Biology

Overall grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-16	17-33	34-49	50-58	59-67	68-77	78-100

General comments

Teachers, students and examiners commented favourably on the interactive nature of the assessment and considered the clarity of the questions to be good. The difficulty of the exam was thought to be appropriate with the number of unanswered questions consistent with previous sessions. Some students felt that the more time was needed to finish the exam, commenting on the time required to engage with the media. Other students found the media useful in supporting the understanding of less familiar topics, particularly in the more open-ended tasks.

The exam gave equal waiting to the four assessment criteria and reflected the published topic list. Some teachers felt the exam was a little heavy on topics they covered in MYP4, but this is of course different for every school and is a feature of summative assessment.

The assessment team would welcome more feedback on the exam from students and teachers. We would urge coordinators to facilitate this by circulating the exam and survey links, as well as setting aside dedicated time for teachers to engage with this task.

The areas of the programme and examination which appeared difficult for the students

Students found the following areas difficult:

- The relationship between surface area and volume in living organisms
- Speciation
- Biotechnology; the use of genome mapping
- Supporting observations with scientific explanations
- Detailing experimental limitations
- Understanding the significance of random sampling
- Outlining the process of osmosis and the challenges associated with reverse osmosis

The areas of the programme and examination in which students appeared well prepared

Students were well prepared for the following areas:

- Functions essential for life, including homeostasis
- Adaptations of plants and animals
- Feeding relationships
- Simple calculations and plotting graphs to show data
- Planning scientific investigations
- Suggesting improvements to scientific investigations
- The water cycle

- Selecting relevant information from supporting media to justify arguments

The strengths and weaknesses of the students in the treatment of individual questions

Question 1

1(a)

The majority of students could successfully select the three functions essential to life. Although often answered correctly, reaction to an internal or external stimulus provided the most challenge for students.

1(b)

Many students could suggest a reasonable feature, with only stronger students able to link the feature to heat loss. The most commonly seen answers included reference to large surface area or flapping of ears. A significant number of students misinterpreted the question and described the accompanying media, simply stating that the ears were coldest.

1(c)

Most students explained the advantages of large surface area in terms of absorbing more sunlight, with many justifying this in terms of photosynthesis. All answers on the mark scheme were seen. Common errors included linking the surface area of the leaf to the absorption of water or the shading of plants growing below.

1(d)

Stronger students were able to outline the advantage of cactus leaves having small surface areas in terms of reduced transpiration. Many students incorrectly wrote about protection from animals.

1(e)

This was designed to be a challenging question. The best students unpacked the ratio in terms of the benefits provided by a large surface area or a small volume. The most commonly awarded mark was for understanding the benefits of a (relatively) large surface area on exchange of materials. Weaker students tended to repeat significant information from the question, or draw incorrect conclusions, for example saying the cells with a larger surface area to volume ratio had a larger surface area, which contradicted the information provided in the question.

Question 2

2(a)

The majority of students could correctly construct a food chain according the instructions provided. The inclusion of Pacific halibut at trophic level 4 supported students, and resulted in relatively few chains ending with producers, a common error from previous sessions.

2(b)

Many answers lacked the specific detail required to gain the marks. Common responses included a general statement about whales being apex predators or statements that were not supported by the food web, such as whales eating everything in the ecosystem. The best answers used scientific vocabulary to justify answers; trophic levels were identified and linked to examples of prey from the food web.

2(c)

This question was frequently misinterpreted. Many students wrote long answers detailing why each of the three killer whales had different hunting preferences, often repeating significant portions of the media. Stronger students were able generalise, answering in terms of reduced competition.

2(d)

Most students gained two marks for identifying differences between the killer whales. Stronger students explored the link between lack of interaction and interbreeding, and how this leads to speciation. Some students wrote longer texts discussing evolution by natural selection, without using examples about the whales.

2(e)

Genome mapping was a challenging concept for many students, with many instead discussing alternative methods used to classify different species, including structural features. Stronger students gave succinct answers supported by appropriate scientific vocabulary.

2(f)

The most commonly observed answer was Yes - supported by differences provided in the media. No - by the idea of naturally occurring variation was also seen frequently. A number of students contradicted themselves by stating the whales were similar and then listing a number of differences between them.

Question 3

3(a)

The majority of the students correctly selected the tape measure. Protractor and ruler were seen occasionally as selected distractors.

3(b)

Most students followed the instructions provided in the example calculation and correctly estimated the age from the circumference, with a few not gaining marks for forgetting to give their answer to the nearest year. A number of students omitted to convert the circumference into diameter before multiplying by the growth factor.

3(c)

Many students could articulate the link between the units in the growth factor and those used in the measurement of the circumferences. Weaker students commented on the need to measure circumference to calculate diameter, ignoring the relevance of units.

3(e)

Most students answered in terms of the base being the oldest, or new shoots or branches being younger and therefore not having as many rings to count.

3(f)

This question differentiated effectively between students. Many students correctly identified the difference between the temperate and tropical trees, but only stronger students could offer suitable explanations for this in terms of seasonal variation and optimal growing conditions.

3(g)

Responses referring to human error or carelessness when counting or measuring were often seen but not credited. A good range of acceptable limitations was seen, with the difficulty in calculating a diameter from a non-circular trunk and inability to count the rings in tropical trees frequently credited.

Question 4

4(a)

Many students answered in terms of removing bias from the sample. Very few students considered the size of the sample. Weaker students did not appear to understand that a random sample is representative, and often answered in terms of collecting a wide variety of data.

4(b)

Few students answered this question well. Many students used the word random and then described a system that did not allow all trees in the forest an equal chance of being included in the sample.

4(c)

Many students correctly selected student B and framed their justification in terms of the investigation's intended independent variable and dependent variable. Weaker students simply repeated the prediction, or provided a weak explanation why the two variables may be linked, which did not answer the question.

4(d)

All acceptable answers were seen. The most common errors included providing comments (qualitative data) for all trees or consistency in the increments of age.

4(e)

This was a high scoring question. The scale was forgiving, and the points were well plotted, with occasional errors seen for (5,3). Axes labels were frequently correct, and generally included units. Titles included reference to age and height, with a significant number specifying the type of tree.

4(f)

Stronger students answered this question succinctly, gaining both marks. A few students gained one mark for acknowledging the rapid growth at the start. However, most students did not score on this question as they discussed height rather than growth of the tree.

Question 5

5(a)

Most students correctly identified the four variables. Marks were lost when variables were not qualified, for example stating the dependent variable as time without saying which time was being measured.

5(b)

Many students correctly identified an insufficient number of repeats (only two), with a significant number also identifying the lack of heights tested (only three).

5(c)

The improvements suggested needed to make the model closer to what was happening in nature. Common answers included conducting the experiment outside so that external factors like wind or lower tree branches would be present, or with heights or seed masses that were more in line with sycamore trees found in nature.

Question 6

Students continue to improve when answering the open-ended planning task. The best answers followed the bullet points from the question, elaborating in each in detail.

Variables: The importance of the independent variable and dependent variable was raised this year, with one needing to be correct to score the first mark, and both correct for two marks.

Correct control variables were only considered when marks for independent variable and dependent variable had been awarded. Performance on this part was generally high, with marks occasionally not awarded for variables related to an earlier question or a lack of detail. Hypothesis: Most students could correctly link the independent variable and dependent variable, though supporting it with correct scientific reasoning was not seen very often. Equipment: Many students provided a list of equipment, but the marks were also awarded when correct equipment was seen in other sections, for example the method. Method: The best methods contained sufficient detail to manipulate the independent variable, providing both instructions and measurements, and to measure the dependent variable. Specific values supported detailed instructions when considering important control variables. Weaker methods were often inexact and frequently lacked the detail required to change the independent variable, or included a second independent variable (often drop height). Data: It was more common for students to suggest repeating a trial three times than it was to vary the independent variable five times. The best students did both, stating the five specific angles as independent variable increments and indicating an intention to calculate the average for the trial repeats. Safety: The most common reason for not achieving the safety mark was for not addressing it in the response. Relevant comments included precautions linked to drop height or sharp objects used to create the models. Marks were also given for acknowledgement of no serious safety concerns when this was apparent from the method given, for example using low drop heights where risk of injury from falling was minimal.

Question 7

7(a)

The most commonly awarded mark was two, where the idea of waste build up in the body was credited for excretion and challenges of temperature regulation in temperature control. Reference to reduced sweating was seen more often than the impact on urine volume or concentration.

7(b)

This question was answered poorly. The majority of students could not use the arrows to show the net movement of water into the cell.

7(c)

The most common ecosystem impacts written about included habitat destruction and the disposal of the concentrated waste. A large number of students incorrectly suggested that the water levels would change. Common consequences of high energy usage included cost or a discussion of the impact of fossil fuels. Stronger students scored both marks for each point and considered the benefits provided by the fresh

water in their appraisals, despite focusing on the negatives in their texts. Weaker students often did not gain the appraisal mark due to only focusing on the negatives.

Question 8

8(a)

The water cycle was correctly completed by most students.

8(b)

The majority of students were able to outline consequences to the region, with flooding and droughts being the most common responses. Marks were lost when students answered in terms of the water cycle from part (a), for example, more collection, without connecting this to the region in question.

8(c)

Steps that could be taken to reduce water shortage in the home: this section scored very highly. Students used the media effectively to suggest a wide range of ways water is used in the home and offered well thought-out suggestions as to how it could be reduced. Occasionally, suggestions like "turning taps off or fixing leaks" were not linked to how the water was used in the home.

A description of how an individual's dietary choices can affect their water footprint: students used the media effectively to aid in supporting dietary choices, often referring to and comparing the values given as their evidence. However, many students only provided evidence for one dietary choice, missing out on the highest marks in this section.

A suggestion of how government policies can influence water usage: students were able to suggest a wide range of government actions, and were frequently able to elaborate on how these actions would reduce water loss.

Concluding appraisal: Most students provided a concluding statement. Stronger students considered the relative impact of actions of both individuals and groups.

Recommendations and guidance for the teaching of future students

Teachers must continue to use the full range of MYP command terms in their teaching and assessment, to enable students to become more familiar with what is expected of them in terms of level and detail.

Teachers should model how to respond to questions using higher level command terms such as explain, discuss and evaluate, justify, and compare and contrast to help students further develop these skills.

Students should be exposed to a range of varied, open-ended practical tasks as part of their MYP studies. Students are not expected to have encountered all investigations presented in the examination; some will be unfamiliar but will be supported by detailed media.

Teachers could focus on and model different aspects of the scientific method; it is not always necessary to complete the full process to practice the skills needed. For example, students could be given opportunities to construct research questions and hypotheses, as well as to evaluate and improve them without always having done the experiment.

Teachers can provide students with data sets that encourage them to support and reject hypotheses to differing extents. Opportunities for meaningful processing of data should be planned for, beyond that of calculating the mean.

The selection of pieces of equipment or experimental techniques should be discussed in terms of accuracy, precision and reliability and the impact on the validity of the data should be explored using the correct terminology.

Teachers must provide students with regular opportunities to engage with source material linked to real world issues. Students need time to plan and produce extended responses where they are challenged to consider relevant factors.

Teachers must model how information found in source material can be identified and subsequently used as a starting point for further justification and developed accordingly. The interactive media and questions in past exams can be used to support this.

Teachers should model how to breakdown big questions into smaller parts. Students should practice using the bullet points to structure their answers and ensure all parts of the question are covered.

Teachers should work with students to develop writing strategies that encourage students not to repeat the question in their answers as this wastes time.

Schools should make use of the familiarisation material and past exams available, ensuring that students are familiar with the style of the on-screen presentation and have experience interacting with the different tools and available media. This will also help students with their time management skills in the exam.