Course report 2023

Advanced Higher Biology

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. You should read the report in conjunction with the published assessment documents and marking instructions.

The statistics in the report were compiled before any appeals were completed.

Grade boundary and statistical information

Statistical information: update on courses

Number of resulted entries in 2022: 3,163

Number of resulted entries in 2023: 3,090

Statistical information: performance of candidates

Distribution of course awards including minimum mark to achieve each grade

A	Number of candidates	758	Percentage	24.5	Cumulative percentage	24.5	Minimum mark required	82
B	Number of candidates	837	Percentage	27.1	Cumulative percentage	51.6	Minimum mark required	66
C	Number of candidates	704	Percentage	22.8	Cumulative percentage	74.4	Minimum mark required	51
D	Number of candidates	549	Percentage	17.8	Cumulative percentage	92.2	Minimum mark required	35
No award	Number of candidates	242	Percentage	7.8	Cumulative percentage	100	Minimum mark required	N/A

Please note that rounding has not been applied to these statistics.

You can read the general commentary on grade boundaries in the appendix.

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 and information page of SQA’s website.

Section 1: comments on the assessment

Question paper

The question paper was designed to have the appropriate balance of questions testing knowledge and understanding and skills. It contained questions that many candidates should be able to answer correctly and an appropriate proportion of more challenging questions. As in previous years, candidates achieved a wide range of marks. Most candidates attempted all, or most of, the questions. The number of unanswered questions was lower than in 2022. Markers noted that some candidates did not seem prepared for the challenge and scale of the question paper because they managed to give only a few correct responses.

Candidates performed best in questions that required them to demonstrate knowledge by giving terms or making relatively simple statements based on the mandatory knowledge.

Performance in the extended response (with option) question was strong. Candidates had more difficulty applying their knowledge and understanding to unfamiliar contexts. In some cases, this was because they did not express ideas clearly and accurately.

In question 13, where there was a choice, option A was more popular, but the mean mark was slightly higher for option B.

Many candidates demonstrated competence in a range of skills including processing and selecting and analysing information from sources, such as graphs and tables. Candidates generally performed less well in skills questions relating to experimental design.

The legibility of some candidates' handwriting was an issue for markers.

Section 1 of the question paper performed as expected and section 2 was more challenging than expected. This was taken into account when setting grade boundaries.

Project

The requirement to complete the project was removed for session 2022–23.

Section 2: comments on candidate performance

Question paper

Section 1

Question 1

Most candidates were able to identify the definition of the proteome.

Question 2

Most candidates identified the endoplasmic reticulum as the site where the signal sequence of a transmembrane protein docks.

Question 3

Most candidates were able to select the correct information from the table.

Question 4

Most candidates were able to identify features of positive modulators.

Question 6

Few candidates were able to apply their knowledge of the cell cycle to determine the phase where the drug could be acting to inhibit progression.

Question 7

Most candidates were able to identify an example of replacement in animal studies.

Question 10

Most candidates were able to process the data using the equation provided.

Question 12

Most candidates were able to identify the events of meiosis.

Question 14

Some candidates were able to apply the Hardy-Weinberg principle to calculate the allele frequency.

Question 15

Most candidates were able to identify the sampling strategy.

Section 2

Question 1(c)

Most candidates were able to perform this calculation.

Question 1(d)(i)

Many candidates were able to draw a conclusion from this data. Where a candidate did not gain the mark, this was often because they focused on one datum point.

Question 1(f)(i)

Many candidates were able to give a general conclusion about these results.

Question 1(f)(iii)

Many candidates did not use the information in Figure 4 as directed, and so gave overly simplistic responses.

Question 2(a)(i)

Many candidates demonstrated understanding that there would be no colour change in a negative test for this immunoassay. A few candidates demonstrated understanding that human serum would not contain antibodies against a specific pathogen an individual had not been exposed to.

Question 2(b)(i)

Many candidates demonstrated good knowledge and understanding of how SDS-PAGE separates proteins on the basis of size.

Question 2(b)(ii)

Some candidates demonstrated the knowledge that, during Western blotting, proteins are transferred to a solid medium after electrophoresis.

Question 3(a)

Most candidates recognised the function of a kinase enzyme.

Question 3(b)

Most candidates were able to explain why the chemical described is a ligand.

Question 3(c)

Most candidates were able to explain the consequence of ligand binding on a protein.

Question 3(d)

Few candidates recognised that, since both species are eukaryotes, the drug could have a similar effect in both.

Question 4(b)

Most candidates were able to describe a suitable placebo.

Question 5(a)(i)

Most candidates were able to state sodium ions are the substance being co-transported with glucose.

Question 5 (a)(ii)

Some candidates could explain how the sodium-potassium pump provides energy for the active transport of glucose during symport.

Question 5(b)

Most candidates achieved 2 marks or fewer for their descriptions of facilitated diffusion. Some candidates did not give any correct statements about diffusion, and a few candidates confused facilitated diffusion with active transport. Markers frequently awarded point 6 because many candidates did not correctly describe features of a channel or transporter.

Question 6(a)(i)

Most candidates did not give an example of an external death signal.

Question 6(b)(ii)

Few candidates used the information given to relate their response to the development of the bat wing.

Question 6(c)

Many candidates could not state another process in which apoptosis is essential. Some candidates confused processes involving apoptosis with signals that trigger apoptosis, such as DNA damage.

Question 7

A few candidates gave comprehensive responses including relevant information about viral structure and an explanation of why they are classed as parasites. Many candidates achieved 2 marks or fewer. Some candidates confused viral structure with lifecycle. A few candidates stated that other parasites, such as Plasmodium, were viruses.

Question 8(b)

Most candidates were able to describe changes in the abundances of indicator species, but few were able to explain these changes in terms of species being favoured or susceptible in different environments. The terms ‘favoured’ and ‘susceptible’ rarely featured in candidate responses. Many candidates made no attempt to explain the changes.

Question 9(a)

Some candidates gave accurate statements about genetic drift but did not relate their response to the specific context of the question. A few candidates stated that genetic drift involved natural selection and/or focused their response on the process of speciation.

Question 10(a)(iii)

Most candidates were able to state an environmental factor associated with sex change in animal species.

Question 10(b)

Many candidates were able to describe at least two costs of external fertilisation. Some candidates stated that external fertilisation was associated with asexual reproduction.

Question 11(b)

Few candidates were able to explain how protein analysis could be used to determine the evolutionary origin of the venom proteins.

Question 11(c)

Many candidates made the association between cooler climates and lower parasite density/diversity, but few developed their response to make the link to a lowered requirement for variation to combat parasites.

Question 12(a)(i)

While some candidates correctly identified that there is interspecific competition between the two species of squirrels, others, even those who went on to correctly identify competitive exclusion in part (ii), stated there was resource partitioning between the two species.

Question 12(b)

Most candidates were able to use the data to support the hypothesis about the spread of pine martens.

Question 12(c)

Some candidates were able to suggest why the additional sampling methods would improve the validity of conclusions. Some stated what is meant by an elusive species but did not give a reason why the additional methods would overcome difficulties with sampling of these species.

Question 12(d)

Many candidates mentioned the Red Queen hypothesis but did not apply this knowledge to the context of the question. The concept of grey squirrels, as an introduced species, not having had the opportunity to adapt to pine marten predation was poorly understood. Some candidates missed the importance of the selection pressures imposed by pine martens and focused on selection pressures imposed by the squirrel species on each other.

Question 13A

Candidates were able to access all marking points.

Point 1 was rarely awarded for a correct diagram of an amino acid.

Point 4 was rarely awarded. Although most candidates stated the different types of R groups, few went on to describe how they affected the chemical properties of amino acids.

Some candidates missed out on point 13 because, although they referred to disulphide bridges, they did not state that the sulphur atoms involved in bonding are in the R groups of specific amino acids.

Question 13B

Candidates were able to access all marking points.

Point 3 was rarely awarded as many candidates missed the idea of neurotransmitter receptors being specific.

Although many candidates described the wave of depolarisation along a neuron's membrane, relatively few gained point 15 as they did not describe the events at the end of the neuron.

Point 2 was rarely awarded as many candidates did not include information about how neurotransmitters reach their receptors.

Section 3: preparing candidates for future assessment

Question paper

Many candidates demonstrated a good depth and breadth of knowledge across the mandatory knowledge detailed in the course support notes (appendix 1 of the course specification). Candidates preparing for future assessments should have a sound knowledge and understanding of this biology.

Candidates should be able to apply knowledge and understanding to unfamiliar contexts. When directed to relate an answer to a specific context, candidates must avoid giving responses that are too generalised. Candidates should understand that when a question asks them to explain, they should provide a reason for the information given. To help candidates focus on the question being asked, teachers and lecturers should continue to encourage candidates to read questions carefully and pay close attention to the information in the question stem. Centres should give candidates opportunities to practise a variety of question types, so they become familiar with the standard required at Advanced Higher. Past papers, and their marking instructions, are available on SQA's website.

When drawing conclusions, candidates must avoid simply restating results or giving responses only linked with some of the data.

When discussing experimental design or results, candidates must be able to use the terms 'validity', 'reliability', 'accuracy', and 'precision' correctly. These terms are defined in the course specification.

Most candidates who used more space indicated clearly where they had continued their responses. This makes it easy for markers to ensure all work is marked appropriately. Teachers and lecturers should continue to highlight this as good practice. Centres should continue to encourage candidates to write as legibly as possible to ensure markers can read their handwriting.

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

Project

We removed the project from the Advanced Higher Biology course for session 2021–22 and session 2022–23. From session 2023–24 the Advanced Higher Biology course will return to full assessment requirements.

Teachers and lecturers must ensure they are using the current version of the Advanced Higher Biology Project Assessment Task (valid from session 2019–20 until further notice). The 2019 revisions to the Advanced Higher Biology course resulted in some changes to the marking instructions and the instructions for candidates.

There are examples of project reports, showing the marks awarded, in the Understanding Standards section of SQA's website.

Candidates should refer to the instructions for candidates throughout the planning, execution, and reporting stages of their investigations. Candidates can also use other publications to support them, such as the guides produced by the Scottish Schools Education Research Centre (SSERC).

Although candidates may modify their aims as their investigations progress, it is essential that they formulate a clearly stated aim at a very early stage in the planning process. Teachers and lecturers should encourage candidates to apply their knowledge of investigative biology to develop sound protocols with appropriate controls, procedures that allow key variables to be controlled, a reasonable sample size, and independent replication. The degree of challenge should be appropriate for work at this level.

Candidates should include a pilot study, or studies. They must be able to justify how the pilot study informed the final procedure. Descriptions of procedures should make clear the controls that they used, how they controlled confounding variables, the sample size they used and how they achieved independent replication.

When considering what to include in the account of underlying biology, candidates should focus on information that is most relevant to their investigation's aim(s). The account needs to have sufficient depth to support later discussion. Candidates must be aware that they do not need to limit themselves to theory covered in the Advanced Higher Biology course. To avoid using incorrect or unscientific information, teachers and lecturers should encourage candidates to consider the quality of the sources they are using.

Teachers and lecturers should encourage candidates to use a variety of graphical presentations to display data in interesting and informative ways. Although candidates should combine data from replicates to present summarised data, they are not limited by this, and presenting data in additional ways might provide scope for further analysis and evaluation.

When evaluating procedures, candidates must go beyond a description of procedures and explain how aspects of their experimental design were required to allow them to draw valid conclusions. Candidates should use statistical analysis when evaluating results, but they need to understand the statistics they are using to prevent errors in interpretation. All candidates would benefit from using an analysis of the variation between repeats and replicates to support discussion about whether variability is due to error in laboratory practice, intrinsic variation in the biological samples studied, or the treatments that have been planned. Candidates often find it particularly difficult to interpret results that do not match their hypothesis and/or previous findings. In these instances, they should try to distinguish between the effects of methodological weaknesses and treatments that have no effect.

Candidates must use either the Harvard or the Vancouver referencing system in their report. They must closely follow the guidance on referencing in the instructions for candidates.

Appendix: 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 was developed to support learners and centres. This included modifications to course assessment, retained from the 2021–22 session. This support was designed to address the ongoing disruption to learning and teaching that young people have experienced as a result of the COVID-19 pandemic while recognising a lessening of the impact of disruption to learning and teaching as a result of the pandemic. The revision support that was available for the 2021–22 session was not offered to learners in 2022–23.

In addition, SQA adopted a sensitive approach to grading for National 5, Higher and Advanced Higher courses, to help ensure fairness for candidates while maintaining

standards. This is in recognition of the fact that those preparing for and sitting exams continue to do so in different circumstances from those who sat exams in 2019 and 2022.

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 2023 and the ongoing impact the disruption from the pandemic has had on learners. 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 the removal of revision support.

The grade boundaries used in 2023 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 2023 Awarding — Methodology Report.