



*Let the mind manage the bod.  
Que l'esprit gère le corps*

**MAURITIUS  
EXAMINATIONS  
SYNDICATE**

**NCE 2020-2021  
GRADE 9**

**Science (Biology)**

Subject code: N530

**EXAMINERS' REPORT**

April 2022

## KEY MESSAGES

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- The majority of candidates achieved Grade 6 or better in Science and many fared relatively well in the Biology component.
- The NCE Biology paper assesses candidates not only on their ability to recall facts, but also on how to apply their knowledge across the contents of the syllabus.
- The majority of candidates attempted objective-type questions testing recalling successfully. However, when knowledge-based or application-based questions were tested through open-ended items, candidates had more difficulty.
- Candidates should use key terms/ biological terms more accurately. They should respond in a clear and concise way.
- A significant number of candidates had difficulty with the manipulation of data, that is reading tables, drawing information from a set of data or drawing a bar chart. Such questions also usually require candidates to interpret their answers while referring to the data set and they should be encouraged to be more thorough in their answers.
- Some mathematical skills are essential to answer certain questions in the NCE Biology paper. Candidates need to be familiar with them in order to apply them to the Biology questions (e.g; calculation of mean, magnification etc...).
- For questions where candidates need to be more descriptive and which usually involve two or more marks, it is advised that they think well about the formulation of their answers before attempting in order to avoid telescoping answers.
- Candidates are encouraged to read questions and instructions carefully and revise their answers.

## GENERAL COMMENTS

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The first edition of the National Certificate of Education (NCE) Assessment was held in 2020-2021. This assessment comes at the end of the Nine-Year-Continuous-Basic-Education and is the second important national assessment that candidates take after the Primary School Achievement Certificate (PSAC). As with the PSAC assessment, the NCE assessment is based on the National Curriculum Framework Grades 7, 8 and 9 (*MIE, 2017*) and the Teaching and Learning Syllabus Grades 7, 8 and 9 (*MIE, 2020*).

In Science, according to the syllabus, the focus of the learning is on three main areas:

- Unifying themes in Science which includes scientific inquiry, diversity, models and systems, interactions, energy, measurement and science technology and society
- Development of inquiry skills, processes, attitudes and values
- Specific learning outcomes.

The assessment objectives and their respective weighting is given in Table 1 (Annual Programme for the National Certificate of Education Assessment 2020-2021, *MES 2021*):

**Table 1:** Assessment Objectives

Assessment Objective	Weighting
AO1 Knowledge with understanding	45 – 50
AO2 Application	25 - 35
AO3 Scientific Inquiry	20 - 25

The NCE assessment in Biology focused on the learning outcomes given at Grade 9 in the Teaching & Learning Syllabus.

The NCE assessment 2020-2021 took place in special circumstances with the COVID-19 pandemic and its ensuing disruptions to school life and the school calendar. Due to these disruptions, the assessment was based on only part of the Grade 9 syllabus. Table 2 gives the specific content which was **not** assessed.

A significant part of the chapters ‘Biodiversity’ and ‘Nutrition in Plants’ were not assessed following the ‘de-loading’ of the assessment. It was expected that this measure would help

students focus on certain parts of the syllabus which were considered essential while providing them with sufficient pre-requisite knowledge to continue their learning in Biology at Grade 10 or to be sufficiently scientifically literate.

**Table 2:** Learning Outcomes Not Assessed

UNIT	SPECIFIC LEARNING OUTCOMES (LOs) OF TLS NOT TO BE ASSESSED
<b>B3: Biodiversity</b>	<ul style="list-style-type: none"> <li>• Discuss ways by which human activities such as deforestation, pollution, degradation of habitat, invasive alien species, global warming can have a negative impact on biodiversity</li> <li>• Suggest solutions for the above threats</li> </ul>
<b>B4: Nutrition in Plants</b>	<ul style="list-style-type: none"> <li>• Identify the different tissues making a dicot leaf with the help of a diagram</li> <li>• Investigate that some substances (e.g. particles/water) can move from a region of higher concentration to a region of lower concentration</li> <li>• Observe vascular bundles in a cross section of a root and a stem using microscope/poster</li> <li>• Recognise vascular bundles using a cross-section diagram of a root and stem</li> <li>• Identify xylem and phloem in a vascular bundle of a root and a stem</li> <li>• Communicate the proposed experiments/results of experiments on factors which are important for photosynthesis</li> </ul>

Given the above, the weighting of the different assessment objectives was slightly adjusted to cater for the significant disruptions in learning.

An analysis of the performance revealed that most candidates attempted all the questions found in the paper. The Biology component of the question paper consisted of 5 questions assessing the 5 main topics, that is;

- Blood Circulatory System
- Reproductive System
- Biodiversity
- Nutrition in plants
- Measurement in Biology

The Biology paper produced a good spread of marks with some candidates scoring in the top mark range. However, there are candidates who faced difficulties with analysis of data and with questions requiring descriptive answers such as in item 4(a). Some items testing the assessment objective “*Knowledge and Understanding*” were also found challenging, for instance, items 2(c), 2(d) or 4 (b), 4(c). It was also noted that the level of the language produced and the use of mathematical skills were not always to the standard expected from Grade 9 candidates. The overall percentage pass in Science was about 80% and the mean mark of the Biology component was 27 over 50.

## SPECIFIC COMMENTS

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The paper comprised 5 questions. Apart from Question 1, Questions 2, 3, 4 and 5 consisted of different types of items, that is, short-answered, matching, labelling or open-ended. Generally, objective-type questions or those requiring only a very short answer were better tackled than those which required a longer answer. This was irrespective as to whether the item was testing knowledge, application or inquiry skills.

The following is an analysis of the performance of candidates based on the findings during the marking exercise as well as on a quantitative item analysis from a representative sample of scripts.

### Question 1

Question 1 consisted of 10 multiple-choice questions assessing mainly AO1, Knowledge and Understanding. The mean mark scored in this question was 6.7 out of 10.

The items which proved to be within the reach of most candidates were items 1 and 9. For the other items, fewer than 7 out of 10 candidates found the correct answer.

It seemed that candidates did not read certain items accurately, especially for items 5, 7, 8 and 10 where apparently familiar information were provided, but where the questions were framed in an unfamiliar context.

Table 3 provides the answer key for Question 1.

**Table 3:** Answer keys for Question 1

Item	Key
1	A
2	C
3	B
4	B
5	D
6	A
7	A
8	C
9	B
10	D

### Comments on specific items

**Item 1:** *Which one of the following is a non-communicable disease?*

The item was knowledge-based and candidates had to recall the information. They needed to understand the term ‘non-communicable’ disease first to choose the correct example of such a disease. The correct answer A ‘*Stroke*’ was provided by most candidates.

**Item 2:** *Which part of human blood fights against foreign bodies?*

The correct answer is C ‘*White blood cells*’.

This item proved to be challenging for a significant number of candidates, although it tested a simple recall of information. The three distractors were equally popular among the wrong answers.

**Item 3:** *Which of the following gases causes acid rain?*

About 6 out of 10 candidates found the correct answer B ‘*Sulfur dioxide*’. However, ‘*Carbon monoxide*’ was largely popular among the wrong answers provided.

The learning outcome ‘Describe ways by which human activities such as deforestation, degradation of habitat, invasive alien species, pollution, global warming can have a negative impact on biodiversity’ was assessed in this item. Besides being part of the topic ‘Biodiversity’

in Biology, the description of different types of air pollutants and their negative impacts is also part of the topic ‘Atmosphere and Environment’ in Chemistry.

The negative impacts of air pollutants on the environment is introduced at Primary Grade 6 level and students are expected to be familiar with the different toxic gases and their specific effects.

**Item 4:** *What is meant by the term biodiversity?*

The correct answer is B ‘*The variety of species in a defined area.*’.

While the majority of candidates found the correct answer, a non-negligible number gave option A ‘*The place where different species live.*’. It may be worth ensuring that students can distinguish between the common terms used in this topic, namely, *biodiversity*, *ecosystem*, *habitat* or *population*.

**Item 5:** This item is based on a picture showing a farmer using fertilisers near a water body. Candidates were requested to name the process giving rise to the growth of algae and dead fish.

The correct answer is D ‘*Eutrophication*’.

Performance on this item was satisfactory. Among the wrong answers given, ‘*Global warming*’ and ‘*Ozone depletion*’ were equally popular. It is to be noted that students often confuse these two terms and their causes.

**Item 6:** *What are invasive alien species?*

The correct answer is A ‘*Exotic species which affect native species*’.

As for a number of concepts which have been tested in this topic (biodiversity, pollution etc...) the concepts of *endemic*, *exotic*, *endangered*, *extinct* species have been introduced since Grade 5. In this particular item, candidates must first understand these different terms and then the term ‘invasive alien species’. About 3 out of 10 candidates opted for either option B ‘*Endemic species found naturally in a specific region*’ or option C ‘*Species that have become extinct*’.

**Item 7:** *Carbon dioxide enters a leaf by the process of diffusion. What happens to particles during diffusion?*

A very important concept in Biology (and in Chemistry) is that of the movement of molecules or particles. The concept of diffusion (and osmosis) is one that the student will continue to come across throughout the O and A Level Biology syllabuses if these subjects are chosen at

higher secondary level. It is also a concept that is encountered in everyday life situations, from the smell of perfume in a room to that of gas exchange during breathing.

Only half of the population of candidates opted for the correct answer A *'They move from a region of high concentration to a region of low concentration.'* A very high number of candidates (4 out of 10) selected option B *'They move from a region of low concentration to a region of high concentration.'* One of the reasons for this mistake might be that candidates chose an answer without reading all the options carefully enough.

**Item 8:** *What is the male sex cell called?*

Despite being a simple recall question, it was the worse done item in this question with a high number of candidates opting for the wrong answer A *'Penis'*.

The correct answer here is *'Sperm'*.

The organisation of cells to form tissues, organs and systems is introduced at the level of Grade 7. In the topic 'Reproductive System' students learn about the different organs forming the reproductive system as well as the male and female sex cells. Emphasis is laid upon the understanding of the sex cells, where they are produced, how they are called etc... It can further be emphasized that the sex cells or gametes fused to form a zygote which will develop into a new human being.

**Item 9:** *Which of the following actions would help control the spread of HIV?*

Most candidates were knowledgeable about the actions that help control the spread of HIV. This was the best done item in this question with 9 out of 10 candidates choosing the correct answer B *'Using protection during sexual contact.'*

**Item 10:** This item is based on a diagram showing the steps occurring in the fertilization process and then to the development of a baby. Candidates had to identify the 'zygote'.

Fewer than half of the number of candidates got the correct answer D. The distractors were equally chosen by candidates.



## Question 2

Question 2 proved to be one of the most challenging questions in this paper with a mean mark of 2.68 over 8. Several candidates did not meet the examiners' expectations while responding to the items. It appeared that many did not read the different parts of the question properly to ensure that the points being made were relevant to what the items were asking. For example, item **2(c)** was one related to the adaptation of leaves for photosynthesis and not the factors for photosynthesis. Item **2(d)** was related to the responses given in **2(c)**. Few candidates were able to correctly relate their answers to item **2(d)** with their corresponding explanations on item **2(c)**.

### Comments on different items of Question 2.

**Item (a):** Candidates were required to label the leaf margin, veins and midrib on the diagram of a leaf skeleton provided.

This is a knowledge-based item with a diagram provided as support. The correct labelling needed to be provided. Performance in this item was disappointing with only around 15% of candidates scoring the 3 marks allocated and about 44% getting no mark.

Some candidates incorrectly labelled part **D** as the capillary or the xylem of the leaf.

**Item (b):** *Write down the word equation for photosynthesis.*

To score the mark, candidates had to provide the correct reactants and products involved in photosynthesis. Students are introduced to the concept of photosynthesis at Grade 5 and to the word equation of photosynthesis at Grade 6.

Few answers were accurate and thorough. Many candidates confused between the raw materials and products of photosynthesis. A few candidates used '=' instead of an arrow '—————>' in their word equation. Occasionally, symbols (CO<sub>2</sub>/H<sub>2</sub>O) were also seen while the item requested for the word equation. Though the use of symbol was tolerated (if correctly used) candidates' attention should be drawn to the requirement of the question to provide the word equation.

**Item (c):** *Give two ways in which leaves are adapted for photosynthesis.*

Correct answers referred to the presence of chlorophyll, stomata, network of veins or broadness of a leaf. Some candidates also mentioned the presence of a transparent epidermis. Some wrong answers were ‘carbon dioxide’ and ‘water’. Those candidates did not distinguish between the terms adaptation and raw materials or factors necessary for photosynthesis to take place.

Candidates were not requested to elaborate on the adaptation in this item but only to state how the leaf is adapted. About 4 out of 10 candidates gave the correct answers.

**Item (d):** *Explain how each adaptation you mentioned in part (c) helps the plant carry out photosynthesis.*

Candidates had to explain how each adaptation is helpful. Expected answers included:

- Broad leaf – It allows a maximum exposure to sunlight
- Presence of chlorophyll – Enables the leaf to capture sunlight/ light to carry out photosynthesis
- Presence of stomata – Enables the leaf to exchange gases with the surrounding environment.
- Presence of a network of veins – Enables the transport of water from the roots to the leaf for photosynthesis

Some candidates found it challenging to explain how the adaptation helps the leaf while some others explained adaptations which they had not mentioned in part (c).

For these types of items, where one is related to the previous answer, it is helpful when candidates rewrite their previous answers and then provide the explanation required. This gives more clarity to their thinking.

### Question 3

Question 3 comprised four parts, testing AO1 – knowledge and understanding – on the topic “Reproduction”. This was a scoring question which was well attempted by most candidates. The mean mark was 5.1 out of 9.

**Item (a):** *State the importance of reproduction for living organisms.*

While the majority of candidates stated the importance of reproduction, that is, for the perpetuation of the species, some candidates gave the definition of the term Reproduction.

**Item (b):** *Give two differences between sexual and asexual reproduction.*

Performance on this item was satisfactory. Many candidates gave ideas about the difference in the number of parents involved or the difference in the genetic identity of offspring from one another or from the parents.

Care should be taken when answering such types of questions where reference should be made to both sexual and asexual reproduction in each answer provided. Where the same characteristic was described for both answers, a lower weightage mark was given to the candidate.

It should also be noted that in some scripts, the correct scientific terms were not used but instead words such as ‘*couple*’, ‘*partners*’, ‘*people*’ and ‘*persons*’ were used. The use of correct scientific terms should be encouraged and practiced.

**Item (c):** *Give one example of an organism that reproduces asexually.*

There was a wide possibility of answers not restricted to those provided in the textbook. About half of the population of candidates provided a correct answer.

Among the wrong answers, ‘*Plants*’ was not accepted as it was important to specify the type of plant or the name of the plant.

**Item (d):** This was a matching item with part of the male and female reproductive systems given in Column A to be matched with their respective functions in Column B.

This question was relatively well answered by the majority of candidates. However, only about 3 out of 10 of candidates scored full marks in this item.

## Question 4

This question on the topic 'Blood Circulatory System' was found to be relatively challenging by some candidates. The mean mark of the question was 6.4 out of 14.

**Item (a):** *Observe Figure 4.1 carefully. Give two visible differences between the artery and the vein.*

Less than half of the number of candidates gave two correct observed differences. Correct answers included differences in the structure of the walls or the size of the lumens.

It was important that a comparison between the artery and the vein be given in each answer. Candidates also had to be careful to avoid telescoping answers, that is responses carrying the same idea in both answers provided.

Common incorrect responses included the use of non-specific terms such as *space, hole, circle* instead of *lumen*.

**Item (b):** *Give the function of each blood vessel.*

While about half the number of candidates provided a correct answer for the function of the artery and the vein. An important number of candidates had difficulties to provide a function of the capillary.

A number of candidates also confused between the blood vessels which carry oxygenated and de-oxygenated blood or the one carrying blood towards the heart and away from the heart.

Some candidates also confused between the structure of a blood vessel and its function. For instance, some candidates gave '*prevent the backflow of blood*' as answer for both the artery and vein.

Many answers were considered incomplete or incorrect because they lacked precision, such as:

- *Carries blood to muscles*
- *Carries blood to all part of the body*

**Item (c):** *For each blood vessel, give one way in which its structure is adapted to its function.*

The answer to this part was not necessarily related to part (b). Answers could be related to any specific structure of the blood vessels which contribute to their specific function.

Some of the correct answers provided were:

- Artery: *It has a small lumen thus keeping blood at high pressure*  
*It has a thick layer of muscle which allows blood to flow under high pressure.*
- Vein: *It has valves to prevent blood from flowing back.*
- Capillary: *Has gaps between the cells to allow white blood cells and nutrients to flow in and out.*

It is noteworthy that a significant number of average to high achieving candidates did not give the correct answer to the part on capillary in this item.

**Item 4 (d):** This item was based on the data provided in a table on the rate of the blood supply to different parts of the body when at rest and when exercising.

- (i) *Use the information from Table 1 to complete Table 2 below.*

Candidates had to retrieve the information provided in Table 1 to complete Table 2 where they had to indicate whether the rate of blood supply to the different parts of the body during exercises had increased, decreased or remained unchanged. Candidates were required to put a tick in the correct column. Almost 8 out of 10 candidates provided the correct answers and scored full marks on this item.

- (ii) *Which part of the athlete's body was supplied with most blood during exercise?*

The majority of candidates found the correct answer, that is, '*Muscles of the skeleton*'. Finding this answer was rendered easier by first using the information in Table 2, that is by looking at the part of the body where blood supply has increased. The choice was then between three parts only and from Table 1, the part which received the most blood was '*Muscles of the skeleton*'.

It is worth noting that some candidates did not use the information provided in Tables 1 and 2 but gave a general answer. Many such answers referred to the heart.

It is important that students use the context given wherever applicable and not provide general answers which may not be appropriate to the context of the question.

**Item 4 (d)(iii):** *Give two reasons why this part of the athlete's body received the most blood supply during exercise.*

Possible ideas were:

- *To increase the amount of oxygen supplied to the muscles (for the contraction and relaxation of the muscles)*

- *To increase the amount of nutrients supplied to the muscles (for respiration to take place)*
- *To rapidly remove the waste products being produced (during respiration).*

The majority of candidates found only one correct reason or none at all. Fewer than 2 out of 10 candidates provided the two correct reasons.

## Question 5

Question 5 was on the topic 'Biodiversity' with item (a) testing the ability to count and estimate the number of different species in a given ecosystem and item (b) evaluating the ability to draw graphs in Biology.

The mean mark for this question was 4.5 out of 9.

**Item (a):** Candidates were requested to count the number of two different species and then to calculate the mean number of two species in the ecosystem.

While the first part of the item posed no difficulty to candidates, calculating the mean proved to be more challenging. Indeed, more than 95% of the candidates rightly found the number of slugs in quadrat 5 and the number of marigolds in quadrat 2 and only over half the number of candidates calculated the means of slugs and marigolds correctly. Calculating average is a skill learnt at primary school level and it was noted that even some candidates who have scored an overall mark over 35 struggled in finding the correct answer.

**Item (b):** Candidates were required to draw a bar chart using the information provided in table 3.

Bar charts are used in Biology when the data is not continuous, that is, it is discrete. For instance, in this question, different species of organisms. On the other hand, line graphs are favoured when the data is continuous.

When drawing a bar chart in Biology, the independent variable should be on the x-axis, whereas the dependent variable goes on the y-axis.

As opposed to a histogram (which is also used for continuous data), the bars in a bar chart should be evenly spaced out unless it is a grouped bar chart. At Grade 9, the most common graphs used in Biology are bar charts and line graphs.

Another important consideration when plotting graphs, is the scale used on the axes. The maximum space available on the grid should be used and thus the scale should be sufficiently spaced out to provide the possibility of drawing the most accurate bars while using the maximum space.

It is also very important that axes are labelled. In this case, the x-axis is the type/species of organism and the y-axis is the number of organisms.

Finally, the accurate plotting of the bars is taken into consideration.

In this item, 3 marks were allocated to the plotting of the graph. 1 mark was for the correct labelling of the axes, 1 mark for the correct scale used and the last mark for the accurate drawing of the bars.

More than half of the candidates did not score any mark in this item.

The skill of representing data is found within the topic 'Measurement in Biology' as well as under the topic 'Scientific Inquiry'. The representation of data is also a cross-curricular skill which students will use whether they continue studying Science or embark on the studies of other subjects.

**Item (c):** *What can you observe from the bar chart you have drawn in part (b)?*

Once the graph is drawn, the next step is to observe trends and patterns and finally to come to specific conclusion from the observable data or information.

The expected answer for this item was based on an observation or drawing information from the graph, that is, there are more snails than slugs and marigolds and that the number of slugs and marigolds are the same.

Most candidates who attempted item (b) correctly provided a correct observation. Some based their observation on the table rather than on the graph drawn and scored the mark.

**Item (d):** *The student wants to get a better estimate of the number of organisms in the defined area of the ecosystem. What must she do?*

There are two possible ideas for this item; either to carry the experiment all over again or to use more quadrats.

About one third of the number of candidates gave a correct answer.

## Recommendations:

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In general, it was noted there is still room for improvement in the way students responded to questions. Some recommendations to improve performance are:

1. Students must be encouraged to explain their reasoning, especially when more elaborate answers are expected.
2. More practice is required on how to interpret a given situation and answer in a concise manner.
3. Students should be more familiar with using biological terms.
4. Students are also encouraged to work more on the mathematical requirements of the syllabus – calculations, use of tables and graphs etc...
5. Language skills must be improved. This is important for students to convey their answers in a precise and accurate way.
6. The whole of the syllabus should be given due importance, that is, also the parts on Biological measurements and Scientific inquiry.
7. Particular attention should be given to the use of specific words used when detailing the learning outcomes in the syllabus. This gives an indication on the depth of knowledge that should be acquired.