Course report 2022

Subject	Biology
Level	Higher

This report provides information on candidates' performance. Teachers, lecturers and assessors may find it useful when preparing candidates for future assessment. The report 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 assessment documents and marking instructions.

The statistics used in this report have been compiled before the completion of any appeals.

Grade boundary and statistical information

Statistical information: update on courses

Number of resulted entries in 2022	7340

Statistical information: performance of candidates

Distribution of course awards including grade boundaries

A	Percentage	30.4	Cumulative percentage	30.4	Number of candidates	2230	Minimum mark required	82
B	Percentage	22.4	Cumulative percentage	52.8	Number of candidates	1645	Minimum mark required	67
C	Percentage	22.5	Cumulative percentage	75.3	Number of candidates	1650	Minimum mark required	52
D	Percentage	16.0	Cumulative percentage	91.3	Number of candidates	1175	Minimum mark required	37
No award	Percentage	8.7	Cumulative percentage	N/A	Number of candidates	640	Minimum mark required	N/A

You can read the general commentary on grade boundaries in appendix 1 of this report.

In this report:

- ‘most’ means greater than 70%
- ‘many’ means 50% to 69%
- ‘some’ means 25% to 49%
- ‘a few’ means less than 25%

You can find more statistical reports on the statistics page of SQA’s website.

Section 1: comments on the assessment

Question paper 1: multiple choice

The multiple-choice paper performed as expected.

Question paper 2

Feedback from the marking team and from teachers and lecturers indicated that question paper 2 was a fair and well-balanced paper. However, some questions were more demanding than anticipated. This was taken into account when setting grade boundaries.

Assignment

The requirement to complete the assignment was removed for session 2021–22.

Section 2: comments on candidate performance

Question paper 1: multiple choice

Question 1	Most candidates showed good knowledge and understanding of the structure of DNA.
Question 2	Most candidates showed good knowledge and understanding in the organisation of DNA.
Question 3	Some candidates were able to use the base sequence in an anticodon to identify the DNA sequence that coded for an amino acid. Some candidates incorrectly selected the mRNA codon base sequence.
Question 4	Most candidates showed good knowledge and understanding in the uses of stem cells.
Question 5	Most candidates showed good knowledge and understanding in single gene mutations.
Question 7	Most candidates showed good knowledge and understanding of induced fit.
Question 11	Many candidates were unable to identify the inner membrane of the mitochondrion as the site where most ATP is synthesised in aerobic respiration.
Question 14	Most candidates demonstrated competence in identifying the independent variable.
Question 15	Many candidates were unable to demonstrate how selectable marker genes are used in recombinant DNA technology.
Question 19	Most candidates showed good knowledge and understanding of photosynthetic pigments.
Question 20	Many candidates could not select a value from a line graph when asked to identify a concentration that was 50% of the control.
Question 23	Most candidates demonstrated competence in selecting information from a bar graph.

Question paper 2

Question 1(c)	Most candidates showed good knowledge and understanding in stating a practical application of PCR.
Question 2(a)	Most candidates showed good knowledge and understanding in naming the organelle where transcription occurs.
Question 2(b)(ii)	Most candidates were unable to describe alternative RNA splicing. Some candidates simply described RNA splicing, while a few candidates incorrectly stated that the order of exons changed.
Question 4(a)(i)	Many candidates could not describe cell differentiation.
Question 4(c)(ii)	Few candidates were able to apply their knowledge to identify an auxin concentration at which growth was inhibited.
Question 5(a)(i)	Most candidates showed good knowledge and understanding in identifying a geographical isolation barrier.
Question 5(a)(ii)	Some candidates could describe speciation. Many candidates did not explain the purpose of the isolation barrier and that there were different mutations on each side of the barrier.
Question 6(b)	Most candidates showed good knowledge and understanding in identifying oxaloacetate.

Question 6(c)	Few candidates could apply knowledge of competitive inhibition to explain why the activity of citrate synthase would decrease.
Question 6(d)	Most candidates showed good knowledge and understanding in naming a product of fermentation.
Question 7(a)	Most candidates demonstrated competence in describing a relationship in a table of results.
Question 7(b)	Most candidates demonstrated competence in calculating times greater.
Question 7(c)	Few candidates could explain why results were expressed per kg when animals' body masses were different.
Question 7(d)	Most candidates showed good knowledge and understanding in naming a piece of equipment to measure metabolic rate.
Question 7(e)(ii)	Some candidates were able to explain how the arrangement of the chambers in a bird's heart results in efficient delivery of oxygen to its body cells.
Question 8(a)(i)	Most candidates showed good knowledge and understanding in relating aestivation to metabolic rate.
Question 9(a)	Most candidates showed good knowledge and understanding in identifying the lag phase on a growth curve.
Question 9(e)	Most candidates showed good knowledge and understanding in naming a culture condition that should be monitored in a fermenter.
Question 9(d)(ii)	Few candidates were able to describe an ecological advantage to bacteria of producing antibiotics.
Question 10(a)(ii)	Most candidates demonstrated competence in suggesting how to improve an investigation.
Question 10(b)	Most candidates demonstrated competence in completing a line graph.
Question 10(c)(ii)	Few candidates could state that the investigation should be repeated at each wavelength of light to improve reliability of an experimental procedure. Some candidates gave a National 5 level response by simply suggesting that the procedure should be repeated.
Question 10(d)	Few candidates were able to explain how algae living under floating surface plants are adapted to photosynthesise using light transmitted through the surface plants.
Question 11	Some candidates had prepared well for this extended-response question, taking advantage of this year's revision support, which provided advance notification of the key areas assessed.
Question 12(a)(ii)	Few candidates were able to identify how the design of the investigation took account of variability in results within a treatment.
Question 12(b)	Most candidates showed good knowledge and understanding in explaining why cultivars were selected in a crop breeding investigation.
Question 12(c)	Some candidates could explain why F1 hybrids are not usually bred together.
Question 13(a)(i)	Most candidates showed good knowledge and understanding in identifying a mutualistic relationship.
Question 13(a)(ii)	Some candidates were able to suggest a benefit to organisms in a mutualistic relationship.

Question 14(a)(i), (iii)	Most candidates showed good knowledge and understanding in naming and describing a role of worker bees.
Question 14(a)(ii)	Some candidates could explain how the behaviour of worker bees demonstrated kin selection and state the advantage of this behaviour.
Question 15(a)(i)	Few candidates were able to state that goats are an invasive species because they spread rapidly and outcompeted the native species. This is required knowledge in the course specification and was also outlined within the question.
Question 15(a)(iii)	Some candidates could describe the impact of the bottleneck effect on a population.
Question 15(b)	Few candidates could identify and describe genetic diversity.
Question 16	Some candidates had prepared well for this extended-response question, taking advantage of this year's revision support, which provided advance notification of the key areas assessed.

Section 3: preparing candidates for future assessment

It is important that candidates learn the required knowledge in the course specification, particularly alternative RNA splicing, cell differentiation, sites of the stages of aerobic respiration and where most ATP is synthesised, heart structure and oxygen delivery, and invasive species. Candidates will find questions assessing these areas in past papers on SQA's website. They should complete the past papers and check the marking instructions to ensure they are answering the questions to the required standard.

Centres should give candidates opportunities to carry out calculations from scientific data, particularly those involving averages, ratios, percentages, percentage changes, times greater and average increases and decreases. There are several examples of these in the past papers on the SQA website.

There are examples of candidates' question papers showing the marks awarded in the Understanding Standards section of SQA's website.

Although there is no requirement to complete the assignment for session 2022–23, centres should give candidates opportunities to carry out practical investigations, where possible. In this year's question paper, many candidates did not answer questions based on practical investigations correctly. Candidates should be familiar with the terms 'control', 'validity' and 'reliability', and be able to comment on these in experimental set-up questions. The course specification will be updated to include definitions of these terms.

Teachers and lecturers should ensure that candidates are able to describe improvements to reliability by repeating investigations at each value of the independent variable rather than simply repeating the experiment.

It is important that candidates state conclusions in relation to the stated aim rather than simply restating results. For experimental questions, teachers and lecturers should remind candidates to identify the aim in the stem of the question and then state a conclusion related to this aim, supported by the experimental results.

In describing overall trends in results, candidates should avoid referring to small changes in values within the overall trend. When describing a relationship, it should be clear that changes in the dependent variable are due to changes in the independent variable and not vice versa. Teachers and lecturers should prepare candidates to answer questions on taking account of variability in results within a treatment. Candidates should be prepared to interpret experimental results expressed as a percentage of the control value.

Appendix 1: general commentary on grade boundaries

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

For most National Courses, SQA aims to set examinations and other external assessments and create marking instructions that allow:

- a competent candidate to score a minimum of 50% of the available marks (the notional grade C boundary)
- a well-prepared, very competent candidate to score at least 70% of the available marks (the notional grade A boundary)

It is very challenging to get the standard on target every year, in every subject at every level. Therefore, SQA holds a grade boundary meeting for each course to bring together all the information available (statistical and qualitative) and to make final decisions on grade boundaries based on this information. Members of SQA's Executive Management Team normally chair these meetings.

Principal assessors utilise their subject expertise to evaluate the performance of the assessment and propose suitable grade boundaries based on the full range of evidence. SQA can adjust the grade boundaries as a result of the discussion at these meetings. This allows the pass rate to be unaffected in circumstances where there is evidence that the question paper or other assessment has been more, or less, difficult than usual.

- The grade boundaries can be adjusted downwards if there is evidence that the question paper or other assessment has been more difficult than usual.
- The grade boundaries can be adjusted upwards if there is evidence that the question paper or other assessment has been less difficult than usual.
- Where levels of difficulty are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from question papers in the same subject at the same level tend to be marginally different year on year. This is because the specific questions, and the mix of questions, are different and this has an impact on candidate performance.

This year, a package of support measures including assessment modifications and revision support, was introduced to support candidates as they returned to formal national exams and other forms of external assessment. This was designed to address the ongoing disruption to learning and teaching that young people have experienced as a result of the COVID-19 pandemic. In addition, SQA adopted a more generous approach to grading for National 5, Higher and Advanced Higher courses than it would do in a normal exam year, to help ensure fairness for candidates while maintaining standards. This is in recognition of the fact that those preparing for and sitting exams have done so in very different circumstances from those who sat exams in 2019.

The key difference this year is that decisions about where the grade boundaries have been set have also been influenced, where necessary and where appropriate, by the unique circumstances in 2022. On a course-by-course basis, SQA has determined grade boundaries in a way that is fair to candidates, taking into account how the assessment (exams and coursework) has functioned and the impact of assessment modifications and revision support.

The grade boundaries used in 2022 relate to the specific experience of this year's cohort and should not be used by centres if these assessments are used in the future for exam preparation.

For full details of the approach please refer to the National Qualifications 2022 Awarding — Methodology Report.