

# Examiners' Report June 2010

GCE

## GCE08 Biology 6BI06

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## Contents

Unit 6	6BI06/1A/1B	Visit or Issue Report	pg 4
Unit Grade Boundaries and Uniform Marks			9

Maximum mark ..... 45

Mean mark..... 27.8 1a & 27.7 1b

Standard deviation..... 7.6 1a & 8.5 1b

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### General Introduction

This report applies to 6BI06 1A and 6BI06 1B. There were joint procedures for training and standardising moderators and examiners. The strengths and weaknesses of candidates was similar for both assessment options. Although some sections apply only to centres entering candidates for moderation (1A), most are relevant to all.

In this new specification report of the Individual Investigation is the only assessment for unit 6. 90% of the available marks are awarded for Assessment Objective 3 - How Science Works. The examiners/moderators were therefore looking for evidence of how these national requirements had been met at A2 level when applying the criteria. Whilst the criteria are very similar to the legacy Salters-Nuffield Unit 6 specification, the increased emphasis on rigorous evidence for HSW criteria, the increased mark allocation and the application of hierarchical marking meant that there were significant differences which many centres did not appear to recognise. Many candidates appeared to be unfamiliar with some important HSW concepts and this was a major factor in limiting marks.

All centres are reminded that there is full information and advice in the Support Booklet for Unit 6 -6BI06 which is available to download from the secure section of [www.Edexcel.com](http://www.Edexcel.com).

### Suitability of topics for investigation

There was a wide range of both laboratory and fieldwork investigations, neither stood out as being more likely to yield higher marks. The most important factor was always the manner in which initial planning had been approached and the opportunities it offered for candidates to demonstrate their individual skills.

The moderators assumed that all candidates have detailed instructions on the basic methodology of all core practicals and could only support modest marks where there was little evidence of individual planning beyond simply following a published protocol.

Similarly, only limited credit can be given where many candidates in one centre follow an almost identical method and trial. This was sometimes the case in fieldwork and centres are reminded that it is their responsibility to ensure that field centre staff are fully aware of the approach taken to individual work compared to other examining bodies.

It is accepted that many common ideas for investigation are actually new to each cohort of students but those who obviously applied objective scientific principles to how they were to collect their data in a reliable manner rather than follow a predetermined recipe were more likely to be awarded high marks.

It is recognised that many centres choosing fieldwork do so very early in the A2 course or at the end of the AS course. This means that candidates will have had limited time to develop their skills and assessment cannot take this into account. Centres choosing this pattern need to consider carefully how they develop their students might develop the necessary skills before embarking on an A2 investigation.

### **The importance of core practicals**

A record sheet for assessment practical skills was required for all candidates. This stresses a range of skills which it is expected will have been developed throughout the course. These are directly linked to HSW criteria. Obviously candidates need a knowledge of basic techniques which may be tested in written papers but the prime purpose of the core practicals is to develop these skills throughout the course. It will be evident from other comments in this report that several of these skills statements were important areas of weakness which limited performance and it might be a value for centres to review the role of these practicals in preparing candidates for Unit 6.

### **Research & rationale**

The moderators were looking for two main elements in this section.

- (a) The main biological principles underpinning the investigation and an outline of why this might be an interesting biological question.
- (b) Any arguments were supported by a range of relevant and reliable sources and the report clearly indicated where these had been used.

Many centres did not identify the important change in emphasis in the ascending mark ranges in this section. For the award of R(b) 7-9 or above candidates must have used their sources to 'assist with the planning..... AND to inform the interpretation of results'. This was often ignored by candidates and centre assessors.

The selection of sources was sometimes limited and not always relevant. Many seemed to bear more relationship to a search engine order of priority than relevance to biological ideas. Whilst sources of illustrations and basic techniques are sometimes relevant, many needed to have more detailed biological references.

### **Planning**

Moderators /examiners looked closely to find evidence of real planning in P(a) and P(c). A surprising number of candidates failed to consider the reliability of their main data collection. Some common examples were;

Measuring light intensity in the field is notoriously difficult but was rarely discussed or trialled sensibly. Many took measurements regardless only to explain later that it had rained or become cloudy at one point!

There were numerous poor investigations using bacterial lawns. Not only was there little biological justification for simply adding unrelated compounds, often without even explaining their contents fully, but also highly accurate vernier callipers were used to measure one diameter only when clear areas are rarely circular. A good trial would be expected to check whether area might be more reliable and discuss whether to include the disc or well. Most candidates using this technique showed no understanding of the underlying principle of diffusion in aqueous agar and often added oils or diluted with ethanol with no thought as to the effect these might have.

It was difficult to support high marks for trials which were merely initial data collection or obviously designed to confirm a pre-determined method rather genuinely inform its design.

### **Observing and recording**

To support a mark range of O(b) 3-6 it is essential that 'any anomalous results are noted and investigated'. A surprising number of candidates and assessors simply ignored this requirement. On this occasion the moderators accepted that no comment might mean there were no anomalies, but this was by no means true in all cases. For even higher marks some comment is expected. This might be very brief but should explain the thinking behind the decision but not seek to identify anomalies which are clearly not present.

### **Interpreting & evaluation**

Basic statistical calculations were often completed correctly for I(a) but discussion of HSW 5 (an understanding of the problems of correlation and causation) was extremely rare. Having found a significant correlation or difference it was common for other evidence in the data to be ignored, e.g. patterns shown by graphs, and lead to absolute assertions concerning the validity of the hypothesis or causation. I(b) was often very limited or even omitted completely. For higher mark ranges the moderators were looking for reference to biological knowledge from sources linked directly to the data collected not a simple reiteration of research and rationale. Objective evaluation for I(c) is a difficult skill and marks awarded by assessors were often generous where candidates did not address their methodology rigorously. HSW 5 and the signed validation of core practical skills clearly require candidates to show an understanding of systematic and random errors. Well over half of the candidates did not even mention such errors and even less analysed them in any way. Only limited marks were supported where there was simply a list of basic errors or, as in some cases, where there were comments on failings which were exactly the issues which should have been addressed in a thoughtful trial.

### **Communicating**

Centre assessed marks in this section were often generous and lacked discrimination with the award of 5-6 marks to all candidates when there were clearly much wider differences. Whilst most candidates set out their reports well for C(a), graphical presentation was often weak. Poor selection of format was common and the moderators/examiners could not support high marks where there were scientifically meaningless comparisons using 'sample number' as an axis. C(c) where even numerous examples of poor expression and grammatical errors elicited a 'good' comment was also generous. Many bibliographies were very poorly constructed and it was not possible to identify the source accurately. Candidates cannot be awarded more than C(d)2 overall where they do not include a scientific journal in their sources. This was treated in its widest sense but many found journal references on the internet. Although some of these were excellent many simply gave an internet URL which neither indicated the title, journal nor authors. Many of these were of highly dubious relevance to the investigation.

The level of evaluation of sources was disappointing. The June 2009 Unit 3 examiners report suggests that evaluation needs to include evidence rather than simple assertion and it was expected that there would be some progression to A2 level. There was a surprising naivety when describing sources. It was not uncommon for anyone with a degree assignment to be regarded as reliable or that commercial sites carrying product advertising and links would be scientifically objective. It was also suggested that C.U.P. and O.U.P. publications must all be peer-reviewed.

The moderators accepted evidence for C(d) where it was applied to a sensible range of sources rather than every one but many did not even go as far as mentioning peer review and overall this was a significant factor in causing differences between centre and moderated marks.

### **Administration**

- Please do not submit reports in individual plastic envelopes. This is environmentally wasteful and increases handling time considerably. If hard copy is submitted please use a single punched hole at the top left hand corner and secure the sheets with a treasury tag.
- A significant number of centres did not submit the reports of the lowest and highest scoring candidates with the sample or replace missing or absent candidates to make up the correct sample number.

- Several centres used the mark up function in Word to add annotations to reports without changing the original document. This was very effective for electronic copies.
- It was appreciated that scanning record sheets containing student and assessor signatures was time consuming but hard copy of the sheets with the reports on disc was a very effective solution for many.

### **Hierarchical Marking and Annotation**

Many centre assessments did not indicate how marks for each sub-section of a criterion had been aggregated in strict hierarchical fashion as required. It is essential to follow the guidelines contained in the Support Booklet for Unit 6 if marks are to be accurate.

There are three clear recommendations in this booklet to prevent candidates being unduly affected by this form of assessment.

1. Ensure candidates use and complete the student checklist as they are writing their reports.
2. It is strongly recommended that all reports have clear sub-headings which match the criteria.
3. The booklet strongly recommends (see 'What is acceptable and desirable') that when reports are submitted they are checked carefully for omissions. Where any such omissions are found reports should be returned to candidates, with a short deadline, for them to be rectified. Note pointing out the problem is acceptable, but describing the solution is not!

### **Standards of centre assessment**

Where there were large differences between centre and moderated marks it was very common for annotations to be very general or simply quote criteria. In most cases there was no individual assessment of each sub-section.

Whilst this assessment is criterion based it would be helpful to bear in mind the following.

The mark ranges require some quality judgements to be made. The award of a maximum mark range for any criterion implies that this is work of the highest quality that could reasonably be expected of an A2 candidate.

These are difficult criteria and therefore it would be reasonable to expect a wide spread of marks which reflects the standard of the reports submitted. It is important that high quality reports are clearly differentiated.

### **Summary of main candidate weaknesses**

#### **Research & Rationale**

- The link between the hypothesis and biological reasoning was not always clear.
- Some lists of sources concentrated on peripheral information such as images but were very limited on references to the biological science supporting ideas to be investigated.
- Resource information was often not evident in explaining data.

#### **Planning**

- Use of core practical techniques with limited evidence of individual skills or understanding of the underlying principles.
- Trial investigations used to confirm a pre-determined method not inform its design.
- Failure to accurately standardise the most important aspects of data collection.

### **Observing & Recording**

- A failure to address O(b) . Marks above 6 must have some comment and action to deal with any anomalies at the data collection stage.

### **Interpreting**

- Very limited attempts to address I(b) for more than minimal marks with no reference to sources used.
- No discussion of methodology or evidence for systematic and random errors.

### **Communication**

- Poor selection of graphical format to aid analysis.
- Bibliographies with important details missing.
- Naive evaluation of sources with no evidence for the highest marks. E.g. actual cross-referencing of information.

## Grade boundaries

### Raw mark boundaries

Max Mark	a*	A	B	C	D	E	N
45	39	34	29	24	20	16	12

### Uniform Mark Scale boundaries

Max Mark	a*	A	B	C	D	E	N
60	54	48	42	36	30	24	18

a\* is only used in conversion from raw to uniform marks. It is not a published unit grade.

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