External Assessment Report 2010

Subject	**Biotechnology**
Level	**Intermediate 2**

The statistics used in this report are pre-appeal.

This report provides information on the performance of candidates which it is hoped will be useful to teachers/lecturers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding. It would be helpful to read this report in conjunction with the published question papers and marking instructions for the Examination.

Comments on candidate performance

General comments

Overall, the level and quality of the candidates' responses were good. All questions in the paper functioned as expected. It was pleasing to note a large increase in the number of candidates (up 25% over the average number from 2007–2009). There were two new centres, both further education colleges, and two returning centres, both schools. As in previous years, it is evident that the staff delivering Intermediate 2 Biotechnology are clear about both the Course Arrangements and the application of standards.

Areas in which candidates performed well

Section A

Candidate performance was very much as expected in this area. Candidates answered well in many areas of KU including preparation and labelling of agar plates, parts of the microscope, the nitrogen cycle, sewage treatment, and antibiotics.

PS/PA skills continue to show improvement with many candidates performing well in areas such as calculation of total magnification, drawing conclusions from experiments set in unfamiliar contexts, use of controls and calculations involving ratios and simple percentages.

Section B

Candidate performance in this section was strong in a number of areas including the structure of protozoa, the structure of bacteria, viral replication, mycorrhizal associations, genetic engineering, and the use of micro-organisms in the food industry.

In PS/PA, candidates were comfortable in identifying the aim and control variables in experiments, making predictions in familiar contexts, selecting numerical information from graphs and tables and drawing line graphs.

Section C

Candidates performed particularly well in Questions 1A and 1B in this section with many candidates scoring full marks and hitting all the available points in the marking instructions. Nearly all candidates attempted one of the choices in Question 1. Although Question 1A was considerably more popular than Question 1B, the average marks were almost identical. The average marks for Question 1A/B were considerably higher than those for Question 2A/B. Question 2A was more popular and had a higher average mark than Question 2B.

Areas which candidates found demanding

Section A

Candidates found the following areas of KU challenging in this section: preparation of the lab for microbiological procedures; storage of agar plates; types of reproduction in fungi; energy and biomass; and micro-organisms involved in continuous flow processing. In the PS/PA area, candidates were challenged by questions in the following areas: calculations involving unit conversions; and limiting factors in photosynthesis.

Section B

Performance was weakest in KU areas that asked candidates to give an explanation or a reason as part of their response. Candidates struggled in the question about preparing a smear of bacteria for staining when asked to explain why the smear was prepared in a particular way. Although candidates were confident in their knowledge about viral replication, very few candidates, surprisingly, could describe a feature of a virus that made it a non-cellular structure. Although the genetic engineering question was generally completed to a high standard by candidates, it was evident that many did not understand the role of enzymes in this process. The question on silage production challenged candidates when they were asked to explain their answer in the choice of the most effective species in silage production and the understanding of the role of acids in silage production was poorly understood. Candidates found, not unexpectedly, both explanation questions in ethanol production from maize difficult to deal with. Knowledge about the biotechnology techniques used in agriculture was disappointingly weak. As in previous years, candidates struggled to calculate a percentage change.

Section C

Although candidates performed impressively in Questions1 A/B, a significant number of candidates misread Question 1A and described the steps in the transfer of bacteria from liquid to solid, rather than solid to liquid as stated in the question. In Question 2 A/B, candidates often failed to answer all aspects of the question, eg describing the process and the raw materials and the benefits and the uses. As a result, only a few candidates collected full marks in this question.

Intended ‘A’ type questions that operated in Section B of paper:

- Question 2 (a) — 1 mark, KU.
- Question 2 (b)(ii) — 1 mark, KU.
- Question 3 (b) — 1 mark (of 2), KU.
- Question 3 (c)(ii) — 1 mark (of 3), KU.
- Question 4 (a)(i) — 1 mark (of 3), KU.
- Question 4 (a)(ii) — 1 mark, KU.
- Question 5 (c)(ii) — 1 mark, PS/PA.
- Question 6 (b)(ii) — 1 mark, KU.
- Question 7 (a)(i) — 1 mark (of 3), PS/PA.
- Question 7 (a)(iii) — 1 mark (of 2), KU.
- Question 7 (c) — 1 mark, KU.
- Question 8 (b) — 1 mark (of 2), KU.
- Question 8 (c) — 1 mark (of 2), KU.
- Question 9 (e)(ii) — 1 mark, PS/PA.
- Question 10 (a) — 1 mark (of 3), KU.

Advice to centres for preparation of future candidates

Centres should continue to stress to candidates the importance of learning, retaining, recalling and especially, understanding the knowledge content of all Units.

Centres should also make sure that the practical work undertaken on culturing micro-organisms includes a variety of different transfer methods and utilises different types of micro-organisms.

Candidates should be encouraged to have a clear understanding of the reasons for carrying out the various microbiological techniques and skills that they develop during practical work in Unit 2, including the staining of micro-organisms.

Centres should give candidates practice in calculating averages and percentage changes through experimental work and other problem solving situations.

Centres should continue to give candidates practice in writing Extended Response answers with an emphasis on Section C Question 2 Extended Response in the context of Units 1 and 3. The bank of questions and marking instructions from past papers could be used in a formative way to help candidates improve the quality and relevance of their response.

It is important that centres provide opportunities for candidates to carry out practical work in as many different areas of the Intermediate 2 Biotechnology Course as possible.

It is important that centres refer to the updated Intermediate 2 Biotechnology Arrangements document (Fourth edition, June 2002) for clarification to depth of treatment to content, especially in areas of KU.

Statistical information: update on Courses

Number of resulted entries in 2009	77
Number of resulted entries in 2010	110

Statistical information: performance of candidates

Distribution of Course awards including grade boundaries

Distribution of Course awards	%	Cum. %	Number of candidates	Lowest mark
Maximum mark — 100				
A	24.5%	24.5%	27	70
B	20.0%	44.5%	22	60
C	18.2%	62.7%	20	50
D	10.0%	72.7%	11	45
No award	27.3%	100.0%	30	—

General commentary on grade boundaries

While SQA aims to set examinations and create marking instructions which will allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and a well prepared, very competent candidate to score at least 70% of the available marks (the notional A boundary), it is very challenging to get the standard on target every year, in every subject at every level.

Each year, therefore, SQA holds a grade boundary meeting for each subject at each level where it brings together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Head of Service and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.

The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.

The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.

Where standards are comparable to previous years, similar grade boundaries are maintained.

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, and the mix of questions are different. This is also the case for exams set in centres. If SQA has already altered a boundary in a particular year in say Higher Chemistry this 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.

SQA's main aim is to be fair to candidates across all subjects and all levels and maintain comparable standards across the years, even as Arrangements evolve and change.