

Principal Assessor Report 2003

Assessment Panel:

Biology

Qualification area

**Subject(s) and Level(s)
Included in this report**

Biology Advanced Higher

Statistical information: update

Number of entries in 2002	
Pre appeal	1,549
Post appeal	1,549

Number of entries in 2003	
Pre appeal	1,629

General comments re entry numbers

The number of presentations is up slightly (4%) on last year at the same stage. The highest entry for CSYS Biology was 1273 in 1999; this year's entry for AH Biology is 26% greater. There has been a gradual increase in uptake of this level of Biology course over a number of years; once again it is reassuring to report that there is growing interest in the subject even though the exam itself is complex and challenging.

Grade boundaries at C, B and A for each subject area included in the report

Maximum Mark = 125

Grade boundaries expressed as a percentage of mark in brackets

Year	Upper A	A	B	C
2002	101 (80.8%)	87 (69.6%)	73 (58.4%)	59 (47.2%)
2003	97 (77.6%)	83 (66.4%)	69 (55.2%)	56 (44.8%)

General commentary on passmarks and grade boundaries

- While SQA aims to set examinations and create mark schemes which will allow a competent candidate to score a minimum 50% of the available marks (notional passmark) and a very well-prepared, very competent candidate to score at least 70%, it is almost impossible to get the standard absolutely on target every year, in every subject and level
- Each year we therefore hold a passmark meeting for each subject at each level where we bring together all the information available (statistical and judgmental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the senior management team at SQA
- We adjust the passmark downwards if there is evidence that we have set a slightly more demanding exam than usual, allowing the pass rate to be unaffected by this circumstance
- We adjust the passmark upwards if there is evidence that we have set a slightly less demanding exam than usual, allowing the pass rate to be unaffected by this circumstance
- Where the standard appears to be very similar to previous years, we maintain similar grade boundaries
- An exam paper at a particular level in a subject in one year tends to have a marginally different set of grade boundaries from exam papers in that subject at that level in other years. This is because the particular questions are different. This is also the case for exams set in centres. And just because SQA has altered a boundary in a particular year in say Higher Chemistry does not mean that centres should necessarily alter boundaries in their prelim exam in Higher Chemistry. The two are not that closely related as they do not contain identical questions
- Our main aim is to be fair to candidates across all subjects and all levels and maintain standards across the years, even as syllabuses evolve and change

Comments on grade boundaries for each subject area

Compared to 2002, the Grade C boundary was three marks lower while the Grade A boundary was 4 marks lower. These changes reflect several combined influences: the performance of the written paper; alterations made to the assessment of Investigation Reports; and a perceived general improvement in the preparedness of candidates.

Comments on candidate performance

General comments

In the exam, some candidates produced outstanding work under pressure: they had excellent knowledge and understanding, they were quick to grasp the context and complexity of the data handling and they were articulate enough to be able to set it all down with economy and style. Other candidates had little awareness of core knowledge, almost to the point where markers believed there had been no teacher/lecturer input.

Investigations also varied from the imaginative and original (uncommon) to work that was little more than recipe following, even showing some regression from the level seen in Standard Grade.

Areas of external assessment in which candidates performed well

Candidates performed well in Section A objective test items (mean 18/25), an improvement on last year. The section was similar in difficulty and discrimination to last year. Candidates showed better knowledge across all topics and sound ability in the problem solving questions. A large proportion of candidates produced good answers in the data questions in Section B. Marks were slightly better for this section than last year and there was clear evidence of improvement in comprehension of the modern concepts in Cell and Molecular Biology. Understanding of applied DNA technology was sound.

Essays on mandatory units were well done on the whole, particularly those on Cell Cycle and Nitrogen Cycle. In Section D, testing the Options, the essay on blood glucose, exercise and diabetes, essay 5, was tackled competently.

Candidates' IT skills were excellent and were employed effectively in Investigation Reports; very few Reports were hand-written. Use of the Internet for sources of background information for Investigations was also widespread.

Areas of external assessment in which candidates had difficulty

Examination

Planning and organisation of information in essays was weak. There was a tendency for candidates to write down anything they knew about a topic without paying attention to how the question was worded or to the mark allocations. For example, most candidates chose the Cell Cycle essay: almost universally, abler candidates wrote too much on mitosis, giving long and detailed descriptions stretching at times to two pages, yet only 5 marks were available for the whole of the cycle. In the Option topics, essay 6 was the commonest choice (on the specific links between exercise and weight control and exercise and bone composition) and it was the worst done. The most common error by candidates of all abilities was to invent a new title on the general benefits of exercise.

Markers frequently mentioned poor handwriting and poor language skills. If this is the case then there is a significant problem, with 45 marks available for essays and 25 more for the Investigation Report. Over half the course assessment depends on candidates being able to communicate clearly; many candidates had not had adequate preparation and rehearsal in test conditions.

The average score in Section D (Option Units) was lower this year mainly because of very poor performance in essay 6 for the reason mentioned above. There was some concern about parts of other essays: many choosing the Behaviour Option had no idea what the 'selfish gene' concept referred to. In Biotechnology, the

essay on novel fermented products was chosen more frequently. Unfortunately, it was not uncommon to see essays seriously referring to 'good' bacteria and 'bad' bacteria as if knowledge from a TV commercial provided adequate depth of treatment in this level of exam. Many markers felt once again that candidates were being left to study their Option unit with little or no teacher/lecturer support.

One or two concepts were not as clearly developed as they might be: selfish genes; what plasmids are (rather than what their commercial function is); timing and nature of checkpoints; probes in DNA applications; predation; parasitism; the function of proliferation and anti-proliferation genes.

There is generally poor understanding of the convention for naming organisms using Linnaean nomenclature.

Investigations

Every aspect of candidate Reports of their Investigations came in for criticism from markers. But by far the most frequent cause for concern was that staff in Centres had not briefed candidates properly on the format and essential components of the Report. There is a major quality assurance issue in Centres where candidates have not received a copy of the document **Advanced Higher Biology Investigation: Candidate Information**. This document forms the basis of the marking scheme used to grade the submitted Reports.

Some Reports were models of the format specified, and were describing how good scientific principles were applied in a context relatively new to the candidate. Most, however, lacked some or many of the following: informative title, page numbers, contents page, summary of aims and findings, references in the specified format, discussion of biology indicated by results obtained; rigorous evaluation.

Many Centres were criticised by markers for failing to support candidates at all in the planning and execution of the Investigation. Staff should be aware at an early stage when replicates and controls are not adequate, when procedures are inappropriate for the aims and when candidates are failing to get results because of poor skills or faulty equipment.

It is acknowledged that the time-scale for investigations is different to that in CSYS. However markers reported that many candidates cited 'lack of time' in the Evaluation section of the Report for failing even to consider replicates and controls, and were expecting to gain marks for this self-awareness after the event.

A number of marks are contingent on sound experiment design, including the more challenging ones awarded for evaluation of results and procedures. In passing candidates for the Investigation Unit, staff should be aware that they are attesting to the quality of the planning and analysis stages of the Investigation. It was felt that many candidates could not possibly have been keeping a lab notebook adequately and should not have passed the Unit.

Centres were also criticised for presenting sets of Investigations that were so similar that candidates could not possibly have had to plan anything; background and protocols were virtually identical except for the organism, antiseptic or enzyme being tested.

Where antiseptics or other substances are being compared using wells cut into bacterial lawns on agar, the diameter of any clear areas around the wells will depend on the toxicity of the substance **and** factors that affect the rate of diffusion. This point is mentioned because so many Investigations fail to take account of variables affecting the outcome.

Specific areas of difficulty included:

- X axis of graphs drawn by Excel software; graphs too small
- too many graph varieties generated from the same data; graphs not described and analysed
- not understanding the need to summarise replicates and treatments into a single graph representing the investigation results
- poor quality references, failure to acknowledge sources, plagiarism
- poor awareness of links between background, procedures used and biological discussion of results
- depth of knowledge and level of demand insufficient for AH level
- poor understanding of the value of replicates in evaluation
- 'chemistry projects' masquerading as Biology

- too little time devoted to the work.

Safety issues were raised by some markers. It is to be hoped that staff are aware of the local health and safety regulations, eg on incubation of skin micro-organisms, incubation at 37⁰ C, use of pesticides and on use of human blood samples. Safety is not formally assessed by SQA but it should figure in the planning recorded in the lab notebook.

Recommendations

Feedback to centres

Examination

Practise essays in test conditions - timed in class (eg. 30 minutes) and no prior warning of the title. Give feedback on planning; bad planning wastes candidates' time as they labour to recall and set out non-scoring information.

Go over Linnaean nomenclature.

Check the information supplied to candidates in the form of notes: make sure notes are accurate for all syllabus content and that are not too detailed for the course arrangements.

Investigations

SQA is revising the Investigation guidance and this will be re-issued to Centres. This guidance will combine teacher/lecturer information and candidate information as a single document. Make sure Candidates read it and follow the format as it is laid out when they write up Reports.

Check lab notebooks are covering all the criteria for planning and analysis. Check that they are being maintained properly so there is evidence to justify passing the Investigation Unit. Retain the lab notebooks in the Centre in case they are required for moderation.

Try to have all candidates doing different investigative work. The challenge of the Investigation is lost if all the candidates in a Centre are doing essentially the same protocol - background research is common to them all and there is no scope for creativity and discussion.

Discuss the role of replicates in experiment design. Move on from the Higher LO3 point that mean values are more reliable than individual values, to discuss the idea that replicas should be identical; if they are not, which is likely in biological work, then there needs to be some discussion about the cause of the variance.

Conclusions would usually focus on trends in mean results derived from replicates, but Evaluation discussions should examine the validity and reliability of the conclusions in the light of variation evident in replicates. The more replicate values differ, the more unreliable trends will be.

Make sure that the candidate and the presenting teacher/lecturer have both signed the declaration on the back of the Flyleaf before it is sent off with the Report.