



PSAC 2019

Grade 6 Modular Science

Subject code: **P141/2**

Examiners' Report

INTRODUCTION

The 2019 PSAC Grade 6 modular assessment in Science was based on the content and skills given in the MIE Teaching & Learning Syllabus (2015). The assessment objectives of the paper are given in the Annual Programme PSAC (2019) which are as follows:

Knowledge with Understanding

Learners should be able to demonstrate knowledge with understanding in relation to the following:

- scientific facts, concepts, processes and phenomena;
- basic scientific vocabulary and terms linked to the topics being assessed;
- basic scientific instruments and experimental techniques and
- basic safety measures and precautions.

Application

Learners should be able to:

- apply their knowledge to everyday life situations;
- use and interpret simple numerical and other forms of data.

Inquiry Skills

Learners should be able to demonstrate the acquisition of inquiry skills in relation to the following:

- looking for relevant information;
- following instructions;
- observing and reporting on given contexts, situations and diagrams;
- grouping and classifying living and non-living things according to their characteristics, properties, similarities or differences and uses;
- using information to identify patterns, report trends and draw inferences;
- presenting reasoned explanations based on knowledge acquired for phenomena, patterns and relationships;
- reporting and communicating findings in a scientific manner;
- planning and designing a simple scientific experiment;
- making simple predictions and hypotheses;
- evaluating solutions to a given problem and
- supporting ideas with appropriate justifications and evidence.

The weighting given to each of the different assessment objectives is given in Table 1.

Table 1: Weighting of the Assessment Objectives

| Assessment Objectives | Weighting % |
|---------------------------|-------------|
| Knowledge & Understanding | 40 |
| Application | 40 |
| Inquiry Skills | 20 |

Moreover, importance is also given to the development of the right attitudes and values which, *inter alia*, include the following:

- drawing conclusions and explanations with respect to the evidence shown or gathered;
- demonstrating knowledge on the importance of preserving the environment and respecting and caring for animals and living things in general and
- demonstrating a knowledge of safety precautions that need to be observed.

ITEM ANALYSIS

This report is mainly based on the item analysis of a representative sample of scripts, with consideration given to reports of markers involved in the marking process and observations made during the marking. The performance in each item has been analysed and qualitative information is given.

GENERAL COMMENTS

74.71% of candidates who sat for the assessment for the first time achieved numerical grade 5 or better in Science in 2019 as compared to 76.56% in 2018. This shows a slight decrease in the overall performance. It also indicates that about 3750 pupils did not achieve the minimum grade at their first sitting. The

mean mark for the paper was around 29 out of a maximum of 50.

Throughout the paper, one mark is allocated to each correct element of answer except for a few items where 2 marks are allocated. For these items, the responses expected would need to contain a certain element of precision or elaboration, with the possibility of candidates scoring a lower weighting.

This report highlights the areas of difficulties of pupils in view of improving performance in subsequent PSAC assessment sessions. It should however be understood that there was also ample evidence of a high level of achievement, both in terms of knowledge content and application of this knowledge from the scripts of a significant number of candidates.

Figure 1 gives the distribution of marks on a 10 mark interval based on the sample of scripts used for the quantitative analysis in this report.

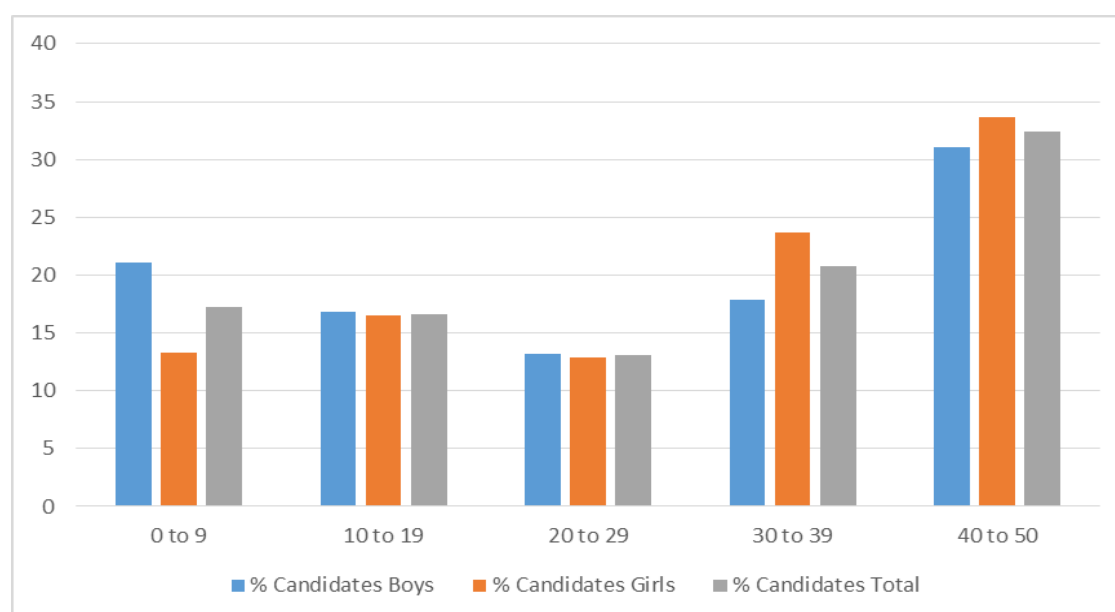


Figure 1: Performance of Boys, Girls and all candidates from the sample

From Figure 1, it can be seen that at the lower end, there is a significant difference in the performance between boys and girls, with about 8% of girls outperforming boys. At the higher end, the difference is much lower with only about 2.6% of girls faring better than boys. As in the previous years, the

performance shows that more boys are struggling to achieve the minimum grade. The reasons for this are numerous and could range from biological factors to social interactions. However, the results should trigger a rethinking of the different ways to raise the interest of boys in Science. One possible reason for this poor performance is the language barrier; in the understanding but mostly in writing. In the PSAC Science assessment, grammatical mistakes and the use of poor English are not penalised as long as the meaning of the responses is not in doubt. However, the scripts showed that some candidates did not have the adequate linguistic ability to produce any writing at all and could only respond to some of the objective-type items.

While objective-type items, like multiple-choice questions, matching and true or false items have a number of advantages, they also have a number of limitations. These include the following:

- guessing is possible, thus there is the possibility of a candidate getting the mark for an item when he/she does not know the answer.
- candidates have a limited ability to express their own ideas, to demonstrate the depth of their understanding and to show any creativity in their responses.

However, bearing in mind that pupils often have difficulty in expressing themselves in writing, the Science paper contains a number of objective-type items or items where only a one-word answer is required. In fact, the total number of marks for such items was about 25 in the 2019 paper, which is half of the total marks.

SPECIFIC COMMENTS

The following gives the specific findings on each item from the assessment paper.

QUESTION 1 (5 marks)

This question consisted of 5 multiple choice items covering different topics in the syllabus.

The mean mark on this question was 3.96.

Item 1 *Which one of the following gases is used as a fire extinguisher?*

This item assessed the knowledge of candidates on the different uses and importance of gases, more particularly here, of that of carbon dioxide. It was found to be the most challenging one among the multiple choice items with more than a quarter of candidates not getting the correct answer. Oxygen was a popular wrong answer given by candidates.

Pupils have difficulty in distinguishing the functions and the importance of oxygen and carbon dioxide to plants and to humans. There are number of different concepts which are involved. These include breathing (and or respiration), photosynthesis, combustion and extinguishing (fire). Pupils often confuse these different processes and more attention should be given to ensure that the right understanding has been acquired.

Item 2 *How many teeth are there in a set of permanent teeth in human adults?*

A significant number of candidates obtained the correct answer, D - 32. In fact this item was found to be the easiest one in this question.

Item 3 *What is the percentage of oxygen gas in the atmosphere?*

Most candidates found the correct answer, that is, 21%. However, just like for item 1, there were some – about 9% of candidates – who opted for option B – 0.03%. This suggests that the confusion between oxygen and carbon dioxide gas may be on several levels. It may be worth spending some time with pupils to

ensure that they understand the difference between these two gases. Some of the areas or concepts that are linked with these two gases are:

- Composition of air in the atmosphere
- Burning/Combustion and extinguishing fire
- Pollution and global warming
- Existence of life on planet Earth

Item 4 *Which one of the following materials is obtained from an animal?*

About a quarter of the candidates did not answer this question correctly. A common wrong answer was cotton. Knowledge of different sources of natural materials is commonly assessed in the Science paper and is often set as an objective-type question, making it relatively easy for candidates to score.

The use of pictures to illustrate the different sources of materials can help pupils to better retain the information.

Item 5 *Which one of the following is a characteristic of birds?*

This item proved to be relatively easy for pupils with the majority getting the correct answer. Wrong answers were equally distributed among the distractors given.

QUESTION 2 (8 marks)

This question was on the topic 'Animals'. The mean mark in this question was around 5.4 out of 8 which suggests that it was relatively well tackled by candidates. The type of questions set in this item was mainly fixed-item responses for a total of 7 marks. For candidates with language difficulties, especially at the level of writing, this question was relatively accessible to them, except for part (c) where a short response was expected.

Part (a) (3 marks)

This item was a matching-type where candidates had to match the food items given in column A to their corresponding functions. Most pupils performed this item correctly. However, there was about 20% who did not score full marks on this question.

Part (b) (4 marks)

Candidates were required to fill in a table. They had to give two food items that carnivores and omnivores consume. Though this item required the production of only a one-word answer for each mark allocated, some candidates found it challenging. Only about a quarter of the population of candidates scored full marks.

Pupils should be encouraged to differentiate between the diets of the different types of animals, namely those of herbivores, carnivores, omnivores, etc. To differentiate between an herbivore and an omnivore, for instance, it should be pointed out that both consume plant-based food but that only omnivores eat animal-based food as well. This activity can be linked to the types of teeth that the animals have and how their dentition is linked to their diet. Encouraging a deeper learning of concepts can help pupils to better remember as they would have developed an understanding of the concept and not retained facts only superficially.

Part (c) (1 mark)

Animals can be classified according to their diets. Give another characteristic that can be used to classify animals.

Pupils were expected to produce a short phrase as answer. Possible correct answers included; the place where they live or their habitats, their body cover and the way they reproduce. Many candidates responded by giving a one-word answer which sometimes did not convey their meaning accurately enough.

Classification is one of the important skills to develop in Science. Pupils can be encouraged to develop this specific skill by classifying different living and/or non

living things according to different characteristics. It is important to point out that different groups will be generated depending on the characteristic being used for the classification. For instance, living things can be classified according to their habitats, diets, body cover, mode of reproduction, the way they move etc... Non-living things can also be classified, for example, materials can be classified into natural or man-made or whether they are from plants or from animals. They can also be classified as conductors or insulators or electricity for example.

QUESTION 3 (11 marks)

This question was mainly on the topic Earth, Moon and Sun. The mean mark was 6 which suggests that it was found to be rather challenging for a number of candidates. This can be attributed to the fact that this question contained 7 items where candidates had to produce an answer on their own.

There is definitely a language barrier for some students when it comes to open-ended questions. In many cases, the language barrier is at the level of the production of writing while reading with understanding is acquired. These students can attempt some of the objective-types questions where candidates are expected to choose from options already given. However, as stated earlier, those types of questions have limited possibilities in assessing all the assessment objectives. In open-ended questions, students have the possibility of demonstrating their own thinking or expressing their own ideas.

Part (a)

Part (a) comprised 4 fill-in-the-blank items. They were direct knowledge items where candidates fared relatively well. The only item which was found to be somehow more difficult was item (ii): *The _____ is a natural satellite.*

It is to be noted that for such fill-in-the-blanks items, more words are given in the list than the number of blanks. This is in line with sound item-writing principles. If the candidate does not know the answer to one of the items, he/she may give a wrong response only for this item. If the same number of words is given as the

number of blanks, automatically, a wrong response will lead to a second wrong response within the question. The same principle applies to questions such as matching-type as well.

Part (b)

Which movement of the Earth takes a year to be completed?

A significant number of candidates were unable to give the correct answer, that is, the movement of the Earth around the sun.

Part (c)

Give one reason why life is possible on Earth.

As opposed to the previous part, more candidates were able to attempt this item, though it is testing a concept requiring a higher level of understanding than the previous item which is a knowledge item. The difference in performance in these two items raises the question of whether pupils have acquired a real understanding of the different facts and concepts or whether they are facing a difficulty in understanding the questions.

It is to be noted that some candidates provided some very good and accurate responses, explaining in detail how the processes of respiration and photosynthesis and the presence of water sustain life on Earth.

Part (d)

(i) What is global warming?

Responses including the idea of an abnormal increase in temperature on the Earth's surface were correct. The importance of the word 'abnormal' or any word having the same meaning is to be stressed upon here. For instance, there is a raise in temperature from winter to summer but this is a normal rise as opposed to the rise in temperature during global warming.

Some candidates gave the cause or the consequences of global warming

rather than the description of the phenomenon, thus highlighting the importance of reading the question very carefully before giving an answer.

(ii) Give one cause of global warming.

More candidates gave the correct answer to this part than to the previous one. Many were able to explain the causes of global warming resulting from air pollution arising from the burning of fossil fuels mainly.

(iii) Give one effect of global warming on Earth.

Candidates fared relatively well on this item. There were different possible correct answers which included the increase in sea level and its consequences, people suffering from extreme heat waves or extreme climatic conditions such as violent cyclones or droughts.

Part (e)

Give one reason why it is important to use such a practice for the disposal of waste.

Candidates had some difficulty to express themselves. Ideas about the reduction of pollution or to facilitate recycling of materials were expected here.

Part (f)

Give one useful way of disposing of waste from plants.

Candidates attempted this item relatively well. The main idea was the making of compost from the waste from plants. Some candidates also gave the idea of making decorative objects which is correct as well. There was a significant number of candidates who wrote only the word 'compost' as answer. Though this answer was accepted, pupils need to be encouraged to reply to such questions in at least a short phrase to be sure that they convey the correct meaning in their responses.

QUESTION 4 (8 marks)

This question was on energy. Candidates scored a mean mark of 3.8

Part (a)

This item was a knowledge-based one on a hydro power station. It was relatively well attempted by candidates.

Part (b)

What is meant by renewable and non-renewable sources of energy?

Many candidates gave the correct meaning of renewable and non-renewable, that is, a renewable source of energy will not run out whereas the non-renewable source will run out one day.

It is important to remind pupils about the different concepts when teaching about sources of energy. There is the concept of renewable and non-renewable energy. There is a different concept of polluting and non-polluting sources. There is also a different concept when we are teaching about the costs of the different sources of energy.

Part (c)

From Diagram 2, name one source of renewable and one source of non-renewable energy.

As often pointed out in previous reports, pupils consider bagasse as a non-renewable source of energy and this was the main source of error. Despite having given the correct definition of renewable and non-renewable sources of energy in the previous items, some candidates gave the wrong answer to this part. This mistake suggests that some pupils may know the definitions but do not really understand what they means. It may be worth quizzing pupils on different sources to ensure that they have understood the concepts properly. Using examples which are for instance both polluting and renewable such as charcoal or bagasse can give a better idea as to whether pupils have really understood these different terms.

Part (d)

The Government of Mauritius encourages the use of renewable energy. Give two ways in which this is beneficial to Mauritius.

The two main ideas were to reduce air pollution and to cut down costs on the import of fossil fuels.

For this item, candidates were expected to demonstrate their reasoning and understanding. They had to produce at least a phrase or a sentence for each way and this posed some difficulties to some. Only about a quarter of the number of candidates scored full marks on this item.

QUESTION 5 (9 marks)

The topic of Materials was assessed in this question. The mean mark for this question was 5.3.

Part (a)

It was based on an experiment on the water permeability of different materials. The amount of time for water to pass through each material was recorded.

(i) Which one of the above materials is the most permeable to water?

Candidates were expected to read the data recorded in the table. They were not expected to know about the permeability of these materials but to provide an answer based on the information given. Such questions illustrate the importance of reading and understanding all the information properly as well as studying all the data or diagrams given, before attempting to give an answer.

(ii) Which one of the above materials is most appropriate to make a raincoat?

Explain your answer.

This item was relatively well attempted by candidates. Many found the correct answer 'plastic' to the first part. Though a bit more difficult, many candidates

were also able to explain that plastic is suitable to make raincoat as it is impermeable or it does not allow water to pass through it.

Part (b)

This part was on materials proposed to build a kennel. Candidates had to give their advantages and disadvantages.

(i) Candidates had to fill in a table to give the advantages and the disadvantages of the different materials.

About a quarter of the number of candidates scored all the marks for this item. However, many were able to get partial marks as well. For this type of question, it is important to remind pupils to give characteristics or properties of the materials which are unique or specific to them as well as to take into consideration the use being made of the material. The properties of the material should be suitable for the use being made of it.

Pupils should be discouraged to give properties which are quite general and subjective, for instance, the cost of the material. In this item, for example, a candidate who gives 'it is cheap' for the three materials does not demonstrate a real understanding of the properties of the different materials.

(ii) Give one way in which the rusting of iron can be prevented.

A large number of candidates got the correct answer. A range of possible ways to prevent rusting was obtained, for instance, painting, galvanising, oiling or coating with a layer of plastic.

QUESTION 6 (9 marks)

This question was partly on the topic of Ecosystems. The mean mark was 3.9.

Part (a)

Candidates had to fill in boxes to show the dependence of different living and non-living things in a garden where lettuce plants are grown. Many obtained the

correct answer, that is, the snail depends on the lettuce which in turn depends on the sun to grow.

Part (b)

*Apart from the sun, name another **non-living** thing shown in **Diagram 5** upon which the lettuce plants depend.*

In this item, both the words 'non-living' and 'Diagram 5' were in bold. This was done to attract draw the attention of candidates to these important elements of the question and to guide them to the correct answer. While many gave the correct answer 'soil', a number of other candidates gave other non-living things which are important to plants but are not shown in the Diagram, for instance, water. Such answers could not be accepted in the context of this question.

It is worth reminding pupils to pay particular attention to words given in bold in the question paper. This is done to guide them on the right direction when giving answers.

Part (c)

- (i) Name the process by which the leaves of the lettuce plant manufacture its food.*

Most candidates found the correct answer 'Photosynthesis'. However, writing the word correctly remains problematic.

- (ii) Describe the process you have named in (c)(i).*

This item carried 2 marks. Candidates could thus score a partial mark as well. Few candidates were able to describe the process of photosynthesis in full. They needed to include the elements of water and carbon-dioxide, in the presence of sunlight and chlorophyll and with oxygen as the output. There were a few outstanding answers where candidates explained the process of

taking water through the roots, the exchange of gases through the pores of leaves etc. Though this level of detail is not expected, it was appreciated by the examiners.

Part (d)

Briefly describe a forest ecosystem.

This was the only other item in the question paper which carried 2 marks with the possibility of scoring a partial mark. Candidates had difficulty in describing a forest ecosystem. The correct answer should have included the inter-dependence of living and non-living things living in the same space.

Part (e)

(i) Give one way how the air pollution caused by the stone crusher affects the trees in the forest shown in Diagram 6.

Given that the item carried only 1 mark, candidates who wrote that they will affect the process of photosynthesis or the manufacturing of food in plants without describing how were given the mark. However, some candidates described how the process of photosynthesis will be affected by the deposit of dust on the leaves which will block the pores thus preventing gas exchange or blocking sunlight. For questions where the word 'how' is used, care should be taken to ensure that all the elements required are present in the response. As such, it is recommended that pupils be encouraged to write down the full responses to such types of question to ensure that they do not score only partial marks in the assessment should the item carry more than 1 mark.

(ii) People have decided to clear the forest completely. Give one harmful consequence this will have on the environment.

Expected answers were mainly related to the ideas of soil erosion or loss of habitats and biodiversity (though the use of this term is not expected). Some candidates also gave as answer that we will not get oxygen. Care must be taken when providing such answers as the clearing of a forest will not result in

the absence of oxygen in the atmosphere. Examples of clearing of forests in different countries, for example, in Brazil can be given to pupils. It can be explained that despite the massive forests clearing happening there, people are still living near this area and thus they can still breathe in oxygen. Such concepts can be related to the percentage of the different gases in the atmosphere to show the magnitude of any impact required to bring about a change in the balance of gases.

CONCLUSION

Educators are encouraged to read through previous years' reports as well to get a more comprehensive overview of examiners' expectations and the strengths and weaknesses of pupils on different topics and different types of questions. The attention of Educators is drawn to the weighting of the different assessment objectives in the science paper. Pupils have to be taught not only the content which more likely will be assessed directly under knowledge but also the application of the content they are learning and the development of scientific skills such as the sense of observation, drawing, interpretation etc.

Questions set on the assessment objective 'application' may require more information about the real and in-depth understanding of concepts. They might also help to identify any misconception. Educators are thus encouraged to set such types of questions as well during classroom activities.

The PSAC assessment in Science is based on the Teaching and Learning Syllabus of Science. As such, the development of Inquiry skills and the acquisition of the right attitudes and values as given in the syllabus are as important as the understanding of content.

The attention of Educators is also drawn to the learning objectives given in the syllabus where a higher level of understanding is required, for instance,

'demonstrate an understanding of the forest and lagoon ecosystems', 'infer how plants help to maintain the composition of air' or 'relate the properties of materials to their common uses'. In these cases, it is not only the knowledge of the concepts which is required but pupils are expected to be able to demonstrate this knowledge through the application of their understanding to new situations. It is not about reproducing what has been learnt in the textbook but rather the application of what the pupils have learnt.

Similarly, pupils are expected to carry out hands-on activities or to learn through demonstration and investigation learning objectives where there is an emphasis on inquiry skills; for example, 'investigate air pressure and communicate findings', 'investigate the rusting of iron and communicate findings' or 'investigate photosynthesis'.