May 2018 subject reports

Sciences

Comments from the chief examiner

This session saw a reduction in the total number of marks available to candidates from 120 to 100. It was evident that there were far fewer questions that candidates did not attempt and questions requiring a greater depth of response received more developed answers. The mark reduction proved to be a successful evolution of the examination blueprint and the examining teams in each of the four sciences on-screen examinations were able to develop a clear picture of candidate understanding.

MYP sciences on-screen examinations are intended to give candidates a different experience to that which may be encountered in other assessments; they are designed to give candidates the opportunity to demonstrate their ability to meet the four sciences objectives encountered during the teaching of the course. The examinations also reflect the global context and the focus of the exploration within this context. The three tasks in the examination each have a clearly different focus, with only the first intended to test a candidate's knowledge and understanding of science. The final task in each examination examines the impact of science and explicitly explores the global context for the session. This final task sees the focus of the assessment move beyond that which may be articulated through the topic list and explores the skills taught when candidates complete tasks in the classroom which are assessed against criterion D. It is therefore expected that candidates will have experience of the wider role science plays in the world and understand the positive and negative consequences that are the result of these encounters. As such, candidates that have been given the opportunity to go beyond the confines of the topic list to inquire into problems faced by the world today and the ways in which science is used to address them, will be best placed to tackle the final task of the examination.

The feedback received from teachers was again overwhelmingly positive. However, one concern commonly raised by teachers is the lack of universal coverage of the topic lists examined each session. It should be noted that it is not the intention of the authors of each assessment to cover all aspects of the topic list in every examination. Given that only a quarter of the examination assesses those skills represented by criterion A, it would not be possible to visit each element of the topic list in each assessment, to a depth suitable for candidates at the end of MYP5.

Finally, it is hoped that as teachers become more familiar with the nature of the four sciences on-screen examinations they will continue to prepare candidates for the completion of the assessments through a strong and varied programme with a focus on practical activities. The examination is intended to reflect good classroom practice and it is hoped that the classroom experience for candidates does not evolve to focus exclusively on the style of assessment utilized in on-screen examinations.

Biology

Overall grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 16	17 - 33	34 - 46	47 - 54	55 - 62	63 - 70	71 - 100

General comments

Based on teacher comments, the exam provided candidates with an opportunity to demonstrate knowledge across all topics on the topic list. The exam also allowed candidates to demonstrate their understanding of the scientific process and the application of science. Teachers also felt that the exam was appropriate in its difficulty.

Data gathered from the exam showed that there were fewer questions left unanswered compared to other years which demonstrates that the exam was accessible to candidates and the length of the exam allowed candidates to complete the exam in the time provided.

Although the teacher feedback was overwhelmingly positive, the number of teachers who provided feedback was very low compared to the number of schools participating in the examination. This feedback process is one of the only ways for teachers to provide direct feedback to examiners and the assessment team. The examiners and assessment team use the feedback to improve the assessment process and feedback from teachers is extremely useful in this process.

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

The proper use of specific scientific terminology and discussion of concepts appeared difficult for candidates. Candidates could use vague terminology but often lacked correct use of specific terminology. A specific area of difficulty for candidates when discussing concepts was comparing and contrasting concepts. Many responses described two factors but did not focus on common characteristics within the description. An example was when candidates compared two types of farming methods they would describe how soil nutrients were provided by one method and then describe how water was provided to plants by the other method. The correct response would have been to discuss how soil nutrients and water were provided to plants by both methods of farming.

The concept of sufficient and relevant data also provided a challenge to many candidates. Many candidates used the terms interchangeably and often used reliable and valid interchangeably when discussing sufficient and relevant data.

When it came to designing and analysing scientific investigations there were two areas that appeared difficult for candidates. Adding specific details to the experimental design (specific

quantities, units, and equipment) was missing from many of the design responses and completely describing trends in data with an explanation was very difficult for most candidates. Many responses provided partial descriptions of trends in data.

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

Candidates demonstrated a clear understanding of the different types of variables. Most candidates were able to correctly identify the independent, dependent, and control variables and many candidates were also able to describe how to manipulate, measure, and monitor these variables respectively.

Candidates were able to use scientific information that was provided and apply it in unfamiliar situations. Information that was provided in the form of tables, graphs, or videos was often applied by candidates to develop responses to questions that were set in unfamiliar situations.

Designing an investigation was a strength of most candidates. Candidates use the prompt in the design an investigation question to adequately describe how to study a research question that was provided to them.

Related to specific topics, candidates demonstrated an ability to answer questions related to biologic concepts related to enzymes and body systems.

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

Question 1: Responses for 1a and 1b were strong. Responses to 1c and 1d were often lacking detail or demonstrated misconceptions related to natural selection and heredity. The use of "individuals" and "species" were often incorrect and the concepts of homozygous and heterozygous were also rarely used correctly.

Question 2: Responses to this question demonstrated a good understanding of photosynthesis and respiration and how they linked plants and animals.

Question 3: Responses were strong overall and many candidates were able to use the scientific information provided to apply it to unfamiliar situations. Candidates did struggle to differentiate between genes and alleles.

Question 4: Candidates answered these questions well most of the time. The one weakness was understanding the difference between reliability and validity. Many candidates used these terms interchangeably.

Question 5: Identifying the enzyme, creating the graph, and identifying the units were strengths of this question. Some candidates struggled to use evenly spaced increments on the y axis. Very few responses reached the full marks for 5d or 5e as they lacked the necessary detail. Many candidates received partial marks. Differentiating between improvements and extensions was still a weakness.

Question 6: Many responses received high marks on this question as candidates followed the prompts and demonstrated an ability to identify variables, form a hypothesis, and manipulate variables appropriately. Candidates could have done a better job including details in the method.

Question 7: This question was well answered by most candidates.

Question 8: Comparing and contrasting similar factors of the two types of farming was a weakness. Many candidates re-stated facts from the prompt but did not organize them appropriately. Many responses focused on erosion and flood control of terrace farming and water and nutrient control of vertical farming.

Question 9: Candidates who followed the prompt usually responded well to this question. The main weakness was a lack of focus on two changes to the landscape for each part to the answer. Candidates would focus on advantages of one change, strengths of the other change, an economic impact of one change, and an impact on society of the other factor.

Recommendations and guidance for the teaching of future candidates

Candidates should be provided with more practice using the command terms and providing answers that meet different levels of marks. Candidates should understand that making one point relates to one mark and questions with higher marks demand more detailed responses.

Provide candidates with clarification between reliable and valid. Increasing trials (3 minimum) makes data more reliable by reducing systematic error. Increasing the range (5 minimum) of the independent variable or making sure that the values used for the independent variable relate to the research question makes the data more valid.

Candidates should be provided with more practice comparing and contrasting concepts. It is important that the same factors are used when describing similarities and differences.

Practice in using scientific terminology would also be beneficial for candidates.

Chemistry

Overall grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 14	15 - 28	29 - 42	43 - 51	52 - 59	60 - 68	69 - 100

General comments

Based on the teacher comments and the grade award meeting, the standard of the assessment was appropriate for Year 5 candidates and was aligned with the MYP criteria.

The assessment allowed the whole range of grades to be achieved and all assessments could be answered permitting full marks to be awarded. Some teachers raised some concern that the questions were too narrow in terms of topics chosen, the examination team did not consider this to be the case.

Examiners and comments from teachers stated that the assessments provided a whole range of questions which allowed access to the lower ability candidates and challenged the higher ability candidates.

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

The examination team believe that with full coverage of the topic list and better understanding of the command terms, objectives and criteria the candidate performances will improve.

The examination team strongly recommend that all candidates should practice using the familiarisation package prior to the examination as many were unable to use subscripts and superscripts correctly in chemical formulae.

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

Candidates struggled with a number of key skills which, if a full MYP programme had been completed, was surprising.

Candidates had problems with drawing Lewis structures and identification of types of bonding.

Candidates had difficulty in balancing formulae with given ions and producing molecular formula.

Candidates had difficulty in identifying and linking elements and their properties.

Candidates found difficulty with criteria B and C, in particular the transformation of data, interpretation of data and graphical analysis. The candidates also had difficulty transforming this data to produce a value based on simple mathematical percentages.

In criterion B, candidates had difficulty identifying controlled and dependent variables when given suitable research questions.

Candidates had difficulty identifying outliers/anomalies in data and making suggestions as to why these could have occurred and suggesting ways to limit these.

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

Candidates were well prepared to answer questions based on periodicity.

Candidates had a good understanding and were able to demonstrate their knowledge on the atomic structure.

Candidates were more than able to create good methodology of investigations from information given, showing a good understanding of the requirements of open ended inquiry.

Candidates had a good understanding of how to undertake general data analysis.

Candidates were well equipped to answer holistic questions given information to analyse and add their own understanding of science in the world in which we live.

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

Candidates showed good understanding with answers showing an appreciation of the material being assessed.

Question 1: Candidates found questions on periodicity easy to complete.

Question 2a: Candidates were able to determine proton and neutron number effectively.

Question 3a: There were very few problems with identifying simple chemical formula.

Question 3d: Candidates found writing methods and identifying variables within the method fairly easy.

Question 6: was well answered and candidates produced good answers.

Question 7: Candidates were able to produce good answers using the prompts given.

Candidates had showed weaknesses with respect to the following questions.

Question 1: Candidates found difficulty in drawing bonds and balancing equilibrium reactions.

Question 2: Candidates found determination of molecular formulae difficult.

Question 2c: Candidates found it difficult to compare properties of elements and difficult to identify elements using these properties.

Question 2e: Candidates found it difficult to differentiate between ions and compounds.

Question 3b: Candidates found identification of variables difficult.

Question 3c: Candidates were unsure of how many trials should be added and also the inclusion of the independent variable into the table.

Question 4: Candidates were unable to be able to identify anomalies/outliers and well as a suitable cause for these results.

Question 4b: Candidates were unclear about how to interpret data and calculate an appropriate answer.

Question 5g: Candidates found this question part difficult to answer based on the information provided.

Question 6b: Candidates were unsure how to describe the process of fractional distillation and the properties of mixtures that could be separated using this technique.

Recommendations and guidance for the teaching of future candidates

Candidates should practice using the familiarization package before the examination. This will enable them to understand how to produce graphs and add sub and superscripts when required.

Candidates should be exposed to questions which require data analysis.

Candidates should be exposed to scientific methodology and the requirements for each aspect as detailed in the MYP Sciences Guide.

Candidates should be aware of how to balance chemical equations which are unfamiliar to them, they should be able to balance equations with state symbols and equilibrium arrows.

Candidates should be aware of the nature and difference of independent variables, dependent variables and control variables.

Physics

Overall grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 13	14 - 26	27 - 40	41 - 50	51 - 59	60 - 69	70 - 100

General comments

Teacher comments and feedback overwhelmingly suggested that the exam was accessible to the candidates, with questions appropriately addressing the areas of the topic list at a suitable level of difficulty. This overwhelmingly positive feedback was in concordance with experience of the examination team. However, it was disappointing that so few teachers took the opportunity to share feedback. This feedback is of great importance, assisting in both the final determination of grade boundaries and the design of future tasks and it is hoped that a greater proportion of teachers share their thoughts in future sessions.

This session saw far fewer questions left unanswered by candidates and given responses showed a greater degree of detail. The slightly shorter format adopted this year for the exam is evidently more appropriate, giving candidates sufficient time to complete the assessment.

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

Candidates found many of the questions using command term *explain* challenging. The responses given often lacked the depth required to demonstrate that they could use the science they had been taught to good effect. While scientific literacy was much in evidence throughout the three sections, there were significant misconceptions shown regarding the role that humans play in the enhanced greenhouse effect leading to climate change. The depletion and subsequent recovery of the ozone layer was often linked to climate change demonstrating significant misunderstandings regarding the impact that science can have on our environment. This session, candidates were not able to consistently meet the requirements of the criterion B strand in which they are required to justify the collection of sufficient, relevant data. Task three required the candidates to discuss and evaluate information regarding the impact of the Three Gorges dam in China. Again, the application of scientific knowledge to assist the evaluation of this information was lacking from candidate's responses.

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

The three questions assessing scientific knowing and understanding showed that candidates had a good understanding of those areas of the published topic list that were most closely

targeted. Questions requiring calculations often showed the necessary working and included appropriate units.

A good understanding of experimental procedures and routine lab protocols were also much in evidence. This session, candidates showed a better understanding of the need for hypotheses to contain relevant scientific justification and a quantitative element when appropriate. A good understanding of the different experimental variables was also in evidence, with candidates able to identify independent, dependent and control variables consistently.

Task three showed that candidates are now prepared to quickly evaluate information regarding the impact of science. While they are not always using science to justify their thinking, there was greater evidence of candidates being willing to state their own opinion on the matters addressed.

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

Question 1: It was clear from the responses that the topics of magnetism, electromagnetism and transformers were familiar to candidates. Overwhelmingly, candidates were able to select the correct diagram showing field lines around a bar magnet and were able to perform a simple calculation using the transformer equation. Candidates found the calculation used to determine the efficiency of a non-ideal transformer more challenging; although commonly those able to calculate the power of an electrical circuit were able to calculate efficiency. Given the familiarity of the topic to all candidates, it was surprising how few were able to offer a simple explanation as to the operation of a transformer in terms of a changing magnetic field and alternating current.

Question 2: Candidates found this question straightforward and the responses demonstrated a good understanding of energy, forces and Sankey diagrams. While most candidates were able to successfully identify the definition of velocity and kinetic energy, a significant number were unable to select the definition of mechanical power. This question also required candidates to *calculate* a value of gravitational potential energy and convert the answer into kilojoules. The command term *calculate* requires candidates *to show the relevant stages in the working.* It was surprising how poorly many candidates showed their working and how few candidates were able to understand that the conversion to kilojoules required an additional step.

Question 3: This question required candidates to explain their scientific knowledge. Most candidates were able to interpret the given information to identify convection as the process utilized in the scenario and were able to explain the underlying principles that explain convection. Far fewer candidates were able to apply the principles of kinetic theory to explain cooling by evaporation.

Question 4: Most candidates were able to successfully write a hypothesis, with many attempting to link the variables quantitatively using a scientific explanation. While identification of variables was also not a challenge to most candidates, few were able to describe the need to record results for at least three trials and at least five different increments of the independent variable. The final two parts of this question required the candidates to determine and use the constant

found from a graph. Most candidates were able to correctly state the constant, however, few were able to adequately demonstrate how this had been determined using data from the graph. While almost all candidates who had calculated a constant attempted to determine the area of the hole which would lead to a fill time of 90 seconds, most candidates miscalculated to produce an area of 8cm^2, or greater. It is important that candidates are reminded of the importance of checking their answers against the likely outcome of the calculation. A quick check would have allowed them to realise that this answer is larger than any in the question and, as such, is significantly too large.

Question 5: Almost all the candidates were able to engage with the requirements of planning an experiment and there many well written responses. Most candidates were aware of the need to describe, rather than simply state, variables involved in the scenario. While candidates did offer equipment lists, few suggested equipment that would be precise enough for measurements to be made and fewer still justified their choice of equipment. Methods were generally reasonable and were judged to be easy for another candidate to follow, although candidates often tended to repeat themselves with long lists of rudimentary instructions. It was pleasing to note the overwhelming number of candidates who suggested that repeated trials were important in the process. It was clear that those candidates who offered the strongest responses were those for whom writing and preparing plans, assessed against criterion B, was common place. These candidates wrote well-structured responses, following a clearly understood procedure, which allowed them to meet all the requirements of this question.

Question 6: Almost all candidates engaged fully with the scenario and were able to attempt the questions asked. However, it was clear that there were profound weaknesses in candidates' understanding of data analysis. While most candidates were able to arrange the data from the experiment into a simple table, there were many recurring errors. The most common errors included inconsistent decimal place, results not recorded in the correct order and units appearing alongside the numerical values. Again this year, candidates were challenged when determining the type of relationship shown by the data. While many more candidates were able to state the characteristics of a proportional relationship, few were able to apply this knowledge to correctly identify and explain why data did not follow the given trend.

Question 7: In responses to this question, candidates showed significant misconceptions regarding the role that named gases have in relation to climate change. Many candidates discussed the concern that burning fossil fuels would release carbon dioxide consuming all of the world's available oxygen, in addition to the concern that carbon dioxide production damages the ozone layer. While these matters may not always fall into some aspects of day-to-day physics teaching, when designing tasks used to address the requirements of criterion D, the role of various gases and their contribution to climate change should be addressed to help alleviate these widespread misconceptions.

Question 8: This longer response question allowed candidates to engage with the May 2018 Global Context: orientation in space and time, targeting the impact that science has on natural and human landscapes and resources. The focus of this question was hydro-electric power and the implications of using this application of science to solve the problem of electricity generation. It was encouraging to note that candidates were able to fully engage with this situation and many showed a nuanced understanding of the situation and were able to support their arguments with the information shared. However, it was particularly evident this session that

some candidates were copying and pasting large sections of the information shared in the question, without engaging in the evaluation of the information or discussing the use of hydroelectric power as it pertained to the material. Questions such as this assess similar skills to those assessed in the classroom against criterion D. While candidates are not penalized in the assessment for copying data shared; they only receive marks where they have engaged in discussing and balancing the arguments raised by this material.

Recommendations and guidance for the teaching of future candidates

Candidates with experience and understanding of the four Sciences criteria are able to best perform across the three tasks in the assessment and future classroom teaching which has a focus on the MYP objectives is to be strongly encouraged.

Each question contains a commend term and candidates familiar with these are best placed to give the appropriate answer in the exam.

The language of the MYP Sciences criteria is drawn on throughout the assessment; classroom activities which also utilize these terms allow candidates to develop a thorough understanding of the requirements of the assessment.

Candidates need to be given the opportunity to explain complex scientific concepts using simple models. The example this session, where candidates where asked to use the kinetic theory to explain cooling by evaporation, would make an excellent starter activity to a class following the teaching of this concept. In this way candidates develop the experience of using ideas to explain everyday phenomenon.

Candidates need to develop a more sophisticated understand of the need for repeated trials, appropriate increments and range of data when designing an experiment. In this way they will be able to better explain whether or not sufficient data has been collected.

Integrated Sciences

Overall grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 16	17 - 32	33 - 48	49 - 56	57 - 64	65 - 72	73 - 100

General comments

The integrated sciences on-screen examination was developed considering the four assessment objectives and criteria, key and related concepts, the topic list and skills for this group of disciplines. The global context was orientation in space and time with a focus on natural and human landscapes and resources.

Based on comments from teachers, the structure of this exam was well developed and allowed candidates to demonstrate a wide range of knowledge and scientific skills thorough the exam. The questions, in general, were designed appropriately to the level of Year 5 MYP candidates. The use of scientific language was accessible for candidates and clear instructions were provided in the exam.

The comments also indicated that there was a good coverage of the assessment objectives and criteria and the use of media was very rich, stimulating and appropriate for candidates. Most teachers commented that the exam showed a good balance among science subjects although some teachers considered that the exam was biased towards biology and physics rather than chemistry. Nevertheless, schools should not expect a full coverage of the topics in the exam.

Finally, most teachers stated that the time frame for the exam was fair this session and candidates had enough time to complete the exam before saving it.

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

There were different parts of the test that seemed to be difficult for the candidates.

Candidates appeared to have difficulty outlining, describing or explaining knowledge and understanding of different questions using correct scientific terminology. They struggled with areas such as electrical circuits, current, voltage, resistance and transformers. Candidates also found it difficult to perform calculations using correct units and some of them were not able to use trends in the periodic table to compare and contrast two metal elements.

Candidates also struggled to identify limitations of the method and to suggest improvements and extensions with proper justification.

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

Candidates demonstrated a clear understanding of how to design a complete and safe method using the prompts provided. Candidates were able to select correct independent, dependent and control variables.

Candidates appeared to be well prepared to answer longer response questions. Most of the candidates used the prompts provided in the question to organize their ideas. Candidates demonstrated a good understanding of renewable and non-renewable sources of energy and conservation of natural resources.

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

The following comments are made on individual questions.

Question 1: Candidates were able to write the correct electronic configuration of lithium metal. Candidates found it difficult to compare and contrast the reactivity of lithium and sodium according to periodic trends. They also found it difficult to explain why some computers heat up when they are charged using their understanding of the behaviour of electrons.

Question 2: Candidates were able to suggest a reason why voltage should be stepped down before it enters a house. They also were able to select the correct formula from the formula sheet provided and calculate the turn ratio of the transformer. Candidates found it difficult to suggest a reason why it is not recommended to use a different charger when charging a cell phone.

Question 3: Candidates were able to state the maximum capacity of each cell phone battery using the graph provided. Candidates appeared to struggle with calculations regarding the resistance of the cell phone with the appropriate units. Candidates also found it difficult to perform multi-step calculations to find the reduction in the number of hours using information from previous answers.

Question 4: Most of the candidates performed very well within this question. They were able to follow the prompts given and could design a complete and safe method according to the context provided. They were able to identify the independent, dependent and control variables, explain how to collect sufficient data, give a complete description of the method and in some cases a detailed explanation of the method; also most of them could state a relevant safety consideration. Nevertheless, some of the candidates struggled with the identification of additional equipment and with giving a proper justification. Many candidates could not get full marks when discussing the validity of the hypothesis, as they did not support their statements using the data from the graph. Candidates also found it difficult to suggest one improvement and one extension with justifications for each one of them.

Question 5: Most of the candidates performed very well within this question. They were able to formulate a research question according to the information provided and to calculate the

average time for the race giving an appropriate number of significant figures. Some candidates struggled with the selection of the appropriate graph to represent the data. Also, some candidates found it difficult to identify limitations of the method and possible improvements.

Question 6: In general, most candidates did very well in this question. However, question 6b seemed to be very challenging in some cases as they could not outline and justify the effect of increasing the land area of an island on the potential interactions. A few candidates also struggled with the organization of a food web.

Question 7: Candidates seem to be very well prepared to answer longer response questions. It was clear to the examining team that the prompts provided in the question proved to be a good help for candidates. Many candidates demonstrated excellent critical thinking and communication skills. Candidates were familiar with discussing and evaluating the impacts of science considering economic and environmental implications.

Recommendations and guidance for the teaching of future candidates

Teachers should focus on the use of command terms and their specific meaning.

Candidates should continue designing and developing their own investigations following specific protocols according to science objectives. Candidates should be able to write a complete method according to the information provided.

Candidates should be capable of differentiating between dependent, independent and control variables when designing an investigation. Also, they should be able to justify their selection, include values and ways to obtain relevant quantitative data.

Candidates should practice developing improvements and extensions for investigations. Improvements should relate to the method, for example increasing the range of independent variable or adding more trial to obtain an average and extensions should change or provide an additional independent or dependent variable to the study.

Candidates should be aware of how to perform basic calculations after selecting formulas from the formula sheet provided.

Candidates should practice writing structured extended responses following prompts given. Candidates also need to be aware of the importance of the correct use of scientific terminology.

Candidates need to be familiar with the use of media resources and stimulus material (interactive tools, videos, graphics, images, others). It is highly recommended to use familiarization material provided by the IB to enhance candidate´s preparation for the exam.