



External Assessment Report 2009

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 standard of candidate responses was good. As in the last three years, there were no new centres presenting and teachers/lecturers involved in delivering Intermediate 2 Biotechnology are experienced and clear about the course arrangements and the application of standards.

Areas in which candidates performed well

Section A

Candidates performed slightly less well than expected in the multiple choice section this year. KU questions in the following areas were answered well by candidates: structure of viruses, enzymes, aerobic sewage treatment and batch processing. PS skills showed definite strengths in the following areas: selecting information from a line graph and a branched key and questions on designing and controlling laboratory experiments.

Section B

Candidates performed well in many areas of KU including the questions on microscopy and the shapes of bacteria (Unit 1), the growth and reproduction of yeast and *Mucor* (Unit 1), photosynthesis and *Chlorella* (Unit 1) and, showing a major improvement from previous years, the steps involved in the nitrogen cycle (Unit 1/3). In PS/PA questions, candidates showed strength in various areas including plotting data as a line graph, controlling variables to ensure experimental design was valid, making predictions and drawing conclusions based on presented data. Many of these PS/PA examples included questions set in unfamiliar contexts e.g. the effect of inoculants on crop yields and silage production.

Section C

Candidates have continued to answer well in this area of the paper. As usual there was a wide range of marks, with many students scoring full marks. Almost all candidates made an attempt at both extended response questions. In question 1, the majority of candidates chose 1A and produced impressive responses and marks. Many candidates chose to present their information as a logical and well-structured table; this is to be commended. The average marks for questions 1A, 2A and 2B were almost identical and much higher than the average mark for question 1B. As in previous years, the excellent extended writing responses to the questions based on Unit 2 (questions 2A/B) showed strong evidence that centres are giving their students appropriate opportunities to experience and perfect many of the practical techniques of microbiology which underpin biotechnology.

Areas which candidates found demanding

Section A

Candidates found the following KU multiple choice questions challenging: sewage treatment of sludge, vital staining of micro-organisms and the production of biotechnological products by fungi. Areas of challenge amongst the PS/PA multiple choice questions included calculating a percentage decrease and calculating a whole number ratio.

Section B

Candidates coped well with the question on photosynthesis and *Chlorella* except for the part about limiting factors in photosynthesis. In the other question in this section of the paper which touched on photosynthesis, very few candidates were able to connect the idea of energy fixation and biomass with the process of photosynthesis. Some of the straightforward recall questions on the production of insulin by bacteria turned out to be challenging; a surprisingly large number of candidates did not recognise the method described in the question as genetic engineering. As in previous years, a large number of candidates recognised the technique of streak plating and the instruments used in the procedure, but there was uncertainty of the reason for using this technique or what could have happened during the procedure to produce the results shown in the diagram in the question. Although the question on reproduction and respiration in yeast cells was answered well overall, a surprising number of candidates could not complete the blanks to complete the simple word equation for respiration. The question on mycorrhizal association was poorly answered with many candidates unclear of the advantage to the plant in this association. Most parts of the question on silage were well answered, although many candidates struggled to explain how the process preserves the nutritional value of the crop. In the PS/PA area, candidates struggled with how reliable and quantitative results could be obtained in an experiment involving *Mucor*, which was set in an unfamiliar context.

Section C

Disappointingly, few candidates attempted question 1 B on extra-cellular enzymes and the average mark was much lower than question 1A. As in previous years, many candidates appeared to ignore the help provide in the graphic and disappointingly did not use the support offered in the diagrams and labels as a prompt for their extended writing.

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

Q 2 (c) (ii)	-	1 mark	PS/PA
Q 4 (a)	-	1 mark (of 2)	KU
Q 4 (c)	-	1 mark	KU
Q 5 (c) (ii)	-	1 mark	KU
Q 5 (d)	-	1 mark	PS/PA
Q 8 (a) (ii)	-	1 mark	KU
Q 9 (a)	-	1 mark	KU
Q 9 (b)	-	1 mark	KU
Q 9 (d)	-	1 mark	KU
Q 9 (e)	-	1 mark	KU
Q 10 (b) (ii)	-	1 mark (of 2)	KU

Advice to centres for preparation of future candidates

- Centres should encourage candidates to have a clear understanding of, and be able to explain, the reasons for carrying out the various microbiological techniques and skills that they develop during practical work in Unit 2
- Centres should make sure that a wide variety of different types of micro-organisms and techniques are encountered by students during practical work, particularly in Unit 2
- Centres should continue to stress to candidates the importance of learning, retaining, recalling and, especially, understanding the knowledge content of Units 1 and 3
- Centres should give candidates practise in selecting information from line graphs and calculating percentage increases and decreases through practical work, other problem solving opportunities in class and as homework
- Centres should continue to give candidates practise in writing extended response answers (Section C). The bank of questions and marking instructions from past papers could be used in a formative way to help exemplify the standards and improve the quality of candidates' writing
- 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 up-dated Intermediate 2 Biotechnology arrangements document (Fourth edition – June 02) for clarification to depth of treatment to content, especially in areas of KU

Statistical information: update on Courses

Number of resulted entries in 2008	97
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Number of resulted entries in 2009	77
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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	23.4%	23.4%	18	70
B	24.7%	48.1%	19	59
C	22.1%	70.1%	17	49
D	6.5%	76.6%	5	44
No award	23.4%	100.0%	18	-

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 SQA therefore 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 Business Manager 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.