Sciences

Contents

Biology

Overall grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-16	17-33	34-45	46-55	56-64	65-74	75-100

General comments

The November exam session is considerably smaller than the May session, with fewer candidates representing a smaller range of schools.

Feedback shared by teachers, candidates and examiners following the exam was again highly positive, praising the interactive nature and creativity demonstrated in the assessment. In addition to offering valuable guidance in establishing grade boundaries, feedback from teachers assists in developing future assessment tasks. Teachers are actively encouraged to provide feedback on the exam in future sessions; schools could facilitate this by ensuring teachers have access to the exam and dedicated time to do this.

Teachers felt that the difficulty of the exam was appropriate, with the clarity of the questions and interactive media rated either good or very good. The exam accurately reflected the published topic list. Most candidates responding to the survey after the exam felt that the questions were of the expected difficulty or harder, this pattern was also observed with respect to the time given to answer the questions.

There continues to be an improved understanding of the assessment blueprint amongst teachers and candidates; in particular, the equal weighting of the four assessment criteria within the exam. The exam offered candidates the opportunity to demonstrate their knowledge and skills in MYP Biology.

The area of the programme and examination which appeared difficult for the candidates

Candidates found the following areas difficult:

- explaining how structures are adapted to function
- generating scientific hypotheses
- selecting and using appropriate equipment for scientific investigations
- processing data; including rounding to an appropriate degree of accuracy
- suggesting relevant improvements to methods and data presentation
- drawing conclusions from experimental data; including identifying limitations
- evaluating the impact of science through different factors.

The area of the programme and examination in which candidates appeared well prepared

Candidates were well prepared for the following areas:

- food webs and predator-prey cycles
- dietary needs
- reproductive hormones and secondary sexual characteristics
- identifying variables and planning investigations to address given research questions

- identifying trends from experimental data and performing basic calculations
- selecting relevant information from sources.

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

Question 1

1(a) Most candidates answered correctly.

1(b) Many candidates knew that producers are eaten by consumers, but few referenced the conversion or flow of energy.

1(c) Many acceptable suggestions were seen. Common errors referred to the banning of hunting which was given in the stem.

1(d) Well answered by candidates.

Question 2

2(a) Most candidates answered correctly.

2(b) Most candidates answered correctly.

2(c) A number of candidates selected the correct answer but could not provide a correct justification or left the justification blank.

2(d) Strong answers outlined how the processes of diffusion or active transport enabled products of digestion to enter the bloodstream. Many candidates talked about absorption of nutrients into the blood which did not receive credit.

2(e) Few candidates achieved full marks. Features such as the lack of nucleus and presence of haemoglobin were often stated but not then explained correctly.

Question 3

3(a) Most candidates answered correctly.

3(b) Most candidates answered correctly.

3(c) Stronger candidates answered with scientific terminology, correctly referencing haploid gametes combining to form a diploid zygote/offspring.

3(d) Many candidates gained the first marking point for XX (female) and XY (male). Weaker candidates showed uncertainty in the number of chromosomes passed on, ambiguously saying sperm passes on X and Y rather than X or Y.

Question 4

4(a) Generally answered correctly by candidates.

4(b) Generally well answered, but common errors included the swapping of the independent and dependent variables and providing unqualified examples, for example, light rather than light intensity or duration of exposure.

4(c) The If / Then / Because model for hypothesis generation was followed poorly by most candidates. Many candidates gained marks for (If) increasing the temperature (no mark was awarded for changing, a

direction was needed) and linking this to (Because) an increase in photosynthesis. Few candidates referred to (Then) an increase in oxygen concentration.

4(d) Many candidates achieved two marks for a correct answer. However, many were not consistent when rounding to a degree of accuracy consistent with the raw data in the question. A number of candidates answered with the median rather than calculating the mean.

4(e) This was often answered incorrectly by students not referring to the presentation of the data and instead offering general improvements to the method used.

4(f) Stronger candidates used the results from the experiment to effectively illustrate trends where the prediction wasn't supported (from 20 °C to 40 °C) and where it was (above 40 °C). Weaker candidates discussed the peak at 40 °C but did not elaborate on the relationship between the results and the prediction.

Question 5

5(a) Extra details needed to be linked to making the experiment more repeatable, not simply repeating the experiment. Stronger candidates suggested realistic values for uncontrolled aspects of the method given in the question stem.

5(b) Many candidates identified using 40 °C as a control variable, few candidates justified its selection in terms of ensuring the reaction took place fast enough to measure.

5(c) A relevant improvement needed to impact the sufficiency of data collected. Many candidates were able to suggest reasonable improvements, but few were able to articulate why their suggestions improved sufficiency.

5(d) Candidates were able to correctly identify the trends, often correctly referencing 0.10% CO_2. Only stronger candidates could relate the trend to changing limiting factors below and above this threshold.

5(e) Despite correctly interpreting the graph in part (d), many candidates incorrectly suggested increasing the concentration of CO_2 to further increase the rate of photosynthesis.

Question 6

This question saw the expected variety in both the quality of answers given and the marks gained. Answers ranged from lengthy step-by-step descriptions, gaining many of the marks, to short answers that did not properly address all the points identified in the question. Most answers logically followed the structure encouraged by the question.

Candidates are unlikely to have conducted all the investigations they may be expected to plan in the assessment; they will have to plan unfamiliar tasks and should expect use the accompanying media for support.

Variables: Most candidates gained at least one mark by identifying light intensity as the independent variable or correctly identifying control variables. Correctly identifying the dependent variable was again more challenging for candidates; rate of photosynthesis was not credited as this is not directly measurable but must be calculated from data collected. Stronger candidates understood that oxygen concentration could be measured (to calculate the rate of photosynthesis) and correctly stated this as the dependent variable. Other common errors included control variables that were insufficiently qualified; see the example in 4(b) above.

Hypothesis: Many candidates gained two marks here for correctly linking the appropriate variables. Very few candidates were able to support their hypothesis with a correct scientific explanation.

Equipment: A list of relevant equipment was enough to score one mark. To score two marks it needed to be clear how the independent variable would be manipulated (for example, explicitly saying that a ruler would be used to set the distance between the light source and the plant) and dependent variable measured (for example, using the data logger to record the oxygen concentration in the tank). It was not enough to give these items in a list and then not use them. The same was true for the control or monitoring of control variables.

Method: Methods varied from lengthy, detailed, step-by-step descriptions to vague summaries. Stronger candidates gave clear details for each of the variables identified, as well as providing additional details such as quantities and measurements (linked to appropriate pieces of equipment) that made the method repeatable.

Data: Most candidates intended to conduct at least three trials. Many candidates also suggested five different values for the independent variable.

Question 7

7(a) Most candidates correctly identified plant W.

7(b) The most common response suggested by candidates was that plant did not suffer from pests.

7(c) Controlling variables / external influences was common answer.

7(d) Most candidates answered correctly.

7(e) The most common answer was the correct 6 %, although 5 % (the mean from the correct answers to part (d) was occasionally observed. Answers referring to a constant yield rather than a maximum yield did not achieve the second mark.

Question 8

8(a) Most candidates did not discuss similarities and differences in trends, but instead picked out specific values.

8(b) Many candidates could link the increase in cancer to exposure to the risk factors but did not justify this scientifically.

8(c) Candidates could select the relevant information from the media. The concluding statement was not always coupled with advice to minimise the health concerns.

Question 9

Most candidates were able to answer the question by selecting relevant information from the media. Stronger candidates used the media as a starting point, developing their answers with examples and consequences to introduce new and relevant information.

Medical: Most candidates discussed the advantages of personalised healthcare in terms of correct medication doses and reduced symptoms. Stronger answers explored the possible shift from cure to prevention.

Economic: Most candidates were able to make hypothetical statements about the cost of personalised healthcare, often in terms of medication costs. Stronger candidates explored for example, the long- and

short-term costs, resource needs, inequalities and access to healthcare, and education and workforce implications.

Ethical: Candidates struggled with this prompt the most, with few going beyond what was given in the media. Stronger candidates were able to consider the possible consequences of such data being available to different actors.

Conclusion: Most candidates could provide a simple conclusion regarding the use of personalised health care. Stronger candidates went beyond simply restating the facts by trying to weigh up their relative significance.

Recommendations and guidance for the teaching of future candidates

Teachers must continue to use the full range of MYP command terms in their teaching and assessment to enable candidates to become more familiar with what is expected of them in terms of level. In addition, teachers should model how to answer questions using higher level command terms such as explain, discuss and evaluate, justify, and compare and contrast to help candidates develop these skills effectively.

Teachers must expose candidates to a range of varied, open-ended practical tasks as well as partially completed lab plans and data sets during their MYP studies. Candidates should not be surprised when unfamiliar investigations are presented in the examination, including equipment such as data loggers.

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.

Candidates must be given opportunities to construct research questions and hypotheses, as well as to evaluate and improve them.

Teachers can provide candidates with data sets that encourage candidates to support and reject hypotheses to differing extents. Authentic data can and should demonstrate a range of different relationships.

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.

Candidates must be taught the difference between improvements and extensions to experimental methods.

Teachers must provide candidates with regular opportunities to engage with source material linked to real world issues.

Candidates need time to plan and produce extended responses where they are challenged to consider relevant factors beyond the environment and economy. 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 the exam can be used to support this.

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

Teachers should work with candidates to develop writing strategies that encourage candidates not to repeat the question in their answers.

Schools should make use of the past exams available and the familiarization material, ensuring that candidates are familiar with the style of the on-screen presentation and have experience interacting with the different tools and available media.

Chemistry

Overall grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0-14	15-28	29-49	50-59	60-69	70-79	80-100

General comments

Based on the feedback from teachers and the grade award meeting, the standard of the assessment was deemed appropriate Year 5 students and aligned with the MYP criteria. The assessment allowed the whole range of grades to be achieved and all assessment tasks could be answered, permitting full marks to be awarded.

Teacher feedback also indicated that the assessment was of appropriate difficulty, with good clarity of questions and sources and allowed candidates to express their knowledge.

The length of the assessment was suitable for the candidates, with good foundations throughout in chemistry topics. Some candidates recorded that they experienced difficulty in using the graphing tool.

The examination team agreed that the assessment tasks were fair, linked to the topic list available and assessed the MYP objective criteria.

The area of the programme and examination which appeared difficult for the candidates

The area of the programme and examination which appeared difficult for the candidates were:

- giving the meaning of the term isotope and determining the number of protons and neutrons for a specific isotope
- linking properties of metals and alloys to specific functions
- understanding the concept that adding oxygen produced oxidation
- identifying Lewis structures
- understanding the requirements and forming of ionic bonds
- understanding that there may be two methods to determine a specific determination of a pH and which would produce a the most accurate value, therefore being able to distinguish between a qualitative and quantitative method
- designing a method for an investigation, collection of data and ensuring that sufficient data was collected and the requirement to calculate averages.
- identifying limitations and extensions for an investigation. They also struggled with identification of variables especially independent variables.
- using evidence provided to support their evaluation in an unfamiliar situation and using evidence to support economic impacts of a situation.

The area of the programme and examination in which candidates appeared well prepared

Candidates were well prepared to:

- identify the position within the periodic table and the period an element was in
- balance equations with unfamiliar reactions
- to identify hazard symbols
- calculate averages with given information
- identify changes in pH with numerical data
- identify independent, dependent and control variables when provided with information to design a method
- identify safety requirements for a designed method
- identify variables when provided with a method
- formulate a hypothesis based on a given investigation
- discuss the validity of the statement when given a research statement with supporting data
- use and extract information to identify a suitable fire extinguisher for use on a forest fire
- identify an exothermic reaction.

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

Question 1

Candidates were able to identify the position within the periodic table and the period an elements was in.

Candidates struggled with the meaning of the term isotope and relating the number of protons and neutrons for a specific isotope. They also struggled to outline properties of metals and alloys.

Question 2

Candidates were able to balance equations with unfamiliar reactions and were able to identify hazard symbols when provided.

Candidates struggled with identifying the process when oxygen reacted with an element. Candidates struggled with identification of Lewis structures. Candidates struggled with explaining how an ionic bond formed.

Question 3

Candidate were able to calculate averages with given information. They were able to identify using given information changes in pH with numerical data.

Candidates were able to identify independent, dependent and control variables when provided with information to design a method. They were able to identify safety requirements for a designed method.

Candidates struggled to evaluate two chosen methods for determining pH

Candidates struggled with the formatting and production of a method for an investigation. The main struggles were with the collection of data and ensuring that sufficient data was collected and averages determined.

Question 4

Candidates were able to identify variables when provided with a method. They were able to formulate a hypothesis based on a given investigation.

Candidates struggled with the identification of limitations of a given investigation. Candidates also struggled with providing a different independent variable for a given investigation. Candidates struggled with adding a line of best fit for a graph that they had prepared.

Question 5

Candidates given a research statement with supporting data were able to discuss the validity of the statement. Candidates were able to use and extract information to identify a suitable fire extinguisher for use on a forest fire. Candidates were able to identify an exothermic reaction.

Candidates struggled with using evidence provided to support their evaluation in an unfamiliar situation. Candidates struggled to use evidence to support economic impacts of a situation.

Question 6

Candidates were able to identify organic structures in unfamiliar situations. They were able to discuss and evaluate information in an unfamiliar situation.

Question 7

Candidates were able to use information provided to support social and environmental issues surrounding an unfamiliar situation.

Recommendations and guidance for the teaching of future candidates

- Candidates should use the familiarisation package so that graphing technique can be improved.
- Candidates should use past assessments with markschemes to understand what is required in terms of answers within the assessment.
- Candidates should be taught how to extract information to produce a suitable conclusion and evaluation of a particular situation, more emphasis should be on using a variety of sources to make allow candidates to understand how to evaluate situations which use chemistry.
- Candidate should become familiar with the command terms and understand what that means in terms of the answers required in the examination.
- Candidates should become comfortable in embracing situations which are not familiar.
- Candidates should be familiar with different experimental aspects and analytical tools which can allow a student to determine the outcome of an investigation.
- Candidates should become more familiar with the requirements of criteria B and C in the subject guide.