Course report 2019

Subject	Human 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 post-results services.

Section 1: comments on the assessment

This is the first year of the revised Higher Human Biology Course.

Question paper 1

The multiple-choice paper performed as expected.

Question paper 2

This question paper generally performed as expected. However, a small number of questions proved to be slightly more demanding than intended. This was taken into account when setting grade boundaries.

Candidates were generally good at demonstrating their knowledge and there were far fewer areas this year where knowledge was unsatisfactory. However, candidates, in general, found the applying knowledge questions more challenging than the demonstrating knowledge questions. Many candidates were able to demonstrate good problem-solving skills.

Assignment

Candidates are required to carry out a practical experiment to generate data to use in the report stage of their assignment. The format of the assignment was changed this year, and candidate performance overall was lower than in previous years.

The analysis and evaluation sections continue to be the most challenging sections for candidates. In addition, candidates could have performed better in some of the sections on data-handling. These included the new sections on writing a brief summary and citing references. Candidates' graphical presentation skills were very good.

Section 2: comments on candidate performance

Areas that candidates performed well in

Question paper 1

Questions 2, 10, 11, 13, 16, 18, 19, 21, 23	Most candidates demonstrated that they had knowledge and understanding of these topics.
Questions: 1, 4, 5, 8, 15, 25	Most candidates were able to apply their knowledge and understanding to answer these questions correctly.
Questions 6, 17, 24	Most candidates showed the skills required to answer these questions correctly.

Question paper 2

Most candidates demonstrated good knowledge and skills in the following areas:

Question 1(a)(i), (b), (c), (d)	Stating that embryonic cells are pluripotent, stating that cells formed by meiosis have 23 chromosomes, identifying how stem cells can be used in research and suggesting an ethical advantage of using skin cells as embryonic stem cells.
Question 2(a), (d)	Understanding of the stages of PCR, and how PCR can amplify DNA in blood spots.
Question 3(a), (c)	Identifying that an acetyl group was produced from the breakdown of alcohol and that a competitive inhibitor will block the active site of enzyme 2.
Question 4(a), (b)(i), (b)(iii)	Identifying investigation variables, drawing a line graph and suggesting a reason why the performance of the placebo-taking group might improve.
Question 5(a), (b), (c)	Indicating that ATP is produced in the energy pay-off phase of glycolysis, stating the function of dehydrogenase enzymes and naming glucagon as the hormone involved in pathway Y.
Question 6(a)(i), (a)(ii), (b)	Labelling an interstitial cell, describing two functions of testosterone, and describing how AI and ICSI increase the chance of fertilisation.
Question 7(a)(i), (a)(ii), (b)	Identifying similarities and differences in trends, making a percentage calculation based on a graph reading, and making a calculation based on readings from a table and a graph.
Question 8(b)(i), (b)(ii)	Using a family tree to identify the genotype of an individual and explaining why it was difficult to predict the chances of a child having the disorder.

Question 9(a), (e), (f)	Taking a reading from a graph with two vertical axes, identifying that the graph indicates the man can produce insulin, and suggesting that blood glucose levels could be controlled by exercise.
Question 10(a)(i), (a)(ii), (a)(iii), (a)(iv), (b)(i)	Calculating the greatest percentage decrease, drawing a conclusion from data, calculating a ratio, identifying that death rates are per 100 000 individuals and describing how double-blind clinical trials are set up.
Question 11(a)(i), (a)(ii), (a)(iv)	Suggesting why the water flea was left in the solution for five minutes, suggesting why the flea was videoed and stating how the reliability of the results of the investigation could be improved.
Question 12(a)(i), (a)(ii), (c)(i), (c)(ii)	Naming an activity that increases endorphin production, stating a function of endorphins, describing how a recreational drug has affected a synapse and the impact of this on the individual's drug-taking behaviour.
Question 13(a)(i), (a)(ii), (b)(i), (b)(ii), (c)(i)	Describing how epithelial cells defend the body, identifying the capillary, naming mast cells, explaining why skin around a wound becomes red and explaining how lymphocytes recognise pathogens.
Question 14A	Discussing the encoding, storage and retrieval of information in memory.
Question 14B	Describing vaccination and its role in establishing herd immunity.

Assignment

Section 1	The majority of candidates produced a clear aim for their investigation.
Section 3b	Most candidates produced sufficient raw data from their experiment.
Section 3d	Many candidates selected a relevant piece of internet/literature data.
Section 4	Most candidates were able to produce an appropriate graph with suitable axes, scales and labels. Generally, data was accurately plotted onto the graph.
Section 8	Almost all candidates produced a clear and concise report that had an informative title.

Areas that candidates found demanding

Question paper 1:

Question 3	Only some candidates were able to work out that the sequence of bases coded for six different amino acids.
Question 8	Most candidates were not aware that only application 3 was an example of pharmacogenetics.
Question 9	This was designed to be a challenging question. Many candidates were unable to draw the correct conclusion from the data shown in the graph.
Question 12	This was designed to be a challenging question. Most candidates did not subtract the improvement in performance due to regular training from the improvement in performance due to HITT training.
Question 14	Most candidates were unable to work out from the diagram that there was a 25% chance the child would have haemophilia. Many candidates thought that there was a 0% chance.
Question 20	Many candidates got this wrong because they thought that acetylcholine was broken down in the synapse before an impulse was generated.
Question 22	This was designed to be a challenging question. Many candidates failed to notice that the drug was given twice a day.

Question paper 2

Question1(a)(ii)	Many candidates simply stated that embryonic stem cells can differentiate because they are unspecialised, instead of referring to all genes being switched on.
Question 2(b)(ii)	Many candidates did not realise that the number of copies of DNA doubled every three seconds, so that after 33 seconds there would be over 2000 copies of DNA produced.
Question 2(c)	Many candidates were unable to describe the role of primers during different stages of PCR.
Question 3(b)(i)	Many candidates did not realise that the missense mutation would result in the enzyme containing a different amino acid.
Question 3(b)(ii)	Many candidates said that individuals with the mutation would be unable to break down alcohol instead of referring to the diagram, which shows that they would be unable to break down the toxic compound,

	acetaldehyde.
Question 4(b)(ii)	Most candidates were unable to draw a conclusion that related to the aim of the investigation. Many simply described the results.
Question 4(c)	This was designed to be a challenging question. Candidates had to, firstly, use the body mass or body fat data to describe the effect of the supplement compared to the placebo. They then had to give a reason for the effect.
Question 5(d)	This was designed to be a challenging question. Candidates had to use the diagram to observe that lack of the enzyme would reduce the lipids/nucleic acids/nucleotides. They then had to indicate the role of one of these in cell division.
Question 6(a)(iii)	Many candidates were unable to describe negative feedback control of testosterone levels in the blood.
Question 7(b)(ii)	This challenging question required candidates to realise that the eggs from donors would be younger and so more likely to produce a child.
Question 7(c)	Relatively few candidates knew why PGD can be offered to some women.
Question 8(a)	This question proved to be very challenging to candidates. Many candidates did not compare autosomal disorders to sex-linked disorders, while others did not answer in terms of the location of genes or how they each affect different genders.
Question 8(c)	This question was expected to be challenging as it integrated knowledge from two different key areas. Many candidates did not realise that the transplanted bone marrow would start producing lymphocytes.
Question 8(d)	Most candidates were unable to describe an advantage and disadvantage of using amniocentesis rather than chorionic villus sampling (CVS). Many candidates gave answers that indicated an advantage and disadvantage of using CVS.
Question 9(b)	This was designed to be a challenging question. Few candidates correctly predicted that it would take a further 120 minutes for the glucose concentration to return to its original value.
Question 9(c)	This challenging question required candidates to take a reading from the graph and make a calculation based on the units given. Very few candidates were able to do this.
Question 9(d)(i)	Many candidates did not realise that the cells of type 2 diabetics have fewer insulin receptors, which means that they cannot convert glucose

to glycogen.

Question 9(d)(ii) Few candidates knew that diabetics lose glucose in their urine.

Question 10(b)(ii) Most candidates did not realise that it was the large numbers of men used that made the study reliable.

Question 10(b)(iii) This was designed to be a challenging question. Candidates had to indicate that low LDL concentrations would mean that less cholesterol is deposited in the arteries and that this, in turn, would lower the chances of atherosclerosis.

Question 11(a)(iii) Many candidates were unable to describe the changes in heart rate. Some did not describe the second aspect of the trend, where the rate levelled off between 0·8g/l and 1·0g/l. Others did not indicate units for the relevant figures.

Question 11(b) The majority of candidates found this three-mark question challenging. This was disappointing as two of the marks were available for indicating that the sympathetic system increases heart rate by releasing noradrenaline.

Question 12(b) Few candidates were able to apply their knowledge and come up with an appropriate mode of action for a drug to treat Parkinson's disease.

Question 13(c)(ii) Many candidates could not describe how T lymphocytes induce apoptosis in infected cells. Instead, many thought the T lymphocyte attached directly to the pathogen.

Question 13(d)(i) Few candidates realised that in the first year of infection the lymphocytes were destroying most of the HIV viruses.

Question 13(d)(ii) Most candidates did not realise that, between one and five years after the infection, the HIV virus was destroying the T lymphocytes.

Assignment

The following sections were the most challenging for candidates.

Section 3a Most candidates failed to provide a brief summary. Many summaries were simply experimental protocols, with candidates giving far too much detail.

Section 3c Most candidates failed to present their data properly. Candidates made a variety of errors, including using unclear table headings, not entering units, and calculating averages incorrectly.

Section 3e Most candidates failed to cite or reference their source of data correctly. Many did not give a citation beside the data and then link it to a full reference towards the end of the report.

Section 5	Few candidates gained the analysis mark. This was often because candidates did not quote x-axis values for their comparison or calculation. In addition, many candidates who did a calculation did not link it to the aim of their investigation.
Section 6	Few candidates gained the conclusion mark. Often the conclusion given did not relate to the aim and was simply a description of the results. In other cases, the conclusion was not supported by all the data in the report.
Section 7	The evaluation marks are designed to be challenging marks and the average score for candidates in this section was low. Candidates continue to use the terms ‘valid’, ‘reliable’ and ‘accurate’, but often use them incorrectly. Many candidates also find it difficult to produce an appropriate justification for their evaluative comment.

Section 3: preparing candidates for future assessment

The *Higher Human Biology Course Specification* explains the overall structure of the course, including its purpose and aims as well as information on the skills, knowledge and understanding required. Course support notes are provided as an appendix to the document. Both the key areas **and** the depth of knowledge **can be assessed in the question paper**.

The *Higher Human Biology Assignment Assessment Task* explains the requirements for the assignment. This document provides guidance by including instructions for teachers and lecturers, as well as instructions for candidates.

Centres must ensure that they are using the most up-to-date versions of these documents, which are available on SQA's website.

Question papers

It was evident that the revised course specification has provided clarity to centres about what can be assessed, as there were fewer areas this year where candidates' understanding of basic mandatory knowledge was disappointing. Centres should be aware that certain questions are designed to be challenging, and candidates should be prepared to answer questions that ask them to demonstrate and apply the mandatory knowledge from the course.

Candidate performance in the skills-based questions was again encouraging. However, candidates continue to struggle with drawing a conclusion from experimental results. Centres should consider getting candidates to identify the aim of an experiment and then stress that they have to write their conclusion based on this. Too many candidates continue to restate results when they write a conclusion. In addition, when candidates have to describe trends, using data provided, they must give relevant figures and units in their description. Many candidates did not provide units this year.

It is important that centres encourage candidates to read the question more than once, so that they gain an understanding of what they are being asked. This year, there were a number of questions where candidates appeared to misread the question and then produce an answer that was the opposite of what was required. Centres should also spend time teaching candidates about the different command words used in questions and how they should phrase answers to these. Examples of valid responses to command words are provided in the general marking principles within the marking instructions.

Assignment

The assignment proved to be more challenging to candidates this year. Teachers and lecturers should use the exemplar materials on the Understanding Standards website to prepare candidates.

Centres should be aware that experiments chosen must be at Higher level and not be a repeat of a National 5 experiment. Candidates from a number of centres carried out simple experiments that were based on National 5 course content. The assignment must link to the key areas of human biology contained in the course specification. A number of centres

chose memory-based assignments. It was noticeable that these tended to score fewer marks than laboratory-based assignments. These non-practical assignments do not align well with the requirements of the *Assignment Assessment Task* and centres that have used them should consider changing to a laboratory-based assignment in future.

The following advice relates to the specific sections of the assignment.

Aim

When writing the aim, candidates should refer to the independent and dependent variables, specifying what is being changed and what is being measured. If a specific substance or enzyme is indicated in the aim, then this needs to be referred to in subsequent sections including the internet/literature source.

Underlying biology

This must be written in the candidate's own words and not be reorganised sentences from texts. A small number of candidates got no marks for this section, as they simply copied from the course support notes.

Data collection and handling

Summary	Candidates should avoid too much detail. There is no need to include volumes, concentrations or temperatures in the summary, unless they refer to the independent variable. Candidates must describe how the dependent variable is measured. In memory-based experiments, this is done by writing down and collating the results.
Raw data	Candidates do not need to have five values for the independent variable. Three may be enough to show a trend. Data must include at least two sets of measurements. In memory experiments, using 20 people represents an adequate sample size, but it does not indicate the experiment was repeated.
Data presentation	The table produced must contain clear headings, units and correctly calculated averages. If averages are rounded up, for ease of presenting the figures in a graph, then the rounding must be consistent for all the averages.
Internet/literature source	The source selected must link to both aspects of the aim of the investigation. It is good practice to encourage candidates to insert statements indicating how their selected data source links to their aim.
Citation and reference	Too many candidates were not citing their data source and linking it to the reference at the end of the report. The citation entered alongside their chosen source could be: 'Source 1', 'Ref 1' or simply '1'. The full reference, linked to the citation, should be given at the end of the report.

Graphical presentation

Graphs were well done. Candidates should take care in how they plot log scales and should be encouraged to place tick marks on each of the axes.

Analysis

The x-axis values (with units) used in the analysis must be given for a comparison or a calculation. Many candidates did not link the analysis to their aim. When doing a comparison, any measurements being compared must, in turn, be linked to the aim. Similarly, when a calculation is being made, candidates must link the results obtained to their investigation aim.

Conclusion

The conclusion must relate to the aim and be supported by all the data in the report. This means that candidates must refer to both their experimental data and source data if it is relevant.

Evaluation

Candidates can evaluate experimental controls, variables, errors and potential improvements. In all cases, there must be an appropriate justification to support any evaluative comment. There is no requirement for candidates to use the terms ‘valid’, ‘reliable’ and ‘accurate’. However, if these terms are used they must be used correctly.

Structure

The title must make sense for it to be deemed informative.

Grade boundary and statistical information:

Statistical information: update on courses

Number of resulted entries in 2018	5937

Number of resulted entries in 2019	6259

Statistical information: performance of candidates

Distribution of course awards including grade boundaries

Distribution of course awards	Percentage	Cumulative %	Number of candidates	Lowest mark
Maximum mark				
A	24.7%	24.7%	1545	104
B	21.0%	45.6%	1312	88
C	23.8%	69.4%	1488	72
D	19.3%	88.8%	1211	56
No award	11.2%	-	703	-

General commentary on grade boundaries

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.

SQA aims to set examinations and create marking instructions that allow:

- a competent candidate to score a minimum of 50% of the available marks (the notional C boundary)
- 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.

Therefore, SQA holds a grade boundary meeting every year for each subject at each level to bring 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. Members of the SQA management team chair these meetings. SQA can adjust the grade boundaries as a result of the meetings. This allows the pass rate to be unaffected in circumstances where there is evidence that the question paper has been more, or less, challenging than usual.

- The grade boundaries can be adjusted downwards if there is evidence that the question paper is more challenging than usual.
- The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual.
- Where standards 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 to year. This is because the particular questions, and the mix of questions, are different. This is also the case for question papers set by centres. If SQA alters a boundary, this does not mean that centres should necessarily alter their boundary in the question papers that they set themselves.