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Examiners' Report/ Principal Examiner Feedback

Summer 2012

GCE Biology (6BI06) Paper 1A & 1B

Practical Biology and Investigative Skills

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Grade Boundaries

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http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Introduction

This report covers both 1A (internally assessed with moderation) and 1B (externally assessed) options for this unit.

Further explanation and exemplification of many of the points summarised in this report can be found in the Unit 6 Principal Examiners/Moderators Report for June 2011. All centres, regardless of entry option, are also strongly recommended to consult the revised Internal Assessment Guide published in December 2011. Both documents are available to download from the GCE Biology pages of the Edexcel website at: http://www.edexcel.com/quals/gce/gce08/biology/Pages/default.aspx.

Once again, there was a wide range of investigations submitted for this unit. Candidates who began with an interesting question and thought clearly about what they were to investigate in an objective manner were inevitably in a much stronger position to provide evidence of their 'How Science Works' skills than those who sought to find ready-made investigations they could repeat.

A large number of reports were excessively long. In most cases this was because of irrelevant material or unnecessary over elaboration. Whilst there is no penalty for this, it often detracted from, rather than enhanced their quality, especially where long theoretical introductions were followed by much shorter discussions of important criteria skill such as evaluating.

Core Practicals

Many candidates submitted investigations which were based upon core practicals. The practical verification sheets submitted for each candidate are taken to mean that all candidates have completed such investigations and hence have detailed instruction and guidance on the techniques involved. In such cases examiners/moderators can only award credit for further evidence of planning skills beyond this. Where there is little evidence other than introducing a minor change then only limited marks can be supported. This was particularly true for the candidates using bacterial lawns and clearance zones, where many, simply added different plant extracts or various products. Where this was some biological basis to this, then there was an opportunity to display planning skills but it was common for candidates to add different substances without regard for how they were to be scientifically comparable in terms of ingredients or concentration.

Individual work

The Internal Assessment Guide and the original Unit 6 guide give clear advice on what is and is not acceptable practice when supporting candidates during their investigations. Examiners and moderators can only award credit on the evidence to be found in the report. Where there is a very strong similarity between a significant number of candidates within a centre, examiners and moderators will find it difficult to ascertain the contribution of individuals and hence can only award limited marks. This is particularly true of planning criteria.

Research & rationale

High scoring reports not only had well-chosen and relevant sources but also used them effectively to show a good understanding of the background to their investigation. More limited approaches often used basic biological terms in their hypothesis as an excuse to include long irrelevant sections of biological theory.

A good example of this difference could be seen in those ecological investigations using light/shade as their main independent variable. Good candidates considered the ecological niche of their chosen species and researched the mechanisms of light detection and its link to phenotypic morphology such as leaf size. Weaker candidates simply took the much more simplistic approach of 'More photosynthesis = bigger' and hence submitted several pages of photosynthetic biochemistry with almost no ecology. Where this was linked to distribution there was little recognition that the effect of light on photosynthesis was applicable to all green plants.

Whilst accurate biological information is the most important feature of R(a) it is important that there is some attempt to explain the rationale behind the investigation which addresses the basic question of 'Why might this be of interest to other biologists?' In many cases this is within the biological information but a distinct paragraph addressing this would be helpful to many.

Most candidates now realise that it is a requirement for R(b) that there is evidence that researched information has been used in explaining their data. This was often left to the examiner/moderator to recognise. It would be helpful to advise candidates to include at least one clear reference in the context of their explanation of results in I(b).

Planning

Once again P(c) was the most discriminating section of this criterion. Those who were genuinely planning their investigation as opposed to attempting to justify a pre-determined method could quickly provide evidence for 7-9 marks. These candidates thought carefully about their most important variables, especially their main dependent and independent variables and sought to investigate the most practical way to ensure that these were either controlled or measured in a way that would ensure acceptable precision and reliability.

Lower-scoring plans resorted to demonstrations of the obvious, such as a vernier calliper might be more accurate than a 30cm ruler, or were merely initial data collection.

Observing

A surprising number of candidates ignored the requirement in O(b) 3-6 that 'any anomalous results are noted' or for O(b)7-8 that 'any anomalous results are noted and investigated'. It is not a requirement that some anomalies must be found but candidates are strongly advised to explain briefly their reasoning for making their decisions, even where this is that there were none, to justify the highest mark range.

Interpreting

As in previous years, most candidates were able to apply a suitable statistical test and explain its meaning but, the use of 5% confidence levels and a clearly stated null hypothesis is a requirement for I(a) 7-9.

The improvement in applying researched information to interpret results, seen in 2011, was once again apparent this year. However, it would be helpful to remind candidates that clear references to researched sources in this section is needed to provide evidence for R(b). Candidates with good concise and relevant rationales invariably found it easier to focus on important biological principles when explaining their data. Examiners/moderators were able to support higher mark ranges where candidates concentrated on explaining their data rather than simply reiterating theory from R(a). Weaker candidates simply regurgitated theory without analysis of how this was linked to their actual findings. Although I(a) was often addressed well, only more able candidates were able to discuss their conclusions using highly conditional language such as 'supports the idea that' rather than regarding a positive statistical analysis as absolute proof of something. This was especially true of correlations.

I(c) remains the main discriminator in Interpreting criteria. It is an important How Science Works (HSW) skill to be able to reflect upon the investigation and evaluate it objectively. Weaker candidates simply attempted to list basic limitations or admit to a lack of basic skills. The examiners and moderators are looking for a balanced evaluation which is based on evidence rather than vague speculation. Higher scoring candidates used a range evidence such as, standard deviations of their data, any obvious anomalies (or lack of them) or other evidence of random errors. In fieldwork, additional observations or distinct trends and patterns in their findings enabled good candidates to discuss any drawbacks to their conclusions. Despite being a part of Unit 1, and a popular choice of many statistical analyses, very few candidates explained the problems associated with correlations and causation or looked in detail at the patterns shown by their data in graphical presentation. Even though correlation tests demonstrated very strong correlations, many ignored very obvious trends and patterns in their data. There are some clear guidelines on this section in both the Internal Assessment Guide and in the Principal Examiner's report for June 2011.

Communicating

A large majority of reports were well-presented although it would have been clearly helpful to many if more sub-headings matched to the criteria had been included.

There was, once again, a wide variation in graphical presentation. The selection of the correct graphical format or the need to select the most important summary graph were often not well-understood.

Despite the clear advice given in previous publications, accuracy of listing sources in a bibliography was also very varied. The strong tendency to simply copy web-addresses remains. Whilst many more candidates are finding acceptable journals in their research, some are not always relevant to their actual investigation.

Evaluation of these sources for C(d) is the most discriminating section of this criterion. As this skill is a part of Unit 3 candidates are expected to show some progression to A2 in their discussion. There was often little evidence of this with many evaluations showing little understanding of 'scientific credibility'. Evaluation of all quoted sources is not necessary and a small selection, in more depth, can be awarded the highest marks. The emphasis should be on discussion to show evidence of understanding credibility within the scientific community and hence merely quoting a phrase such as 'peer review' gains little credit unless explained briefly.

Internal Assessment

Moderation is carried out according to a nationally agreed code of practice and all moderators also assess the externally examined option 1B. The main purpose of moderation is to ensure that there are consistent standards across all external assessment.

Many samples were clearly annotated and marks awarded according the strict hierarchical system applied by examiners. However, there was a significant minority where there was very limited annotation and it was not clear exactly how the final marks had been assessed. Others had simply quotes from the criteria with little indication of how this related directly to the report.

Other differences arose where a majority of the reports were accurately assessed but this was not consistent for all. As a result very limited mark ranges were used and this meant that the differential between the most able and the less able were significantly eroded.

It is essential that each sub-section has an assessed mark-range clearly indicated followed by a total mark for that criterion.

During internal moderation it is helpful to consider the overall level of marks which might be applicable. There are quality judgements to be made in all criteria when deciding on a mark level. E.g. there may well be a trial investigation but the quality and relevance of them varies widely. Grade boundaries for this unit are available using the link in this report. It is strongly recommended that, during internal standardisation, centres discuss the implications of these boundaries before agreeing total marks. In particular,

where extremely high marks are awarded does the report reflect the very highest standards that could be expected of an A2 level candidate and do the marks awarded reflect the quality of work evident in the report?

Internal Standardisation – recommended practice.

- ensure that standards are agreed before candidates are assessed not as brief check later in the process;
- internal assessment is time-consuming at a time of significant pressure for most teachers. Therefore, there is great reluctance for colleagues to challenge each other openly or to suggest re-assessment after all the group have been marked;
- use examples from each assessment group which have no annotations for each assessor to mark without discussion;
- there are very likely to be significant differences between assessors. It is the discussion and resolution of these differences which is the most important part of standardising. This is true for even the most experienced moderators/examiners;
- quiet acquiescence and only superficial minor adjustment as a result of internal standardising is very unusual, and should be taken as a warning sign that the process needs to be reviewed.

Administration

Centres are very strongly requested not to submit samples for moderation in individual plastic wallets or envelopes. This increases handling time significantly and is environmentally wasteful. Where the pages of reports are not secured inside such wallets the problem is magnified. A simple loose treasury tag through a punched hole at the top left hand corner is by far the best economic solution.

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