2013 where this section was very limited and in some cases, it was difficult to find any biological content in I(b). Finding other work with similar trends contributes to I(c) but does not meet the requirements of I(b). The contrast between length and quality of reports in R and P and the very limited efforts in I(b) and (c) was often striking. It is expected that these criteria will be more discriminating but many lacked an understanding of what exactly was required. I(b) is expected to be focused on the actual data collected. Many were not objective and made strong assertions about the meaning of their data without a more careful consideration of exactly what had been measured.

At A2 level an evaluation is expected to be analytical and based on evidence. Many were good at pointing out the possible weaknesses in their methods although there was a tendency to revert to the simplistic 'collect more data' sometimes, despite the fact that plans and trials had shown otherwise. Suggestions of basic errors or simply weak omissions can only be given limited credit. Better candidates used some of the types of evidence suggested in the recommended documents but coherent evaluation was rare.

Useful points

- Interpretation needs to concentrate on the actual data collected and needs to have evidence of scientific caution and objectivity about exactly what has been supported.
- To demonstrate the use of research, it is advisable to include references in I(b).
- Correlation is a specific term not simply any relationship. It does not 'prove' any causal effect.
- It would be helpful to many to begin evaluating by a careful look at their data and any associated statistics.

Communicating

Many parts of this section were covered well but there were significant weaknesses. Graphs were often poorly constructed or presented with basic errors such as a lack of correctly labelled axes or units. Those using the Excel programme were often truncated to fit a page or poorly labelled. I(c) requires a 'properly constructed bibliography' for 3-4. This has been clearly explained over the past two years but many are very poor. Web addresses from a browser predominate with little information and a large number claim to consult a scientific journal yet do not give either a title of the article or the name of the journal. These are often clearly listed on the web address given. There is now a wider range of evidence quoted in evaluating but many show little or no progression from AS level, with worrying naivety concerning anything that appears on the internet or anyone with a science degree.

Useful points

- Graphs need to be limited in number and demonstrate patterns in the data linked directly to the hypothesis. Multiple repetitive graphs often show limited understanding.
- There are clear guidelines for the format of all types of sources which need to be followed.
- It is not necessary to evaluate every reference. A small number, representative of the range of sources quoted, evaluated in greater depth is preferable. Concentrating on those sources which are used to provide key information directly linked to the hypothesis, not such things as test statistical tables.

Internal Assessment

At times, there were some significant differences between centre and moderated marks. The main reasons for this were;

- Moderators apply a strict hierarchical rule to the aggregation of marks in any one criterion. Many annotations on reports gave little evidence of this.

- In order to aggregate marks correctly it is vital that a mark range for each sub-section is recorded before deciding on a final criterion total. All centres are advised to check the details in the Internal Assessment Guide.
- There is a tendency to award high marks for criteria where there is some evidence, but the quality of the evidence is very low. This tends to restrict the differential between weaker and more able candidates and result in final totals which indicate the work is of the very highest A2 grade when the moderator is unable to support this view. Full grade boundaries, which have been consistent over the past 3 years, can be found on the Edexcel web site and are a very useful aid to internal moderation.

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