# PSAC 2018

## Grade 5 Modular Science

Subject code: **P141/1**

Examiners' Report

Mauritius Examinations Syndicate
March 2019

# INTRODUCTION

The introduction of the Nine Year Continuous Basic Education (NYCBE) educational reform required that assessment for Science be reviewed at primary level. The Primary School Achievement Certificate (PSAC) assessment for Science became modular in 2017. Whilst evaluation of 'knowledge and understanding' remains a core component of the assessment, the paper design lays much emphasis on assessing application and scientific inquiry skills, as elaborated in the National Curriculum Framework (MIE, 2015).

The table below shows the weighting of the different assessment objectives within the Science assessment paper, as described in the Annual Programme for PSAC 2018.

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

The assessment for Science is split into two parts/modules, with each part carrying 50% of the total marks. Candidates take the first part of the assessment at the end of Grade 5 based on the Grade 5 syllabus. The second part of the assessment is taken towards the end of Grade 6 and is based on the Grade 6 syllabus mainly.

This report provides general comments, key comments, a quantitative analysis of items on the assessment paper, and proposes recommendations. The item analysis is based on a representative sample of scripts of learners across the ability spectrum. Each item has been analysed statistically to better understand how candidates fared. The general and key comments are principally based on reports of markers as well as observations made during the marking exercise.

## KEY MESSAGES

- Candidates need to read questions carefully in order to understand what exactly is being asked.

- Many candidates need to be encouraged to write down the answers to open-ended questions such as **Question 5(d)** and **Question 6(c)(d)**. The mark allocation is an indication on how detailed the answer need to be.

- Candidates should be encouraged to write correctly. This will help them in conveying their answers accurately and clearly.

- Candidates should pay attention to the word "*observation"*, which refers to what one sees.

## GENERAL COMMENTS

Many candidates performed well in the Science Grade 5 paper, showing that the basic knowledge of topics covered in Grade 5 was acquired. There were some questions which were left unanswered by students. These included **Question 5(d)** and **Question 6(c)(d)**. Questions omitted were principally open-ended questions, which were of a higher order.

A significant number of items in the paper were objective-type questions, requiring one-word answers. Whilst these questions generally required that candidates recall key concepts learnt, candidates were also called upon to show application skills and reasoning for the objective-type items. Items based on knowledge and understanding were tackled well by the majority of candidates. However, many candidates struggled with items assessing application and scientific inquiry.

The learning process and assessment are intrinsically linked. The new curriculum, upon which this assessment is based, is guided by the philosophy of developing 21$^{st}$ Century skills. Hence, some basic critical thinking skills need to be developed to enable learners to adapt the knowledge and skills acquired in their Science lessons to real-life situations. It is expected that pupils learning

Science at Grade 5 develop the ability to interpret and evaluate information as well as make predictions and deductions as well as recalling factual scientific content.

There is a need to have more focus on the development of inquiry skills, which can be better acquired through hands-on experiments. Although testing this particular skill on paper can be challenging, the items in the Grade 5 Science paper allowed for an evaluation of how far the learner has been exposed to carrying out experiments and also the extent to which the learner has been working in a scientific manner.

The ability to communicate is also one of the 21st century skills required of learners at all levels. One of the key communication skills in Science is drawing. It was found that the drawing aspect posed difficulty to many candidates. It is important to note that other important communication skills in Science include presenting information in tabular form, and drawing or interpreting graphs to identify patterns and trends.

Questions in the assessment paper were designed with a view to promote the development of the skills as per the new curriculum and to have a general positive washback in classroom.

The sections that follow provide comments on the individual items in the Science assessment paper of Grade 5.

## Question 1 (5 marks)

Question 1 consisted of 5 multiple-choice questions. Most candidates attempted all parts of this question.

| *Item Number* | *Key* |
|---|---|
| 1 | **C** |
| 2 | **A** |
| 3 | **A** |
| 4 | **B** |
| 5 | **D** |

The questions were generally well tackled by most candidates. A significant number of candidates obtained the right answer for the different items. **Item 3** proved to be more challenging than the other questions.

**Comments of specific items**

**Item 1** is a question related to the properties of ice. A common wrong answer was **D**. Candidates could identify one of the properties of ice as being cold, but did not take into account the purpose for which it is being used, that is, skiing. Questions on properties of different materials or elements are often linked to their specific uses. It is thus worth making the link between properties or characteristics with uses thus allowing learners to apply their knowledge to everyday situations.

**Item 2** was on relating a part of a flower to its function. Pupils at this level learn explicitly about the functions of the male and female parts of a plant. The distractors petals and leaf did not seem to pose much difficulty for most candidates. However, a significant number of candidates gave option B, 'Male part' as an answer. Given that a high number of candidates scoring more than the average total marks of the paper gave option B, one possible reason is that they did not read the question carefully and directly associated pollen to the male part of the flower.

**Item 3** was a knowledge-based item with most candidates from the higher ability groups arriving at the correct answer. However, it was wrongly attempted by a significant number of pupils from lower ability groups. Pupils learn about the different land habitats and the plants that grow best in those habitats. While option B was ignored by almost all candidates, candidates opted mostly equally for 'Fern' and 'Papaya'. Given that this is an item where candidates had to recall the information, the possible reason for the wrong answer is that it has not been learnt or remembered.

Learner could be helped to remember these concepts if the characteristics of the plants and how they help each plant adapt to its specific environment were explained.

**Item 4** was about the main agricultural use of a cultivated plant. Although a significant number of candidates chose the correct answer, an equal number of candidates selected options C and D, indicating that candidates were unsure of the correct answer. The low percentage of candidates opting for option A showed that it is common knowledge among pupils that tea plant is not cultivated for its stem.

Having visual pictures of different plants can help learners to remember how they are used. For instance a visual picture of a beetroot being harvested from the soil or tea leaves being plucked can help learners.

**Item 5** was on energy transformation and proved to be within the reach of the majority of candidates. The diagram given provided the necessary clue for the first part of the answer. The diagram showed a washing machine connected to a main switch. This item encouraged candidates to show understanding of the different forms of energy, but also to identify the form of energy provided by a main switch as well as identify the transformation in a washing machine.

## QUESTION 2 (10 MARKS)

Question 2 was based on the topics energy and electricity. 6 out of 10 marks were obtained for one-word answers, which assessed both knowledge with understanding and application skills. Most items carried 1 mark. A significant number of candidates had difficulty with the 'completing circuit' item. Since most of the items required Very Short Answers (VSA), candidates fared generally well in this question, with a significant number of them achieving 5 out of 10.

**Comments of specific items**

**Part (a) (2 marks)**

In part (a), candidates were required to identify whether the circuit shown in the diagram was open or closed. They were also required to give an explanation for their answer. The majority of candidates recognized that it was an open circuit. Some candidates, however, found it more difficult to provide and explanation to their answer. The expected answer had to contain the idea

of the wire not touching the positive end of the dry cell. Some candidates responded in simpler terms and gave answers such as ‘because there is a gap in the circuit’ which was also considered acceptable.

**Part (b) (2 marks)**

In Part (b) (i), candidates were required to state whether the circuit would be closed or open if loose ends of a wire were connected to the oppositely charged terminals of the dry cell. Most candidates were able to find the correct answer ‘closed circuit’. The more able candidates could easily provide an explanation for part (b)(ii). Some candidates instead of giving ‘closed’ or ‘open’ as answer gave ‘yes’ or ‘no’ which could not be accepted. As for the previous part, some lower ability students struggled to give an explanation to their answer to the first part. Some candidates took the words from the stem of the question to provide their answer and if the expressed themselves clearly, they scored the mark.

**Part (c) (3 marks)**

Part (c) (i) was a knowledge-based question. The most common correct answer obtained was ‘bulb’, which was a correct answer. Other acceptable answers were small ‘electric motor’, ‘small electric fan’, ‘small bell’ or ‘buzzer’. There were very few correct answers besides the answer ‘bulb’. This suggests that pupils are probably less exposed to experiments on transformation of electrical energy to movement energy.

It is worth noting that many candidates mentioned ‘wire’ as answer to part(c)(i) as component and consequently just drew a wire connecting the positive terminal to the loose end of the wire connected to the negative terminal of the dry cell in part (c)(ii). A number of candidates also gave ‘nail’ and ‘metal ruler’ as answer. Educators are encouraged to lay emphasis on the identification of components required to complete a circuit. While it is true that a wire would complete the circuit in the drawing, this will not show that electricity is flowing.

Another common wrong answer was ‘switch’. There have often been questions in the past requesting candidates to give a component which would control the flow of electricity.

In part (c)(ii), candidates were required to complete the circuit by drawing the component mentioned in part (c)(i). Many candidates achieved lower weightage mark in this question as they could connect wires leaving no gaps to show a complete circuit, yet omitted the component which shows that electricity is flowing. A recurrent mistake made by those who included a bulb in the drawing was the wrong connection of wires where end of wires were touching each other on the component. Pupils should be encouraged to pay particular attention to such details when they are producing scientific drawings. It is therefore advisable for educators to lay emphasis on developing drawing skills in Science lessons since drawing is an important scientific/communication skill to be acquired by pupils at Grade 5 level and eventually Grade 6 level.

It is to be noted that the answer given to part (c) (i) was taken into consideration when marking part (ii). If candidates for instance gave switch to part (i) they did not lose the mark again to part (ii) if they had drawn a switch with the wires properly connected.

**Part (d) (2 marks)**

This part was a fill-in-the-blank type of question aimed at assessing the knowledge of candidates about forms of energy and energy transformation. Part (d) was related to part (c)(i) as one of the answers was related to the component the candidates mentioned in part (c)(i). The question was about the main energy transformation taking place in the completed circuit, including the added component from part (c)(i). Most candidates could identify chemical energy as the form of energy contained in the dry cell. The expected answers for the form of energy in the component were heat/light/sound/movement depending on the component mentioned in part (c)(i). This item proved to be relatively easy for many candidates although it posed some difficulty for the low-ability candidates.

**Part (e) (1 mark)**

The answer for this part was ‘a switch’, which many candidates found. However, there was a lot of spelling mistakes.

## QUESTION 3 (11 MARKS)

Question 3 was on the functions of different parts of a plant, soil erosion and pollution of water habitats. This question was one of the best answered questions on the whole Question Paper. Very short-answer (VSA) items could easily be attempted by the average and more able candidates. Open-ended questions proved rather challenging to many candidates, scoring lower weightage marks instead of full marks. The mean mark for this question was 5.4.

**Part (a) (4 marks)**

Part (a) required candidates to match different parts of a plant to their respective functions in the plant. It seems that this part of the syllabus generally does not pose much difficulty to candidates as they have been exposed to the unit 'Plant' since Grade 4. It is important, however, to point out that candidates should draw matching lines clearly such that each pairing is unambiguous. Some candidates, who were uncertain about their answers, drew lines from all items under part of a plant and connected them to a central point and thereafter, drew lines to the function list. This type of matching was not acceptable and it would be advisable that learners be discouraged from doing this.

**Part (b) (3 marks)**

This part focused on three fill-in-the-blank items on soil erosion. Candidates generally performed well on this item. They were required to recall fact-based knowledge. Part (b)(i) was successfully completed by a majority of candidates, who identified 'rain/rainfall' as the correct answer. Part (b)(ii) allowed for a wider range of answers which included 'arid', 'bare', 'barren', 'rocky' and 'infertile'. This part proved to be the most challenging of the three items, but was well answered by the more able candidates. Part (b)(iii) was somewhat challenging to the less able candidates, who mentioned sea instead of river. These pupils did not realise that the sea has no 'mouth' and that the only acceptable answer was river.

**Part (c) (2 marks)**

Part (c) was an open-ended question. Most candidates showed understanding of the functions of mangroves by referring to their roots. However, they only scored partial marks. One part of the answer required that candidates mentioned roots holding the sand and in the second part of the answer, candidates had to mention preventing soil erosion/ eroded by action of strong waves. Some candidates produced elaborate answers showing adequate understanding of the concept of soil erosion.

**Part (d) (2 marks)**

This part required that candidates apply their knowledge and understanding of the effects of oil spill on water bodies. Many able candidates suggested that the oil will cover the green plants and prevent them from manufacturing their food; others mentioned that oil will kill the aquatic organisms due to lack of food or lack of movement of wings and fins. A few candidates obtained full credit for this question. The lower-weightage answers came mainly from those pupils who showed understanding of oil causing pollution, but who could not relate it to destruction of water habitat.

## QUESTION 4 (8 MARKS)

This question was based on the water cycle, hydroelectricity and energy transformation. Candidates performed relatively well on this question. Most of the items required a one word-answer. The mean mark achieved on this question was 3.5.

**Part (a) (4 marks)**

In part (a), candidates were required to state both the form and the source of energy. A few candidates had difficulty to differentiate between the keywords ‘source’ and ‘form’. Part (a) (iii) was a fill-in-the-blanks item. Candidates were required to demonstrate knowledge of the water cycle. A common answer for the first part in part(iii) was “decreased/decreasing” instead of cool/low or cold. This was accepted as a correct answer since it conveyed the idea that a fall in

temperature would make the temperature cooler. In the second part of the answer, candidates were expected to write the word ‘ice’.

**Part (b) (3 marks)**

Many candidates fared well on the item, which was on energy transformation. Candidates could identify the energy of falling water as movement energy which is converted into electrical energy in hydroelectric power stations. In part (b)(ii), candidates were expected to say that copper is a good electrical conductor. A less frequent but incorrect answer was ‘Copper is a metal’. Although it is true that metal would conduct electricity, the candidate was expected to mention the electrical property of metal rather than just stating that copper is a metal.

**Part (c) (1 mark)**

Part (c) was a knowledge-based question. Candidates had to state the main source of energy used to run vehicles. The expected answer was fossil fuels. ‘Wood’ or ‘bagasse’ were not accepted as correct answers.

## QUESTION 5 (9 MARKS)

Question 5 focused on endemic animals and the importance of conserving them. All the three assessment objectives were covered in this question. The average mark scored was 3.2. Items based on knowledge were relatively well tackled, but those assessing higher-order skills proved to be quite challenging.

**Part (a) (1 mark)**

In part (a), candidates were expected to write the term ‘extinct’, which seemed to be a familiar term to many. Although there were spelling mistakes, they were not penalised if the meaning was not in doubt. However, sometimes the words extinct and exotic could not be distinguished and candidates did not score any mark. Answers such as ‘unique’ were not accepted as correct answers.

It is important that Educators encourage pupils to use scientific terminologies correctly, without spelling mistakes.

**Part (b) (2 marks)**

In this part, candidates were asked to suggest one way how the saddle-backed tortoise shown in the diagram was adapted to live in its habitat. Candidates were expected to mention its long neck which allowed the tortoise to reach leaves high up on plants. Many also made reference to a "long head" instead of "long neck". It is important to point out that for this item, candidates were required to analyse a drawing, which visibly showed the animal with an elongated neck.

When learning about adaptation of animals or plants to their habitats, learners have to develop their thinking skills and understand how and why the organisms are adapted. Organisms they encounter in their everyday life can be used as examples and not only those given in the textbooks. Examples such as seagrasses or some endemic plants can be given and learners encouraged to discuss how they are adapted to live in the sea or on mountains or in arid areas for instance.

**Part (c) (1 mark)**

Part (c) required a one-word answer. The expected correct answer was 'exotic' which was obtained by a significant number of candidates. As in part (a), some candidates had difficulty in giving the correct spelling of the word.

**Part (d) (5 marks)**

This item was based on the assessment objective 'application' mainly. Part (i) required candidates to give one way how the forests of Mauritius are a suitable habitat for the Pink Pigeon. Expected answers included:

- forests provide shelter from predators
- forests provide a source of food
- forests are protected from deforestation, thus protecting the habitat of the Pink Pigeon.

Some candidates could not find the correct answer. A few candidates had lower-weightage mark which was given for partial answers such 'the forest is protected' and 'the government passed laws'.

Part (ii) was an open-ended question. Candidates were expected to state how the Pink Pigeon can be protected. Equal number of candidates achieved correct and incorrect answers. Some correct answers were 'protect the habitats', 'pass laws to stop their killing', 'rear in captivity'.

A vast majority of candidates struggled with part (iii). Candidates were required to explain the importance of protecting the Pink Pigeon. Only a small number of candidates could provide the correct answer which included 'so that they do not become extinct'. Other similar answers, related to the extinction or disappearance from the surface of the earth were also awarded full marks. A few interesting answers given by candidates contained the idea of preserving the ecosystem for future generations. Answers such as 'it is a beautiful bird' were incorrect.

## QUESTION 6 (7 MARKS)

This question principally assessed scientific inquiry skills. Candidates were required to look for relevant information, design an experiment and make simple predictions. Candidates had some difficulties with this question.

**Part (a) (2 marks)**

Three statements related to how the first coconut tree grew were given. In part (a)(i), candidates were asked which statement was the correct one. Although it was a straight-forward question, a majority could not identify Asha's statement as the correct one. Candidates were expected to know that plants usually grow from seeds and not leaves. Those who correctly answered part (a)(i) could provide a correct explanation in part (a)(ii). Many candidates did not make use of the information given in the stem of the question. For this item, the key consideration was to identify the word 'seed' as it is related to the growing of a plant.

**Part (b) (2 marks)**

This item required candidates to draw and label the diagram in **part B** of the experiment. The experiment was to find out about the importance of water for coconut seedlings to grow. Candidates were expected to:

- not draw any can of water and
- keep all other conditions the same,

to score full marks for their drawing in **part B**. Many candidates came up with different unexpected drawings such as:

- same conditions with taller plants and water (this answer was accepted)
- same conditions with smaller plants and water (this answer was accepted provided that candidates explained in part (d) that with too much water, coconut trees will rot)

However, by drawing taller or shorter plants, candidates were not drawing the second part of the experiment at the start of the experiment, but were rather proposing how the plant would look after the experiment had been carried out.

This item in fact tested an important principle in the application of the scientific method, where a control has to be used. Even if at this level learners are not exposed to the scientific jargon, it is important that they realise that to be able to draw a conclusion, they have to be able to compare the results from the varying factor to the results where are conditions are provided or else the experiment is not carried out in a scientific manner.

**Part (c) (1 mark)**

This item required candidates to suggest the observations that they could possibly make between the first and second part of the experiment. Expected answers included:

- length of the plants
- colour of the leaves
- number of leaves

Many candidates misunderstood the question and suggested answers that were appropriate for part (d). These answers were 'The plant has grown taller in **part A**'. A common mistake was to omit mentioning which part the given observation was for and this type of answer was not awarded marks.

**Part (d) (2 marks)**

This item was an open-ended one and required candidates to reflect on possible observations they would expect after some time for both parts of the experiment. It was expected that candidates would mention that the plant would grow healthily in part A and that the plant would wither or die in **part B**. Very few candidates could score both marks. However, answers were expected to be consistent with what the candidates drew for **part B** and marks were allocated accordingly.

## Conclusion and Recommendations

It was found that there is still room for improvement when it comes to application of knowledge. Candidates struggled with questions where they were required to give an explanations or justification. Educators are encouraged to point out in class that items related to explanation are primarily based on application skills and as a result answers need to show deeper understanding of the concepts assessed. Hence, pupils should be encouraged to provide explanations in their own words to convey their reasoning.

Another key finding is that scientific inquiry skills need to be further developed. This can be achieved by providing sufficient opportunities to carry out hands-on activities. One important experiment that needs to be demonstrated at the level of Grade 5 is 'Setting up of circuits'. Educators are encouraged to demonstrate the making of a complete circuit using bulbs, but also to include other devices such as a fan, a bell and a buzzer. This will allow learners to have a better understanding of components to be added to complete a circuit, but will also allow them to think about the different transformations of energy that could take place in a complete circuit.

Other important experiments are those related to plants. The attention of Educators is drawn to the fact that while conducting an experiment, all conditions need to be the same (controlled variables)

except for the one to be investigated. It is, therefore, advisable to proceed in a rather systematic and scientific manner when demonstrating experiments in class. This can be achieved by undertaking regular practice of drawing experimental set-ups in class coupled with questioning about controlled, independent and dependent variables, though the scientific jargon does not need to be used.

It is crucial that pupils understand that in order to carry out a proper scientific investigation, they need to have a hypothesis and that experimentation allows them to test their hypothesis. Before conducting an experiment, it is primordial to identify the variables. Educators are encouraged to allow pupils to set up their own experiments and to decide on the variables. This will allow them to better grasp how to carry out an experiment and eventually build their capacity to apply that knowledge gained when assessed in examinations.

In this context, schools are encouraged to have a Science corner or Science laboratory where experiments can be conducted to give pupils the opportunity to conduct experiments as prescribed in their textbooks.