



Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Departement van Onderwys
Porafensie Ya Kapa Botjhabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 11

6 SEPTEMBER 2024



LIFE SCIENCES CONTROLLED TEST

MARKS: 50

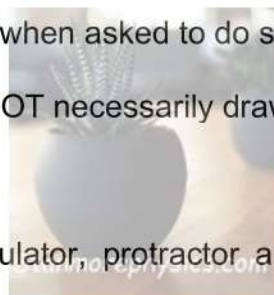
TIME: 1 hour

This question paper consists of 9 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your ANSWER BOOK.
3. Start the answer to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, protractor and a compass where necessary.
11. Write neatly and legibly.



SECTION A

QUESTION 1

- 1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.4) in the ANSWER BOOK, for example 1.1.5 D.

1.1.1

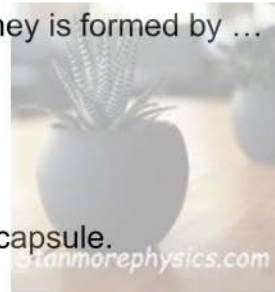
Which structural characteristic is NOT a requirement for an efficient gaseous exchange system?

- A A thin gaseous exchange surface
- B An efficient transport network
- C An effective ventilating mechanism
- D A small surface area

1.1.2

The Malpighian body in the kidney is formed by ...

- A capillary network.
- B bowman's capsule.
- C ciliated tubules.
- D glomerulus and Bowman's capsule.



1.1.3

Microvilli are found on cells lining the ...

- A loop of Henle.
- B proximal convoluted tubule.
- C distal convoluted tubule.
- D Bowman's capsule.

1.1.4

The table below shows the percentage composition of inhaled and exhaled air.

Gas	Inhaled air (1%)	Exhaled air (%)
Oxygen	21	16
Carbon dioxide	0,04	4
Nitrogen	78	78
Water vapour	0,96	2

The difference in the percentage of oxygen in inhaled and exhaled air is due to ...

- A oxygen dissolving in the alveolus.
- B oxygen gas which cannot diffuse through blood capillaries.
- C oxygen combining with haemoglobin.
- D our cells using oxygen from the inhaled air to release energy and giving out carbon dioxide as by product.

(4 x 2)

(8)

- 1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.4) in the ANSWER BOOK.



- 1.2.1 The type of epithelium lining the blood capillary around the alveolus
- 1.2.2 The control centre that is activated when carbon dioxide levels increase in the blood
- 1.2.3 Thin-walled sacs with a large surface area for gaseous exchange in the human lungs
- 1.2.4 The main form in which carbon dioxide is transported in blood (4)

- 1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.2) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Contains C- shaped cartilaginous rings	A:	Bronchiole
		B:	Trachea
1.3.2	Involved in inhalation and exhalation	A:	Intercostal muscles
		B:	Diaphragm

(2 x 2)

(4)

TOTAL SECTION A:

(16)

SECTION B

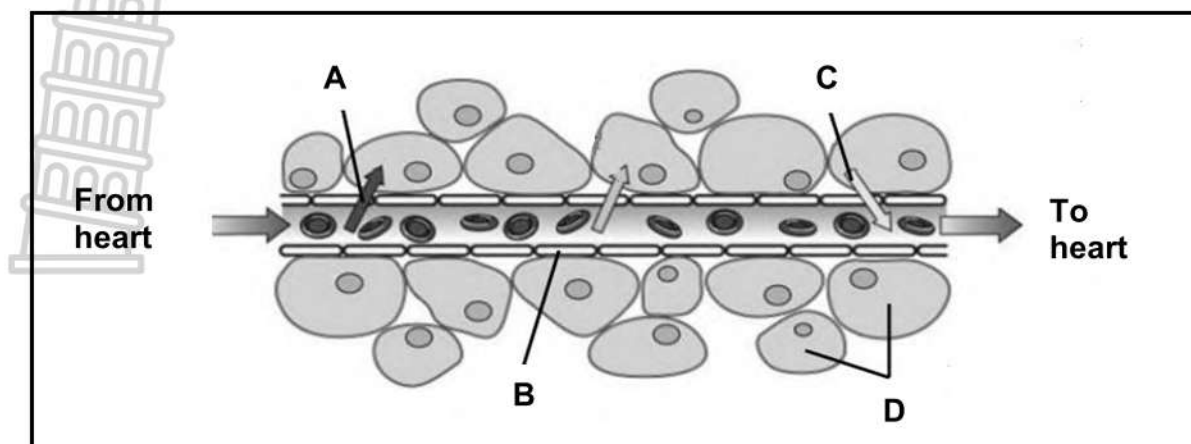
QUESTION 2

- 2.1 The table below represents the number of different plant species in a 500m² forest using a 1m² quadrat.

	Sample area 1	Sample area 2	Sample area 3	Average species number
Lichens	15	6	20	14
Mosses	5	5	4	5
Dandelions	3	6	8	X

- 2.1.1 Determine the average number of dandelions at X. Show ALL the calculations. (2)
- 2.1.2 Draw a bar graph to represent the number of lichens and mosses in each quadrat. (6)
- 2.1.3 Estimate the population size of lichens using the formula: (2)
- Population size = $\frac{\text{average number organisms in sample area} \times \text{habitat area}}{\text{sample area}}$
- 2.1.4 Why was the population size estimate calculated on three sample areas instead of one? (1)
- (11)

2.2 The diagram below represents gaseous exchange at tissue level.



2.2.1 Identify gases indicated as:

(a) **A**

(b) **C**



(1)

(1)

2.2.2 State TWO ways in which gas **A** is transported in the blood.

(2)

2.2.3 The red blood cells are squeezed by the capillary and move in single file (one after the other) inside the blood capillary.

Explain how this promotes efficient oxygen transport.

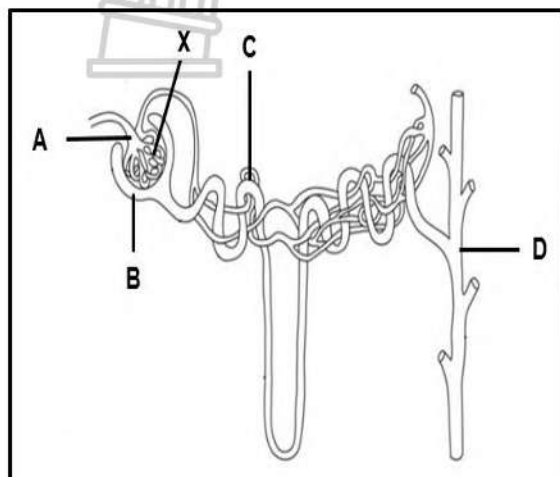
(2)

(6)

(17)

QUESTION 3

- 3.1 An investigation was carried out to determine the flow rate and composition of fluids in the human kidney. Samples of fluid were taken at regions A, B, C and D as shown on the diagrams. The results obtained are given in the table below.



Region	Flow rate (cm ³ /min)	Solute concentration (g/100cm ³)		
		Plasma proteins	Glucose	Urea
A	1000	7.5	0.1	0.04
C	100	0.0	0.1	0.04
D	20	0.0	0.0	0.15

3.1.1 Name the urine forming process occurring at structure **X**. (1)

3.1.2 Identify the parts labelled:

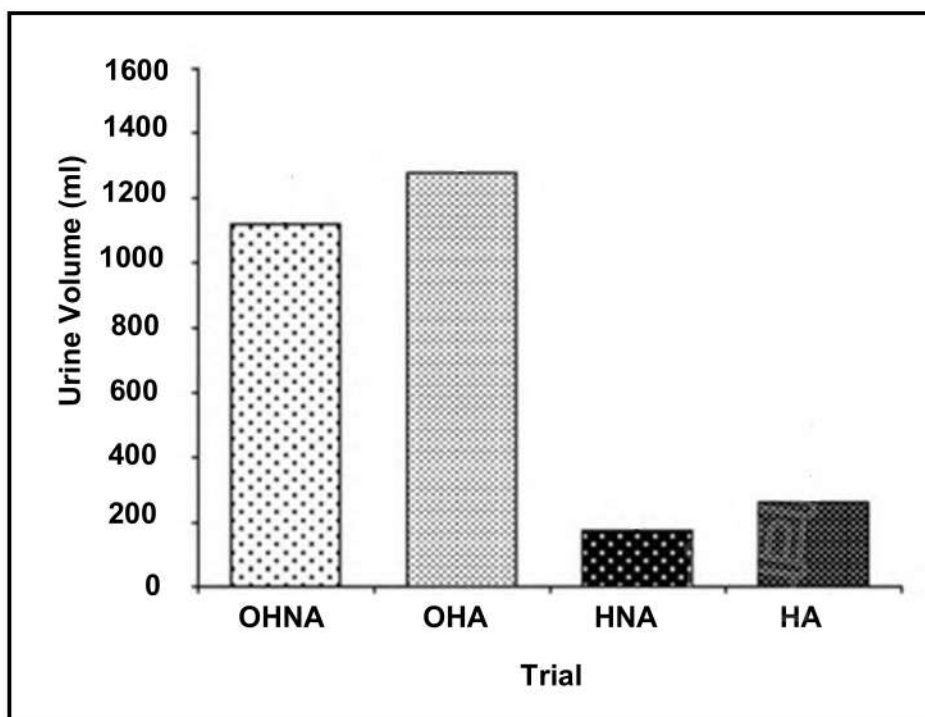
(a) **A** (1)

(b) **B** (1)

3.1.3 Explain the difference in the amount of urea from region **A** to **D**. (2)
(5)

3.2 Scientists wanted to determine how drinking a dilute alcohol solution by optimally hydrated and hypo hydrated individuals affects urine production.

- Twelve healthy 23-year-old male volunteers with an average body mass of 76.6 kg participated in this investigation.
- Four different trials were conducted with a seven-day rest period between each trial.
- In the evening before each trial, individuals were dehydrated through extensive exercise in hot humid conditions.
- The four experimental trials were as follows:
 - Trial 1 (OHNA) Optimally hydrated and drank 1 litre of a non-alcoholic beverage
 - Trial 2(OHA) -Optimally hydrated i.e. given enough fluid with meals after exercise to restore optimum water levels in the blood and drank 1 litre of alcoholic beverage
 - Trial 3(HNA),)-Hypo-hydrated i.e. were given less water with meals after exercise 1 litre of a non-alcoholic beverage
 - Trial 4(HA)- Hypo-hydrated and drank 1 litre of alcoholic beverage
- After each trial their urine was collected every hour for a duration of 4 hours and the average urine volume was calculated.
- The results of the investigation are given below:



3.2.1 Identify the following from the investigation above:

(a) Independent variable (1)

(b) Dependent variable (1)

3.2.2 State TWO ways in which the validity of the results was ensured. (2)

3.2.3 How can the reliability of this investigation be further improved? (1)

3.2.4 Provide a possible conclusion for this investigation. (2)

3.2.5 Describe how the human body responds to low water concentration in the blood. (5)
(12)
(17)

TOTAL SECTION B:	34
GRAND TOTAL:	50





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CONTROLLED TEST TERM 3 2024

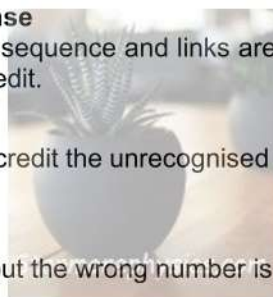
LIFE SCIENCES
MARKING GUIDELINES

MARKS: 50

This marking guideline consists of 6 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information is given than marks allocated**
Stop marking when maximum marks are reached and put a wavy line and write 'max' in the right-hand margin.
2. **If, for example, three reasons are required and five are given**
Mark the first three irrespective of whether all or some are correct/incorrect.
3. **If whole process is given when only a part of it is required**
Read all and credit the relevant part.
4. **If comparisons are asked for but descriptions are given**
Accept if the differences/similarities are clear.
5. **If tabulation is required but paragraphs are given**
Candidates will lose marks for not tabulating.
6. **If diagrams are given with annotations when descriptions are required**
Candidates will lose marks.
7. **If flow charts are given instead of descriptions**
Candidates will lose marks.
8. **If sequence is muddled and links do not make sense**
Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.
9. **Non-recognised abbreviations**
Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of the answer if correct.
10. **Wrong numbering**
If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.
11. **If language used changes the intended meaning**
Do not accept.
12. **Spelling errors**
If recognisable, accept the answer, provided it does not mean something else in Life Sciences or if it is out of context.
13. **If common names are given in terminology**
Accept, provided it was accepted at the provincial memo discussion meeting.
14. **If only the letter is asked for but only the name is given (and vice versa)**
Do not credit.
15. **If units are not given in measurements**
Candidates will lose marks. Marking guideline will allocate marks for units separately.
16. **Be sensitive to the sense of an answer, which may be stated in a different way.**
17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.
18. **Code-switching of official languages (terms and concepts)**
A single word or two that appear(s) in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.
19. **Changes to the marking guideline**
No changes may be made to the marking guideline without consulting the provincial internal moderator.



SECTION A

QUESTION 1

1.1 1.1.1 D✓✓

1.1.2 D✓✓

1.1.3 B✓✓

1.1.4 D✓✓

(4 X 2) (8)

1.2 1.2.1 Squamous epithelium✓

1.2.2 Medulla Oblongata✓

1.2.3 Alveoli✓/alveolus

1.2.4 Bicarbonate ion✓ /HCO₃²⁻

(4 X 1) (4)

1.3 1.3.1 B only✓✓

1.3.2 Both A and B✓✓

(2 x 2) (4)

TOTAL SECTION A: 16

SECTION B

QUESTION 2

2.1 2.1.1 $3+6+8=17$ ✓

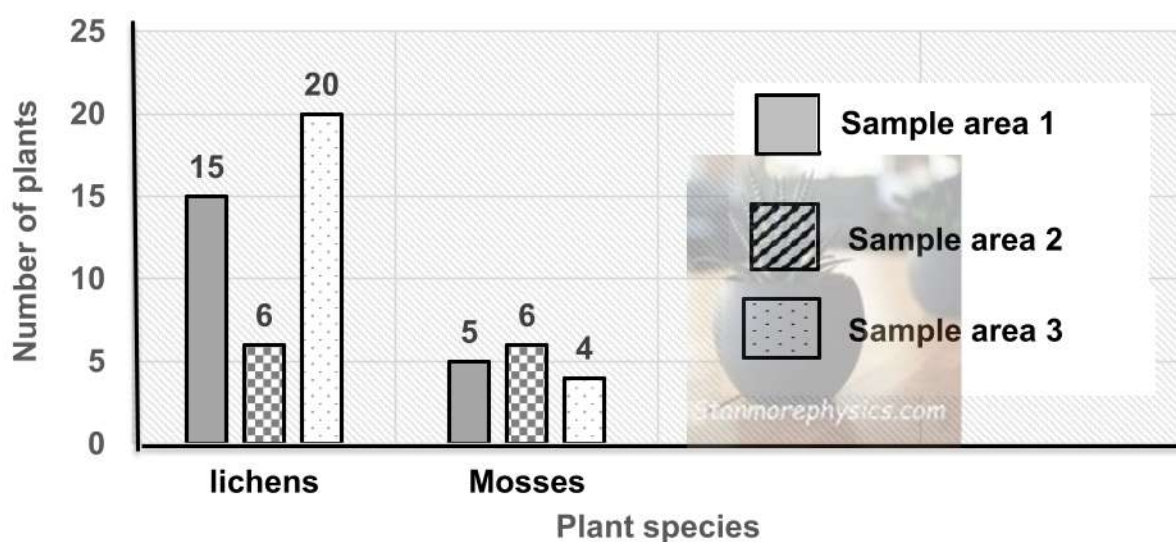
$17/3=6$ ✓

Average number of dandelions = 6

(2)

2.1.2

Number of lichens and mosses in three sampled areas.



Rubric for a graph

Type (T)	✓
Caption (C) with both variables	✓
X and Y axes label (L)	✓
Scale on Y and X axes(equal width and spacing between bars (S)	✓
All 6 bars accurately plotted(P)	✓✓
Only 1 to 5 bars accurately plotted	✓

(6)

2.1.3 $\frac{14 \times 500 \text{ m}^2}{1 \text{ m}^2}$ } ✓
=2500✓

(2)

2.1.4 It was to ensure the reliability of the investigation✓

(1)

(11)

- 2.2 2.2.1 (a) Oxygen✓ / O_2 (1)
- (b) Carbon Dioxide✓ / CO_2 (1)
- 2.2.2 Dissolved in blood plasma ✓
 Combined with hemoglobin/ oxyhaemoglobin✓ (2)
- 2.2.3 – Increases/ maximizing surface area✓
 for maximum uptake of oxygen✓ / ensures that each red blood
 cell is able to transport oxygen / provides a longer time for
 oxygen uptake (2)
(6)

QUESTION 3

- 3.1 3.1.1 Ultra filtration✓ / Glomerular filtration (1)
- 3.1.2 (a) Afferent arteriole✓ (1)
- (b) Bowman's Capsule✓ (1)
- 3.1.3 – Urea in the blood capillaries and around and walls of the
 collecting tubules is pumped into the collecting duct ✓
 thus increasing urea concentration✓

OR

- Many collecting ducts from different nephrons pour their content
 including urea into the main collecting duct ✓ (Duct of Bellini)
 thus increasing the concentration of urea✓ compared to the one
 filtered in the glomerulus.

OR

- Water reabsorption in the proximal convoluted tubule results in
 the same amount of solute dissolving in a smaller amount of
 water✓
 thus increasing the urea concentration✓ (2)

3.2	3.2.1	(a) drinking alcoholic / non-alcoholic beverage✓ (b) urine production✓		(1) (1)
	3.2.2	Same: – body mass✓ – age✓ – health status✓ – amount of liquid✓ – exercise✓/duration of exercise	Any	(2)
		(Mark first TWO only)		
	3.2.3	Increase sample size✓ Repeat the investigation✓	Any	(1)
	3.2.4	Optimally hydrated individuals that drank alcoholic beverage produced more urine compared to hypo hydrated individuals that also drank alcoholic beverage✓✓		(2)
3.2.5		- Low levels of water in the blood are detected by osmoreceptors✓* - The receptors send an impulse to the hypothalamus✓ - Hypothalamus sends an impulse to the pituitary gland✓ - which releases/ secretes the stored ADH✓ - ADH is transported by blood to the kidney✓, - where it causes kidney tubules to become more permeable to water✓ - There is more water reabsorption into the blood capillaries✓ - resulting in the water level returning to normal✓*		
			* 2 Compulsory + Any 3	(5)
		TOTAL SECTION B:		34
		GRAND TOTAL:		50