



# PSAC 2018

## Grade 6 Modular Science

Subject code: **P141/2**

Examiners' Report

## INTRODUCTION

The year 2018 was the second time the PSAC assessment was administered. It was also the first time when students received their final Science grade based on their grades obtained in the modular assessments taken at Grade 5 (in 2017) and Grade 6. With the implementation of the new Science Teaching and Learning Syllabus, there has been a shift from the teaching of content mostly to the development of application skills, scientific inquiry skills and attitudes in Science.

It is expected that with more emphasis being laid on scientific inquiry and the development of the right attitudes, learners will acquire a deeper understanding of concepts which will be more meaningful to them in their everyday life or in continuing to study Science at higher levels. As clearly stated in the Teaching and Learning Syllabus (2015), *learners will be given the opportunity to explore science concepts and engage in scientific activities and in the process develop these competencies. Content, pedagogy and assessment are all aligned to the task of developing these competencies.*

## ITEM ANALYSIS

This report is largely 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

76.56% of candidates achieved numerical grade 5 or better in Science for the PSAC 2018 examination session at first sitting. The mean mark for the paper was around 29 out of a maximum of 50.

Generally, it was found from the answers given that pupils seemed to have had more exposure to practical science as compared to previous years. They understood for instance the importance of having a control in an experiment and many were able to explain this correctly.

It was noted that some basic concepts are still misunderstood by some candidates, like the concept of renewable and non-renewable sources of energy.

Some questions required candidates to make a comparison between two elements. For example in Question 6(b), the candle under the Jar with more carbon-dioxide will extinguish faster than the one under the Jar with less carbon dioxide. Candidates often gave only part of the answer and did not make a comparison.

A few of the answers given were also incomplete. For example, for the last item, answers such as 'they give out carbon dioxide' resulted in candidates not scoring full marks.

The following gives more information on each item from the 2018 Science modular Grade 6 assessment paper.

## **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.

On average, about 45% of candidates answered all the items correctly.

**Item 1**      *The set of teeth which replaces the set of milk teeth in humans is called*

This item assessed candidate's knowledge about the two sets of teeth in humans, more particularly, that the permanent teeth replaces the milk teeth. Many candidates gave the correct answer, A. The most common wrong answer was option B, 'baby teeth'. Pupils often use the term 'baby teeth' instead of 'milk teeth'. For this item though the set of teeth which replaces the set of milk teeth was requested. Just like the use of the term 'baby teeth' the term 'adult teeth' is often confused with 'permanent teeth'. It is to be noted that the use of the right scientific terminologies is important.

**Item 2**      *How long does the Earth take to make a complete rotation around the Sun?*

A significant number of candidates obtained the correct answer, D, 1 year.

**Item 3**      *What is the missing part in box X of this chain?*

Many candidates found the correct answer. Those who opted for the wrong options A, B and D are likely to have misunderstood the concept of food chain, where a living thing depends on another living thing and/or on a non-living thing for its survival. This is a fundamental concept in understanding the importance of conservation of different species and the importance of curtailing deforestation, overfishing or pollution. When one species, plant or animal, is missing from a particular food chain, it is the whole chain of organisms which is affected and this can eventually lead to the extinction of a species of organism and an imbalance in the ecosystem.

Almost 60 % of candidates who scored between 1-9 marks on the whole paper got this item correct. It is yet to be explored whether this is by mere chance or if the visuals helped the candidates and they were able to read and understand the one-word answers given in the options.

**Item 4**      *One disadvantage of using this source of energy is that*

The item was relatively well attempted by candidates who found the correct

answer D – less electricity is produced when there is less sunlight.

It is worth pointing out that candidates often find the topic on renewable and non-renewable sources of energy quite confusing. Firstly, candidates sometimes equate renewable sources of energy with non-polluting sources and likewise non-renewable sources of energy to polluting sources. This is not always the case. Secondly, candidates are sometimes familiar only with the advantages of renewable sources of energy and the disadvantages of non-renewable sources. They are often unaware that although renewable sources of energy have many advantages, they also have some disadvantages, one of which being the reduced production of electricity in low light intensity, as highlighted in this item.

**Item 5**        *Which one of the following explains why the suction cup remains stuck on the window pane?*

This was the most challenging item in the first question, with about 4 out of 10 candidates getting it wrong. The concept of air pressure can prove to be relatively abstract to pupils at this level given that they cannot see it happening. It is therefore helpful if they can be shown what atmospheric pressure is through simple demos instead of only trying to remember where the air pressure should be greater.

Atmospheric pressure, in simple terms, is the force pushing on objects from the weight of air above them. Putting questions like why are we not crushed by the weight of air, or why a metal ship does not sink can help learners to make sense and instead of trying to remember the answer through recall, they can apply this knowledge to the situation presented to them.

## **QUESTION 2 (7 marks)**

This question was on the topic 'Animals', from the Grade 6 syllabus. The mean mark in this question was around 5.2 out of 7 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 6 marks. For candidates with language difficulties, especially at the level of writing, this question was relatively accessible to them.

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

*Why does a baby need to drink a lot of milk?*

There were a number of different variations in the answers provided by candidates and many of them were accepted. The main idea was that milk is a source of protein and a baby needs a lot of protein as he/she is in a growing phase. Some candidates indeed explained this idea very precisely.

Another correct idea that was developed by candidates was that milk is a source of calcium and the baby needs calcium for his/her bones or teeth development.

Some answers were related to the fact that the baby does not have teeth and cannot eat solid food and thus needs to drink milk. This was also an idea which was considered correct.

Yet another idea given by candidates was that milk is a complete diet which provides all the essential nutrients to the baby.

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

There were three different meals given and candidates were required to identify the main nutritional content of each one. Although some candidates could not classify butter correctly, many candidates scored full marks on this

question.

Some candidates wrote the names of the different food items given instead of only putting a tick. As far as the answers given were correct, they were not penalised. However, attention must be drawn so that the instructions given for each item or question is followed.

Some candidates put a tick under the three nutritional contents for the meal of Kelly. They were given the mark for this. However, it is unclear whether these candidates understood the concept of a balanced meal or a balanced diet and this may need to be addressed.

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

Candidates were requested to classify 6 different animals according to their body covering. Whilst they got most of the classification correct, a number of candidates wrongly classified bat as having feathers.

It would seem here that the characteristics of mammals have not been well grasped by all or that some candidates were not aware that bats are mammals and not birds.

Classification is one of the skills that is explicitly mentioned in the Teaching and Learning Syllabus and which candidates ought to develop. Pupils need to understand firstly why it is important to classify – for instance to understand the relationship between different organisms or to allow identification - and then be able to use different characteristics for classification. They can produce, for instance, different classifications of animals based on their body covering, diet, habitat or method of reproduction or based on other characteristics.

### **QUESTION 3 (11 marks)**

This question was particularly challenging for most candidates. A majority of the candidates from the high-ability groups managed to score most of the marks (9-11), while those from the low-ability groups struggled to score 3-4 marks. The majority of marks was scored on the fill-in-the-blanks question or on items requiring only a number or a one-word answer.

#### **Part (a)**

Part (a) comprised 3 sentences with 4 blanks on the process of photosynthesis. While the majority of marks was obtained by most students on this item, it was found that correctly writing words such as 'photosynthesis' or 'chlorophyll' was challenging. Some candidates also had difficulty writing the words 'oxygen' and 'carbon dioxide' correctly.

A number also wrongly gave 'oxygen' as the gas which is taken in by the plant for photosynthesis and 'carbon dioxide' given out.

Although most pupils understand the concept of photosynthesis, it remains important that they are able to translate their understanding in writing. In such a fill-in-the-blanks type of question, candidates with writing difficulties were still able to score all the marks allocated. However, the concept of photosynthesis can also be assessed in the future through open-ended questions or questions assessing their Scientific Inquiry skills where they might be required to write more or to explain their reasoning.

#### **Part (b)**

This part of the question was based on an experiment where the amount of water given to 3 plants was the varying factor. Details given were the following:



- The 3 plants used in the experiment were similar. Unless the plants were similar, it would not be scientifically correct to draw a conclusion on the varying factor which was water. For instance, if 3 plants of different heights were used, their growth pattern could not be compared. Similarly if three 3 plants of different species were used, no conclusion could be drawn on the effect of water.
- It is also important to state that the plants were given the same treatment, that is, they were watered every day for a period of 10 days. If one plant was given 10cL of water every day while the other one was given 20cL of water every 3 days, the experiment would be void.
- All other conditions ought to be the same and again it is important to explicitly state that. If one of the plants was receiving more sunlight than the others, no conclusion could be drawn on how water affects the growth of the plants over the 10 days.

(i) *1. What could be the height of the plant in Pot Z on Day 0?*

Many candidates realised that the plants were similar and this should be 10 cm as the other plants in Pot X and Pot Y.

Some however gave 16 cm or 12 cm. Whilst they were penalised here, their answer was taken into consideration for the second part of the question where they explained that the plant in Pot Z received more water and thus was of a greater height.

*2. Explain your answer.*

The expected answer should mention the idea of the three plants being of similar height at the start of the experiment so valid conclusions can be drawn. Answers such as 'the three plants should be of the same height at the start of the experiment' were accepted as correct.

- (ii) *What was the height of plant Y on Day 6?*

For this item, candidates were expected to read the height of the plant directly from the given table. A large majority of candidates could read the information and give the correct answer.

- (iii) *What can Jay conclude from his experiment?*

The expected answer was that the plant receiving 30 cL of water grows higher than the plants receiving 10 or 20 cL of water. Answers such as the more water the plant receives, the higher it grows were also accepted.

This item is on the conclusion that can be drawn from a particular experiment. One of the fundamental principles of scientific experimentation is that a conclusion can be drawn only based on the experiment carried out. Unless, further experiments have not been carried out, we cannot extrapolate further. For instance, in this experiment, we can conclude that the balsam plant grows higher with 30 cL of water daily but we do not know whether it will grow even higher with 40 or 50 cL of water.

Some candidates gave answers such as 'with 30 cL of water, the plant will rot and die'. However, this is not supported by the data presented in the table given and could not be accepted.

### **Part (c)**

*Give two ways how deforestation affects the environment.*

There was a range of answers that was accepted as correct. It includes ideas about soil erosion, loss of habitat or loss of biodiversity. Answers were often limited to one or two words only which sometimes was not enough to convey the meaning and resulted in loss of marks.

#### **QUESTION 4 (10 marks)**

This question was on the materials and their properties. Candidates scored a mean mark of 5.2

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

Candidates had to fill in a table to give the properties of different materials which made them suitable to make specific objects. The objective of this item was to know whether pupils understood why specific objects are made out of particular materials. In class, such activities can provide opportunities for deeper learning. For instance, putting questions to pupils as to why plastic is still being used to make so many objects despite knowing the harm it causes to the environment, can trigger more thinking leading to creative science with a lot of questions being put forward and pupils finding meanings and understandings.

Wooden spoon- Answers such as it is a bad conductor of heat were expected. Other answers such as it is hard or not easily bent or breakable were also accepted.

Rubber tyre- It is elastic, shock absorbent, water resistant were all considered as correct answers. Some candidates gave the answer 'they are non-conductors of electricity'. This was also accepted as a correct answer.

Iron nail – Acceptable answers included it is hard, it is cheap or it does not bend easily. It conducts electricity or it does not conduct electricity were both not accepted as correct answers. Though iron conducts electricity, it is not the reason why it is used to make iron nails.

Plastic raincoat – The most common correct answer given was it is water – resistant or waterproof.

However, answers such as it is cheap or it is light or heavy are often not meaningful enough and does not explain why a particular material is used to

make a specific object.

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

This part was on an experiment carried out to find out the water permeability of different materials, namely, cotton, silk, wool and nylon. The amount of time water takes to pass through each of the different materials was recorded and a bar chart plotted.

(i) *How many minutes does it take for one litre of water to pass through cotton?*

Candidates were expected to read the bar chart and give the answer 5 minutes. Many attempted this item well.

(ii) *The least appropriate materials is the one which filters water the slowest. Which one of the materials is least appropriate to filter water?*

Given that the least appropriate one is the one which takes the longest time, the answer is the material which took most time to filter that water, that is nylon.

Some candidates gave silk or cotton as answers and these were not accepted for this item. However, their answers were taken into consideration for the next item.

(iii) *Which property of the material you have given in part (b) (ii) makes it least appropriate to be used to filter water?*

Given that nylon was the answer for the previous part, its property which makes it least suitable to filter water is that it does not absorb water well. Some candidates gave answers such as it is water – resistant which was also accepted.

The answers given in the previous part were taken into consideration while marking this item.

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

This part was on rusting.

*(i) Which metal was used to make these pipes?*

Given that the pipes have rusted, the metal used to make these pipes can only be iron. More than half of the number of candidates got the correct answer. Those who did not give iron gave the names of other metals. This suggests that they might not make the difference between different metals and just lump them all together.

It may be interesting to conduct a simple experiment on rusting. The objective of the experiment has to be clear. If we are investigating the metals which would rust and thus encouraging learners to differentiate between different metals, then the experiment can be to see how two different metals rust, for instance a piece of iron sheet and a piece of aluminium. Both metals have to be provided exactly the same conditions for rusting to happen, that is water/humidity and air/oxygen.

*(ii) What are the two conditions for rusting to take place?*

Candidates were expected to give oxygen or air and water or moisture or humidity as answer. About half the number of candidates was able to give the two conditions.

As an extrapolation from the previous part where the metals which would rust is being investigated, another experiment can be to see the effect of different conditions on rusting. In this experiment, iron nails can be used and a particular condition such as the presence of humidity or water can be the varying factor.

*(iii) Give one observation that tells you that rusting has occurred.*

A red brick or red-orange colour or any such colour variant was accepted. 'It becomes brittle' was also accepted as correct. Many

candidates did not give an observation at all. This indicates that some pupils are not familiar with the term observation. While carrying out any practical, pupils should be encouraged to describe and note down their observations. It is also important for them to be guided to make meaningful observations. For instance, if we are conducting an experiment on the growth of plants under certain conditions, meaningful observations will be about the length of the plant, the size of the leaves, the colour of the leaves, the number of new leaves forming or the number of leaves dying. If pupils are only observing for instance the number of flowers, they may miss out on important information and come up with the wrong conclusion.

#### **QUESTION 5 (9 marks)**

The topic on energy was assessed in this question. The mean mark for this question was 4.3.

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

Candidates were expected to interpret the information given in a simple pie chart showing the percentage of electricity produced from different sources of energy in Mauritius.

*(i) What is the main source of energy used to produce electricity in Mauritius?*

This question required a simple reading of the information provided in the pie chart, where coal, which generates 40% of electricity in Mauritius, is the main source of energy.

Many candidates, from all the ability groups, were able to give the correct answer indicating that reading information from given table, bar charts, pie charts is a skill that most have acquired.

*(ii) Which renewable source of energy is used the most to produce electricity in Mauritius?*

From the given pie chart bagasse, which contributes 16% to the production of electricity, is the renewable source of energy most used. However, a significant number of candidates gave hydro as answer.

This wrong answer is not from the wrong reading of the information given in the pie chart but rather is due to the misconception that bagasse is not a renewable source of energy.

As has often been pointed out in previous examiners' reports, pupils tend to confuse renewable and non-polluting as being the same concepts, where all renewable sources of energy are wrongly considered as non-polluting sources and all non-renewable sources are wrongly considered as polluting sources of energy.

It is worth emphasising this point again and make sure that pupils understand what is meant by the concept of renewable and non-renewable. 'Renewable' refers to sources of energy which will not be used up as opposed to non-renewable sources.

*(iii) During periods of drought the production of electricity using hydro energy decreases. Explain why.*

Candidates have some difficulties in expressing themselves. Some, however, were able to explain clearly that due to the smaller amount of water in rivers, the force of falling water is not enough to turn the turbines to produce electricity. The idea of the lack of force to turn the turbines was important here.

*(i) Explain how the use of green sources of energy can help to protect the planet.*

Many answers given related to the reduction of pollution through the use of green sources of energy. Some candidates explained the

consequences of global warming, such as climate change and how the impact can be reduced. Others explained the harm caused by the use of fossil fuels. One difficulty here was to give clear and precise answers directly related to the question.

Another point to consider is to make sure that pupils understand the term green sources of energy.

*(ii) Give one way how plastic bags are harmful to the environment.*

Some of the given answers were only about causing pollution. It is to be highlighted that being harmful to the environment already means polluting and the question was about how they were harmful, to the environment.

A significant number of candidates was able to explain that plastic bags are non-biodegradable and thus pollute our aquatic bodies and are toxic to aquatic life. Some suggested that they are eyesores and others explained how they are broken down in small pieces and end up in our food. It is interesting when pupils can take the experience or the information they are gathering outside the classroom and apply it correctly to their lesson.

*(iii) Instead of throwing away plastic objects, they are turned into new useful objects. What is the name given to this process?*

Generally, candidates found the word 'recycle' and scored the mark for this item.

### **QUESTION 6 (8 marks)**

This question covered the topic of Air from Grade 6. Part of the question is on air pollution and the second part is on the importance of oxygen for burning and carbon dioxide as an extinguisher. The mean mark for this question was around 4.



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

Part (a) showed a picture where school children are seen to be covering their mouths and nose due to the air pollution which is affecting them.

*(i) What could have caused the air to become polluted?*

A range of answers was acceptable such as 'exhaust fumes released by motor vehicles' or 'polluted air from factories'.

Some candidates gave answers such as 'because of fertilisers' or 'pesticides used in agriculture'. Candidates have to be careful when giving such answers. The use of fertilisers or pesticides will most often not give situations where schools have to be closed because of air pollution. An excessive use or an accident involving such chemicals may give rise to such a situation when the air pollution is intolerable.

The context given to a particular question has to be carefully read and understood before answering questions. Such contextualized questions give more insight to examiners about the grasp and the depth of knowledge on a particular concept or topic. By responding in a mechanic way, without really applying their knowledge to the situation given, candidates show only a superficial understanding. Thus once a lesson is completed, wherever possible, Educators are encouraged to apply the concept to outside situations and encourage learners to come up with their own descriptions and explanations.

*(ii) Explain why it is important that children are protected from the poor air quality.*

While many acceptable answers included ideas about the impact of air pollution on health generally, some candidates gave specific answers related to children. Answers such as their lungs or respiratory systems

are affected and this can result in poor growth as they are still children showed that there had been a deep understanding of the scientific concepts.

**Part (b) (4 marks)**

The items related to an experiment being carried out involving two candles being burnt under different conditions. Both candles were covered with jars. Under glass jar A there was 0.03% of carbon dioxide while under glass jar B there was 1% of carbon dioxide.

- (i) 1. *Under which glass jar will the candle go out first?*  
2. *Explain why.*

Such questions are often linked with the concept of oxygen gas being necessary for burning. In this question, the focus is on carbon dioxide as an extinguisher. While many candidates gave the correct answer Jar B, a significant number was unable to explain why. The idea required was that Jar B contains more carbon dioxide than Jar A. Sometimes, candidates only gave the percentage of carbon dioxide without any explanation, which could not be given credit.

- (ii) 1. *What will happen to the level of oxygen under the glass jars?*  
2. *Explain why.*

Candidates had to say that the level of oxygen will decrease as it is used up during the process of burning. Here also, candidates often gave the correct answer to the first part but had more difficulty in explaining why the level of oxygen decreased.

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

*How do animals help in maintaining the composition of air in the atmosphere?*

Candidates were expected to explain that animals take in oxygen and give out carbon dioxide during breathing and this carbon dioxide is taken up by plants

(during photosynthesis) and give out oxygen. Some candidates only gave part of the answer, that is animals take in oxygen or animals give out carbon dioxide, which was not sufficient to score full marks.

## CONCLUSION

As in previous years, Educators are advised to encourage their pupils to think more deeply about concepts to allow a real understanding of Science and not only acquire superficial knowledge. Using the wrong answers provided by pupils provides great opportunities to probe further, to gauge the depth of understanding and to clear misconceptions which are often present.

Learners should always be encouraged to try hands-on experiments, to express their answers in writing, to investigate on their prior knowledge, to find plausible scientific explanations for their results and to understand the scientific method.

Learners should also be encouraged to understand the scientific method and how it helps in conducting fair experiments which produce reliable results from which conclusions can be drawn. The purpose of using the scientific method in each of their investigations should be emphasised. The following is reproduced from last year's report:

- The first step is to make an **observation**. Based on this observation and their prior knowledge, the observation can lead to a question.
- **Forming a question** is thus the second step. In this step, learners do not know the outcome of their investigation. They only want to investigate a specific problem or question. For instance, would seeds need soil to germinate, or what would happen if a plant is kept in the dark, or what would happen if hot water were put to a temperature below 0°C?

- Following the above step, pupils can then come up with a **hypothesis** or a prediction. This is based on their prior knowledge, which allows them to make such a prediction. The outcome of the experiment can meet their prediction or it might not.
- It is only when the above steps are done that the actual **experiment** is conducted. While conducting an experiment, pupils should be encouraged to take the correct recordings or measurements and record relevant observations. They have to write down these information. This part will further develop another skill, which is about communicating the findings which can be in a tabular form or as drawings.
- Based on the results, a **conclusion** can be made where the hypothesis or the prediction is confirmed or not.
- If the expected outcome of the experiment is not achieved, it is interesting to **interpret** why it is so. This step will help in the deeper understanding of the different concepts.

Educators can represent the above in the form of a drawing with annotations which can be put on the wall of the class so that pupils are constantly exposed to it.

All schools are encouraged to have a Science corner or a Science room where simple equipment and materials are readily available. The materials can be kept in different boxes, each box named for a particular topic, for example materials, soil, plants, energy & electric circuit, air etc... The following website gives a list of materials that each school can have: <http://ppds.pdst.ie/pcsparchive/science/equipmentreview.pdf> . This list can be adapted according to the teaching and learning syllabus.

The following is a list of low cost materials that can be used:

*(Acknowledgement of the Source: F Jeerooburkhan)*

## Tools

A pair of scissors  
A knife / a cutter  
A pair of pliers  
Screw drivers  
A small hammer  
A small hand saw  
Measuring tape  
A ruler

## Materials

Plastic bottles-diff shapes & sizes  
Plastic glasses  
Plastic objects, sheets  
Glass panes  
Soap, glue, blutack, cellotape  
Candles, paper clips, pins  
Tooth paste  
Transparent jars  
Rubber balloons  
Cotton reels  
Cotton threads  
Drinking straw  
Elastic bands, raffia tapes  
Pieces of wood  
Pieces of metals  
Pieces of glass

Cotton, rubber, wool, leather  
Dry batteries,  
electric wire, switch, bulbs  
Empty cans – diff. sizes  
Sponge, flannel  
Transparent, translucent objects  
Fertilizers – diff. types  
Potted plants  
Manure, compost, bagasse  
Flour, sugar, colour powder  
Seeds – diff. types  
Pictures of plants, animals, foods  
Nails – diff sizes, needles  
Water colour, paint, paint brush  
Matches, alcohol, paraffin (Danger!)  
Metallic wires  
Pieces of different types of fabrics  
Picture of plants  
Picture of animals  
Salt, sugar, glucose  
Coral, Sand, lime,  
Soil – diff. types  
Chippings, macadam, rock sand  
Rocks – diff. types  
Plastic & glass beads

**Equipment**

Plastic funnels

Transparent plastic tubes

A comb

A nail cutter

A hair brush

A tooth brush

A small aquarium

A hand lens

A thermometer

A small gas burner

An electric kettle

An electric torch

A small mirror

Test tubes, glass rod, beaker

The globe

Spoons

Pencils