



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

**MAURITIUS
EXAMINATIONS
SYNDICATE**

**NCE 2021-2022
Science (Biology)**

Subject code: N530

EXAMINERS' REPORT

July 2023

KEY MESSAGES

- About 80% of the candidates achieved Grade 6 or better in Science. The performance in the Biology component was particularly appreciated.
- The NCE Biology assessment covers the whole syllabus. It assesses candidates' acquisition of content knowledge as well as the relevant skills and competencies as given in the Teaching & Learning Syllabus.
- Candidates fared well in the objective-type questions but had more difficulty in expressing their answers when they had to respond to open-ended questions even if the answers expected were not more than one or two sentences long. The use of clear and concise language should be encouraged.
- Candidates did well in the questions where they had to extract simple information from a table or a graph.
- Candidates are encouraged to read questions and instructions carefully and revise their answers.
- Candidates should use key terms/ biological terms more accurately.
- The development of skills such as biological drawing, use of mathematical knowledge, describing trends and patterns from different sources of data, drawing graphs and carrying out scientific experiments should be encouraged.
- Students should be regularly given the opportunity to respond to open-ended questions – descriptive, analytical, etc.. – to develop their writing skills in English in a clear and concise way.

GENERAL COMMENTS

The second session of the National Certificate of Education assessment was held after an extended academic year. As opposed to the first assessment, the 2021-2022 session, was based on the whole Teaching and Learning Syllabus of the MIE (2016). The main areas of learning in Science are the following:

- Unifying themes in Science which include 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 2021-2022, *MES 2022*).

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 2021-2022 Biology component of the Science paper comprised 5 questions carrying a total of 50 marks and assessed the following main topics:

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

The general performance in the paper was satisfactory, with more than 55% of the candidates scoring marks in the range of 25 – 50 in the paper. Only 6.9% of the candidates scored less than 10 marks in the paper and this can be further improved.

The mean mark scored by candidates in the question paper was 28.75 with no significant difference between Boys and Girls.

Question 1 – Multiple-choice items- was the most well attempted question whereas Question 3 – Nutrition in plants – was the one question which candidates found the most challenging.

SPECIFIC COMMENTS

The paper comprised 5 questions. It included different objective-type questions such as multiple-choice, matching, labelling and question requiring one word answers. There were also some open-ended questions assessing the understanding of certain concepts and their application.

Question 1

Question 1 consisted of 10 multiple-choice questions assessing mainly AO1, Knowledge and Understanding. The mean mark scored in this question was 7 out of 10.

Table 2 provides the answer key for Question 1.

Table 2: Answer keys for Question 1

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

Items, where more than 30% of candidates gave the wrong answers, were items 3, 8 and 10.

Comments on specific items

Item 1: *Where on the human body can a pulse be felt?*

Candidates attempted this item with confidence and most of them provided the correct answer. Pulse can be felt in a number of places over the human body namely, at the neck, the wrist, behind the knee, inside the elbow and at the abdomen.

Item 2: *Which one of the following is a common cause of cardiovascular disease?*

The item was knowledge-based and candidates had to recall the information. The options given were related to factors that contribute positively or negatively to a healthy lifestyle and consequently to cardiovascular diseases. Option C – having a diet which is low in salt – was a relatively common distractor chosen by candidates. While a diet which is high in salt

contributes to hypertension, leading to cardiovascular diseases, a diet low in salt does not have such an effect. The wrong answer opted by candidates could have been a result of careless reading rather than not knowing the correct answer.

Item 3: *Which organism can be counted using a quadrat of 1m x 1m?*

The use of quadrats in investigations related to biodiversity or ecosystem is linked to static or slow-moving living or non-living organisms. As such a quadrat can be used to count the number of organisms such as snails, earthworms, plants as well pebbles or rocks that are present in a specific defined area. The size of the quadrat used will further determine the types of organisms that can be counted. For instance, in this item, the number of cows, even if not moving, cannot be counted using a 1m x 1m quadrat.

The reason why a quadrat is used should be reinforced. It is indeed used to count a sample of the number of organisms in a larger area. From this sample, which has to be representative of the whole area, an estimate of the different types of organisms can be made. Therefore, a quadrat allowing a single count of a cow will not provide a correct estimate of the cow population in the defined area.

Similarly, fast-moving animals such as cats, dogs, tigers, butterflies, birds, or fish cannot be counted using a quadrat as they will not allow the investigator enough time to throw the quadrat and make the count.

Item 4: *Which one of the following is a natural calamity which affects biodiversity?*

A significant number of candidates opted for distractor B – Deforestation.

Often, when dealing with the concept of calamities, damage, or destruction of the ecosystem, the emphasis is on man-made factors. It is important to point out that there are natural causes of calamities as well, such as volcanic eruptions, tsunamis, earthquakes, or cyclones which can also be destructive on a large scale.

Item 5: *Which one of the following is an invasive alien species found in Mauritius?*

The term invasive alien species was well understood by the majority of candidates. The correct answer is C – Goyave de Chine. This is a concept that students learn from primary school where the understanding of key terms such as endemic, exotic, or extinct is developed. This concept is further developed at lower secondary level with terms such as invasive alien species. The plant Goyave de Chine is also well known by most candidates as well as its status as an

invasive (one which competes with endemic plants for resources) and alien (which is exotic to Mauritius) species.

Item 6: *Which one of the following is a communicable disease?*

Most candidates provided the correct answer B- Gonorrhoea. The concept of communicable diseases from the topic of Reproduction and that of non-communicable diseases from the topic of Blood and Circulatory System is an important one, particularly in the Mauritian context with the high prevalence of non-communicable diseases.

Item 7: *Which part of the male reproductive system produces sperm?*

Candidates were familiar with the function of the testis in the production of sperm in general.

Item 8: *Which one of the following describes how yeast cells reproduce?*

The correct answer is D – By forming small buds.

The description of asexual reproduction in yeasts is provided in the textbook and as such this item was a basic knowledge one. However, less than 40% of the candidates provided the correct answer.

It is worth revisiting the concept of sexual and asexual reproduction. At least two types of asexual reproduction are provided in the textbook, that of splitting into two new cells (example of amoeba) and that of budding (example of yeast cells). Candidates are encouraged to understand the difference between these types of asexual reproduction as well as to know other examples of organisms that carry out asexual reproduction. The use of concrete examples in the classroom with plants such as the spider plant or other asexual reproduction from plants can support the students in understanding the concept of asexual reproduction.

Other types of asexual reproduction in animals such as snakes or lizards, though not in the textbook, can further boost the interest of students in understanding the concept of asexual reproduction.

Item 9: *Which one of the following green leaves has the maximum exposure to sunlight?*

Most candidates provided the correct answer C – Surface area of the leaf: 750 cm².

All the leaves provided in the options given were green and information was given in the stem of the question. Students can be prompted to respond to similar types of questions but where variegated leaves are used.

Item 10: *Which diagram correctly shows the phloem and xylem in a cross-section of a root of a plant?*

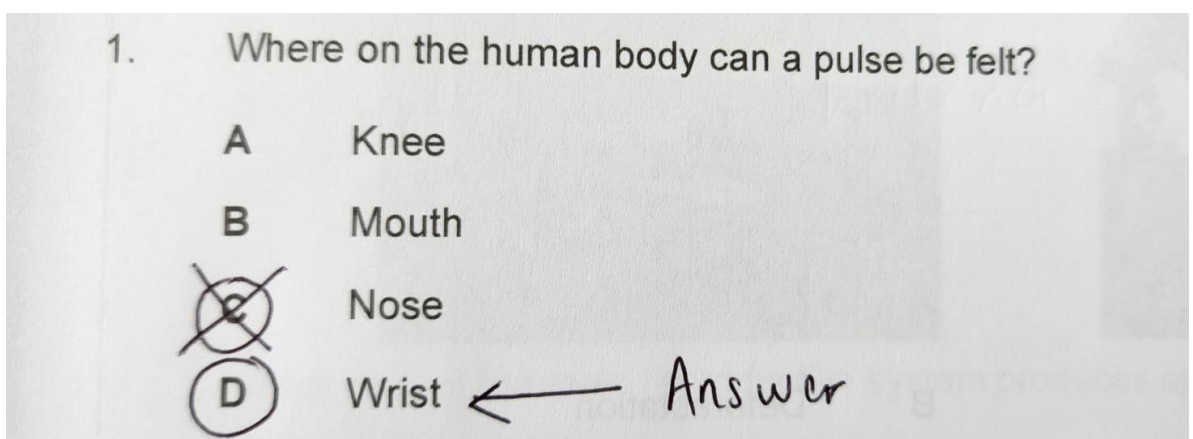
The correct answer is C.

This item assessed the knowledge of the position of the vascular bundle in different parts of a plant and the position of the xylem and phloem within the vascular bundle. It is based on knowledge and understanding and students should be able to distinguish between the representations of the vascular bundle in the leaf, the stem and the root. The presence of root hairs in the representation of the vascular bundle in the root can help students to distinguish it with that of the stem.

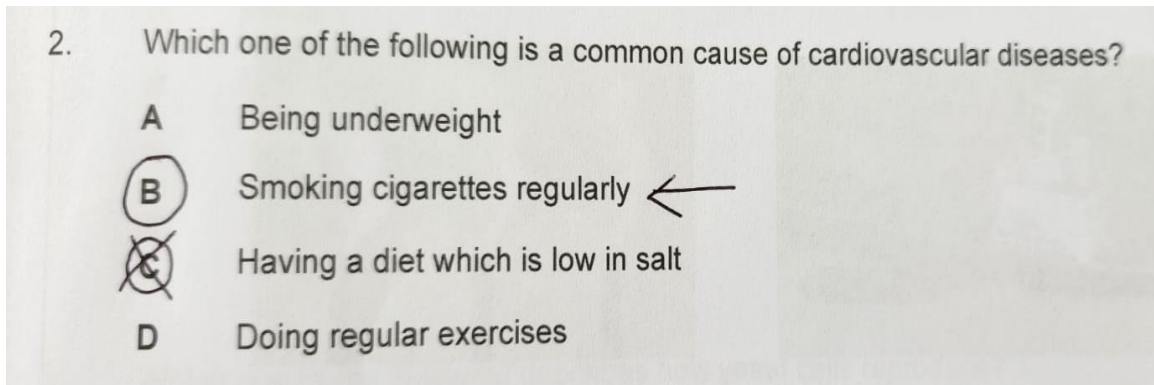
General Comment

It was often found that candidates revisited the answer they provided initially and want to change their answer. Since most of them use pens to answer in the question paper and cannot use correction fluid, they changed their answers by using different methods. It is recommended that the following method be adopted in case a candidate wants to change his/her answer:

- Cross out the option which was wrongly selected and encircled. The candidate then encircles the option he/she now thinks is correct and indicates this clearly by the use of an arrow and the word 'Answer'.



- Cross out the option which was wrongly selected and encircled. The candidate then encircles the option he/she now thinks is correct and indicates this clearly by the use of an arrow only (given that some candidates may have difficulties writing the word ‘answer’).



Question 2

Question 2 assessed the topic ‘Blood and the Circulatory System’. The mean mark of this question was 5.2 over a total of 9 marks available.

The items set were objective types questions with labelling, matching, and very-short answer questions. Candidates from the higher-ability group scored highly and those from the lower-ability groups were able to get some marks, particularly in part (b) of the question.

Comments on different items of Question 2.

Item (a)

- (a) Fig. 2.1 shows the three types of blood vessels in the blood circulatory system.

In the spaces provided below, write the names of blood vessels A, B and C. [3]

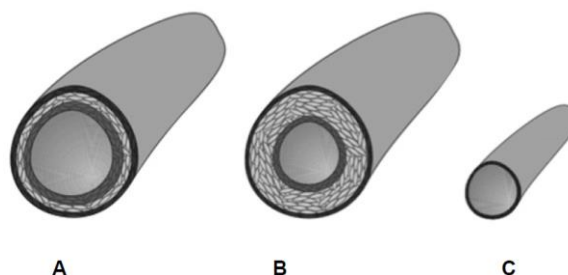


Fig. 2.1: Three types of blood vessels

A: B: C:

The answers were:

A- Vein

B – Artery

C- Capillary

Candidates from the higher-ability group were able to correctly label the three types of blood vessels given. However, some candidates scoring between 25 – 40 marks in the paper could not provide the correct labelling of the blood vessels.

The structure of the blood vessels and how they link to the respective function can be further explored in class. Candidates had particular difficulty in identifying the capillary. Another common difficulty was also to correctly write the names of the different blood vessels.

Item (b)

Match each blood component to its corresponding function.

Blood component
Red blood cell
White blood cell
Blood platelet
Blood plasma

Function
It is involved in blood clotting.
It transports substances around the body.
It pumps blood around the body.
It carries oxygen throughout the body.
It protects the body against diseases.

[4]

Most candidates correctly attempted this item. It has to be noted that an extra option (a distractor) is provided in the second column so that if a candidate wrongly opts for one matching, it is not automatic that another wrong answer will be provided.

Item (c): *What is the colour of blood plasma?*

The correct answer yellowish or light-yellow liquid was provided by most candidates. However, some candidates gave the answer green, red, or white which were not accepted.

It is to be noted that while blood plasma can be found in a wide range of colours, the ‘normal’ colour is yellowish. Other colours of the blood plasma are most of the time associated with certain health conditions or with the intake of certain drugs.

Item (d): *What percentage of blood consists of blood cells and platelets?*

The correct percentage is 45% while that of the plasma is 55%. Only a margin of difference was accepted. Answers such as 4% or 90% were seen in even the ‘good’ scripts.

There are always exceptions in different biological phenomena. However, at this level, students learn about the norms and answers are expected to refer to the norms unless explicitly otherwise requested.

Question 3

Question 3 comprised items on the chapter ‘Nutrition in Plants’. The mean mark in this question was 3.6 over 9 which is the lowest of the question paper. In the first session of the NCE assessment, that is in 2020-2021, the same chapter was the least well attempted by candidates. It was also heavily de-loaded for the first session. The NCE assessment 2021-2022 assessed the whole of the syllabus and all the learning outcomes of the chapter ‘Nutrition in Plants’ could potentially be assessed.

Concepts such as photosynthesis and the factors affecting photosynthesis are introduced to students from the primary level. They also conduct experiments on the importance of light or water at the primary level. Some of the learning outcomes of this chapter are therefore a deepening of the knowledge of students. Other learning outcomes, such as those involving the structure of the leaf, the position of the vascular bundles or the concepts of diffusion and osmosis are new concepts that are introduced in lower secondary.

Given the above, Educators are advised to spend more time on the new concepts introduced as well as in conducting the scientific experiments given. When conducting scientific experiments, the reason why each step in the procedures applied should be clearly explained to students. It was observed that candidates had a lot of difficulty providing explanations in writing and expressing themselves clearly. Such difficulty can result in the loss of marks when the examiner has to guess the meaning of the answer provided.

Comments on each item of Question 3

Item (a)

(a) **Fig. 3.1** shows the cross-section through the leaf of a plant.

Using the words given below, label parts **A, B, C** and **D** on the diagram.

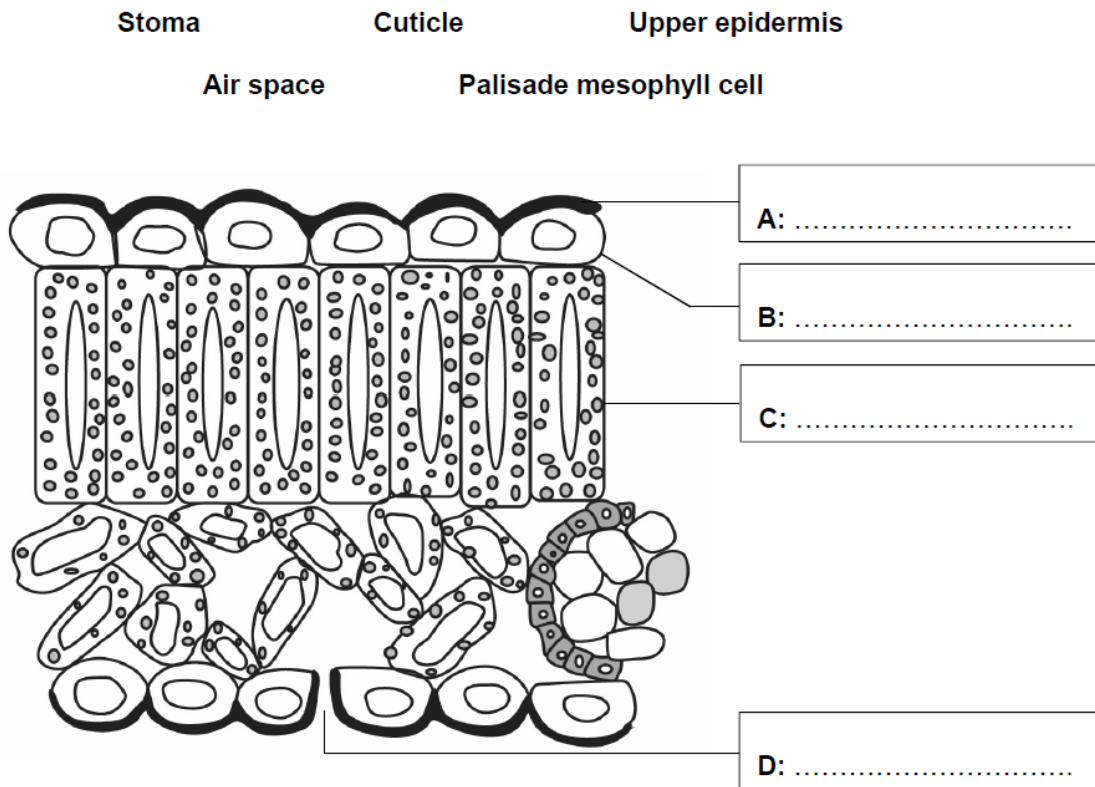


Fig. 3.1: Cross-section through the leaf of a plant

[4]

For 4 marks, candidates had to label the different parts of the cross-section of a leaf. The words were given.

Candidates were confused between the following- Cuticle and Upper epidermis as well as between Stoma and Air space.

A similar diagram is provided in the Grade 9 and Grade 9+ textbooks and students are encouraged to work through it.

Though students learn about the presence of pores (Stomata) in leaves, the labelling of the other parts of the leaf, including the identification of the chloroplasts are new to them in Grade 9. They are encouraged, therefore, to understand the different parts of the leaf as well as to link each part with their function and/or specific characteristics. For example:

- The presence of stomata on the lower surface of the leaf to minimise loss of water vapour.
- The presence of the cuticle on the upper layer to protect the leaf.
- The tightly packed palisade mesophyll cells containing chloroplasts for maximum trapping of sunlight.
- Air space around the spongy mesophyll cell to allow the diffusion of water and air.

Item (b)

- (b) Before the start of an experiment to investigate a factor necessary for photosynthesis, the plant to be used is destarched.

Why is it important to destarch the plant before the start of the experiment?

[1]

Only 11% of candidates scored the 1 mark on this item. This question is based on their knowledge of scientific experimentation. The item assessed the understanding of candidates on why certain conditions have to be measured, controlled or removed before the start of an experiment for the following reasons:

- So that the pre-existing condition does not influence or interfere in the experiment and/or
- To ensure that the results obtained and the conclusion that will be drawn from the experiment is only due to the factor that was varied or tested.

This step in the scientific methodology is applicable to most of the scientific experiments that are carried out. For instance, taking the pulse rate before testing how physical exercises affect the pulse rate is based on the same reasoning.

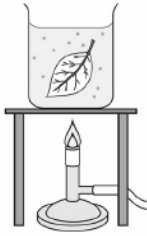

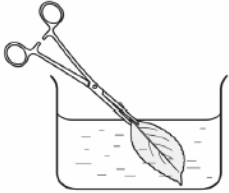
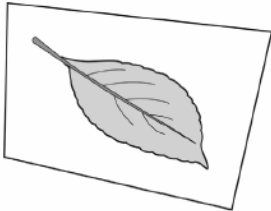
The challenges met by candidates on this item were:

- Difficulty in expressing their idea
- Given the method as to how to destarch a plant
- Stating that the starch has to be removed (which is destarching) without providing the reason why

Item (c)

- (c) Complete **Table 3.1** by giving the **reason** for each of the steps carried out when testing a leaf for the presence of starch.

Table 3.1: Steps to test a leaf for the presence of starch

	Step	Reason
(i)	Put the leaf in boiling water. 
(ii)	Place the leaf in hot alcohol. 
(iii)	Wash the leaf in warm water. 
(iv)	Cover the leaf with a few drops of iodine solution on a white tile. 

[4]

The following observations were made:

- Some candidates were not able to provide any reason

- Many candidates were confused about the reason for each step. While some candidates were aware of the reasons – to stop all chemical reactions in the leaf, to remove the chlorophyll, and to smoothen the leaf – they could not associate them with the correct step in testing a leaf for the presence of starch.
- Candidates had difficulty providing the reason for the last step. The expected answer was to observe any change in colour (which will indicate the presence or absence of starch).

Question 4

This question on the topic ‘Reproduction’ was relatively well attempted. The mean mark was 7.0 over 12.

Some of the types of questions used – labelling or one-word answers, as well as some of the skills tested – biological drawing and extracting information from a table – are expected to be within the reach of most candidates. Indeed, it was observed that some of the lower-ability students (scoring less than a total of 10 marks on the paper) could correctly attempt part (d) and part (e)(i) and (ii) of the question.

Comments on each item

Item (a)

Fig. 4.1 is a front view of the female reproductive system.

- (a) Label parts **W**, **X**, **Y** and **Z** on Fig. 4.1. [4]

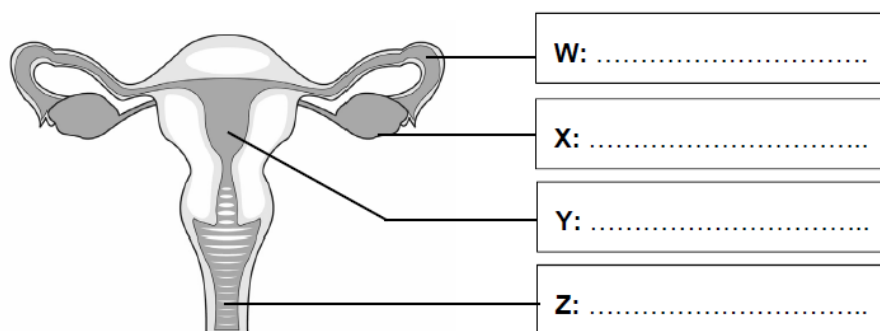


Fig. 4.1: Front view of the female reproductive system

Candidates could score 4 marks for the correct labelling of the different parts of the female reproductive system. This item was relatively well attempted by most candidates though the lower-ability students could only label the vagina correctly.

Item (b): *In which part of the female reproductive system does fertilisation take place?*

A common wrong answer for this part was ‘Uterus’.

The other difficulty was the correct spelling of the word.

Item (c): *What is a fertilized egg called?*

The correct answer ‘zygote’ was provided by only 32% of the candidates.

A common wrong answer was ‘foetus’. The word ‘foetus’ was often wrongly written.

As it was seen in question 3(a), correct labelling is a common question type used at this level when assessing the knowledge of the structure of different organs for instance. It is therefore important that students familiarise themselves with such types of questions. Words may or may not be given but it is also important that the correct spelling of biological terms is provided by candidates.

Item (d)

- (d) **Fig. 4.2** shows the photomicrograph of **Cell A**, an egg (ovum) in the female reproductive system.

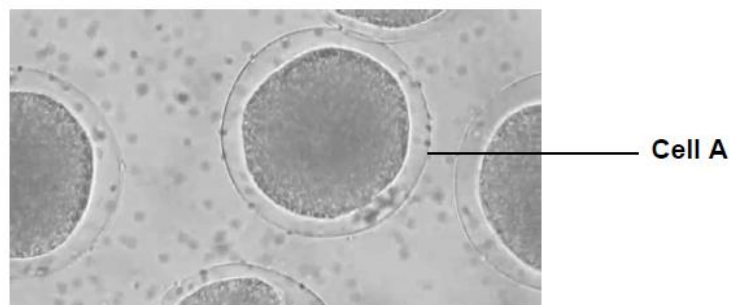


Fig. 4.2: Photomicrograph of an egg (ovum)

In the space below, draw a large diagram of **Cell A**.

This item assessed the ability of students to produce a biological drawing by following all the important rules. These general rules are the following:

- Use of a pencil and not a pen
- Use a sharp pencil which is dark enough
- Drawing is:
 - on the left, labelling on the right when the person is right-handed
 - on the right and labelling on the left for a left-handed person
 - in the centre when no labelling is requested
- Large drawings should be made, using the maximum space provided. The drawing should be larger than the specimen provided.
- The drawing should be an accurate representation of the specimen provided
- The proportions of the different structures in the specimen should be appropriate
- Clear, continuous and sharp lines should be used
- No shading or stippling is allowed
- Labelling lines should not cross each other and parallel lines should be used as far as possible. These lines should not be drawn as arrows.

For this particular item, the drawing should have been a clear representation of cell A with the proportion respected. Continuous lines should have been used and no shading of the drawing should have been carried out.

This is an item which should be within the reach of the majority of candidates as it requires no recalling or application of knowledge to a particular context. Educators are therefore encouraged to work on the development of this skill. Questions assessing biological drawing skills can range from 2 to 4 marks depending on the expectations in the demonstration of the rules applicable in biological drawings.

Item (e)

Table 4.1 shows the number of new HIV cases in Mauritius from 2010 to 2020.

Table 4.1: Number of new HIV cases from 2010 to 2020

Year	Number of new cases of HIV
2010	580
2012	327
2014	333
2016	329
2018	406
2020	164

(i) What is the number of new HIV cases in 2016?

Most candidates correctly read from the table and provided the answer 329.

(ii) How is HIV transmitted?

This item required more than a one-word answer to explain the different ways of transmission of the HIV virus. As such, answers such as ‘sexual’ only should be discouraged and students should be encouraged to express themselves better instead.

The use and understanding of the requirements of different command words is important.

(iii) Suggest two reasons why the number of new cases of HIV has dropped from 580 in 2010 to 164 in 2020.

While some candidates correctly provided two answers which included measures such as educating the public on the ways of transmission or use of condoms by more people, many had difficulties in providing the correct answer. Wrong answers arose from the following:

- Difficulties in expressing their ideas
- Description of the trend of providing numbers from the table rather than the reasons requested.
- Providing reasons for an increase in the number of HIV cases.

Question 5

Question 5 was on the topic 'Biodiversity'. The mean mark for this question was 6 out of 10.

Comments on specific items

Item (a)

Name an animal which is overexploited for each of the following reasons:

(i) Hunted for their tusks which are used to produce ivory.

(ii) Hunted for their fur.

A better performance was expected on this item. Around 46% of the candidates found the answer elephant for the first part and 60% gave a correct animal which is overexploited and hunted for its fur.

The words 'overexploited' and 'hunted' should not have been overlooked. Answers such as dogs or cats were not accepted. The rhinoceros was also not accepted as although overexploited for its tusk, the latter is not made out of ivory.

It was also observed that some candidates provided answers which are often associated with concepts of extinction, endemic etc. As such answers like the Dodo or the Kestrel were seen but were wrong.

Item (b)

Item (b) was based on the following graph.

(b) In 1973, only 2% of the population of the Mauritius Kestrel remained in the wild.

The graph shown in Fig. 5.1 shows the population of the Mauritius Kestrel from 1974 to 1994.

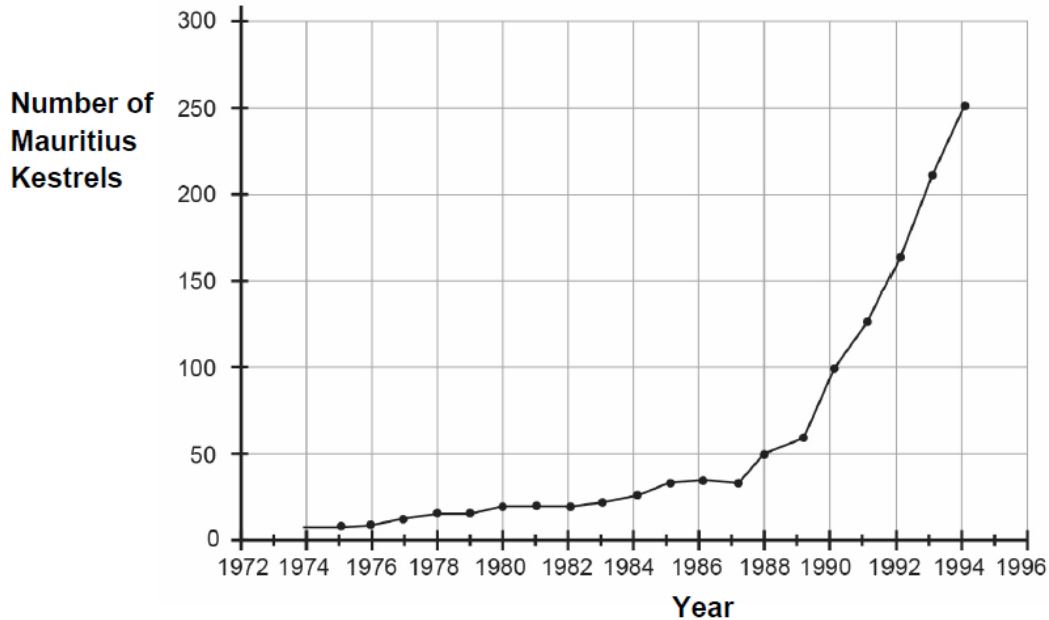


Fig. 5.1: Graph of the population of the Mauritius Kestrel from 1974 to 1994.

(i) What is the approximate number of Mauritius Kestrel in 1988 and 1994?

Candidates from all ability groups attempted this question well.

(ii) Describe the trend in the population of the Mauritius Kestrel from:

1974 to 1987: _____

1987 to 1994: _____

[2]

Candidates had more difficulties in describing the trend of the graph shown. Expected answers when describing the trend of a graph or a bar chart or information provided in a table should include the following:

- The type of change happening - The use of words such as rise, grow, escalate or increase can be used to describe upward movements. The words fall, decrease, drop, go down are appropriate to describe the downward movement. Words such as stabilize, flatten out or constant can be used to explain the horizontal shape of a graph. The words vary or fluctuate can be used to describe upward and downward movements.

- The degree of the change – The use of adjectives such as sudden, sharp, quick, gradual, slow, significant, steady or small are to be encouraged. Adverbs such as swiftly, slowly, considerably, moderately or rapidly can also be used.
- The use of figures from the chart or the table to support the description of the trend.

In many cases, one or two of the above were missing in the description of the trend of the graph. Moreover, a significant number of candidates provided an explanation for the increase in the number of Mauritius Kestrel rather than giving the description of the trend of the graph.

Item (c)

Suggest two human activities which might have led to the decrease in the population of the Mauritius Kestrel in the past.

Generally, candidates were able to provide at least one reason for the decrease in the number of the Mauritius Kestrel. The idea of the destruction of their habitat or deforestation was more common than other correct answers such as the introduction of preys which ate their eggs. One difficulty candidate encountered was to provide two different ideas and not a single idea expressed in different words.

Item (d)

- (d) Between 1981 and 1986, 28 fertilised eggs and 2 young Mauritius Kestrels were removed from the wild as a conservation measure to increase their population.

What is this conservation measure called?

_____ [1]

Candidates were expected to give the answer ‘Captive breeding’. While many could read with understanding, they could not recall the appropriate term for this conservation measure. Common wrong answers included nature reserve, preservation, conservation or reproduction.

Item (e)

What may happen to endangered organisms if conservation measures are not taken?

Many candidates provided a correct answer though most of the time the answers provided were very simplistic, for instance ‘there will be no more’.

Other Comments

The use and application of certain mathematical skills is very important in Biology. For instance, candidates are expected to be able to draw graphs from different sources of data or use mathematical formulae to calculate magnification or average.

Graphs

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

Bar charts are used in Biology when the data is not continuous, that is, it is discrete. On the other hand, line graphs are favoured when the data is continuous.

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.

Other important rules when drawing graphs are:

- Axes should be labelled.
- Appropriate scale should be used on the axes. The maximum space available on the grid should be used and thus the scale should be sufficiently spaced out.
- Accurate plotting using a sharp pencil. Pens should not be used to draw graphs.

Concluding Remarks

In general, performance in Biology was satisfactory. The following is recommended:

- Students should be encouraged to write down their answers and to express themselves concisely and clearly.
- The expectations from the use of different command words should be reinforced.
- Students should develop certain important skills such as drawing of graphs, biological drawing, use of mathematical skills in Biology.

