Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2022

LIFE SCIENCES P2

MARKS: **150**

TIME: **2½ hours**

This question paper consists of 18 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the 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 must use a non-programmable calculator, protractor and a compass, where necessary.
11. Round off all calculations to TWO decimal spaces.
12. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.9) in your ANSWER BOOK, for example 1.1.10 D.

1.1.1 The kingdom to which prokaryotic, unicellular organisms belong:

A Protista
B Fungi
C Virus
D Monera

1.1.2 Which of the following is a characteristic feature of a virus?

A Cell membrane
B Protein coat
C Nucleus
D Chromosomes

1.1.3 Which of the statements below represent a similarity between Bryophytes and Pterophytes?

A Both divisions have vascular tissue
B Both divisions reproduce by means of spores
C Both divisions have a dominant sporophyte generation
D Both divisions are thallus plants

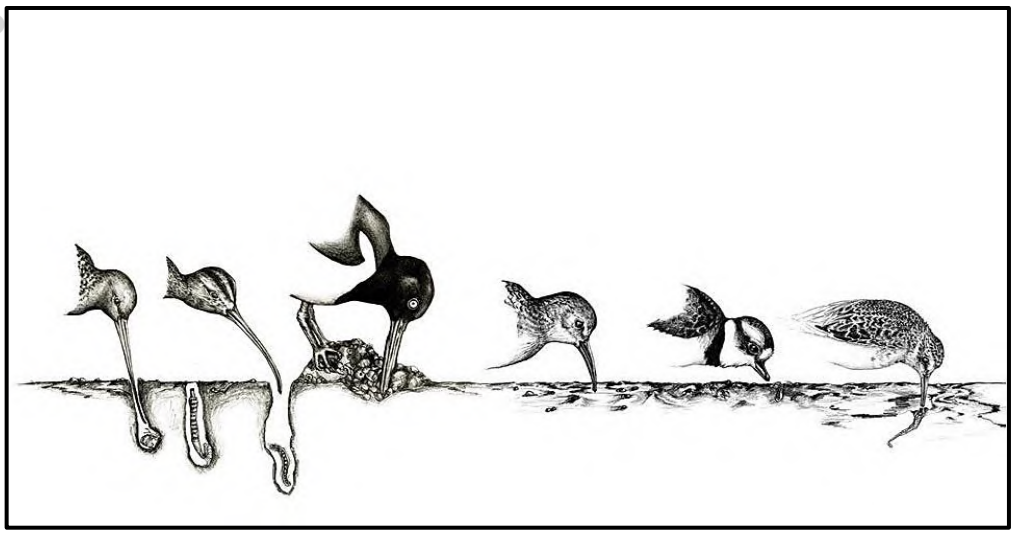
1.1.4 Study the list below:

(i) Offspring are genetically identical to the parent
(ii) Offspring are genetically different from each other
(iii) Only one individual is required for reproduction
(iv) Increases chance of survival

Which of the above statements represent an advantage of sexual reproduction?

A (i) and (ii)
B (ii) and (iii)
C (ii), (iii) and (iv)
D (ii) and (iv)

1.1.5 Study the picture below which shows the feeding habits of six birds that all live on the same muddy lake shore.



Which of the following community interactions does this picture best represent?

A Parasitism
B Mutualism
C Resource partitioning
D Commensalism

1.1.6 Seeds that are not enclosed in a fruit:

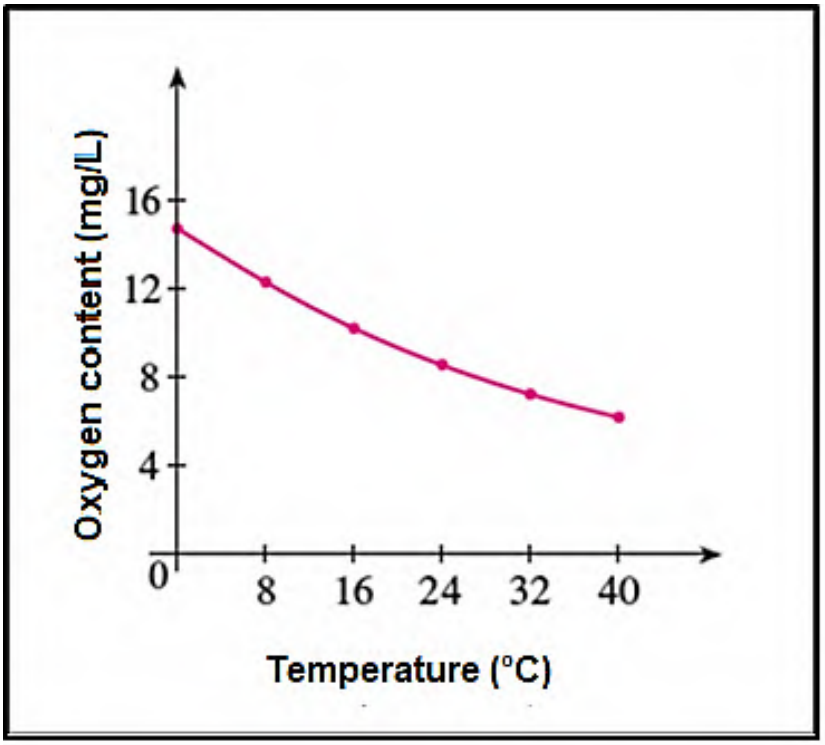
A Nuts
B Spores
C Naked seeds
D Cones

1.1.7 Which of the following would most affect the quality of water?

A Building of a dam in a water catchment area
B The construction of a golf estate on a wetland area
C Alien invasive plants growing around a dam
D Seepage of water through pyrite rock in mines

The following graph refers to QUESTION 1.1.8 and 1.1.9.

Thermal pollution affects the amount of dissolved oxygen present in water. The graph below indicates how the oxygen content of water in a river changes with an increase in temperature.



1.1.8 The following conclusion can be drawn from the graph:

A As temperature increases the oxygen content increases
B At 24 °C the oxygen content of the water would have halved
C As water temperature increases the oxygen content decreases
D A further increase in temperature would increase oxygen levels in the water

1.1.9 A certain species of fish can survive in water with a minimum oxygen content of 8 mg/L.
At which temperature would you expect to find this fish in the river?

A 40 °C
B 35 °C
C 32 °C
D 24 °C

(9 x 2) (18)

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.8) in the ANSWER BOOK.

1.2.1 Symmetry found in Porifera

1.2.2 Dominant generation in the life cycle of ferns

1.2.3 Name the vector responsible for transmitting malaria

1.2.4 The male whorl of a flower

1.2.5 Using an organism's natural predator to control their number

1.2.6 The close relationship between two organisms where both organisms benefit

1.2.7 Illegal hunting or removal of organisms

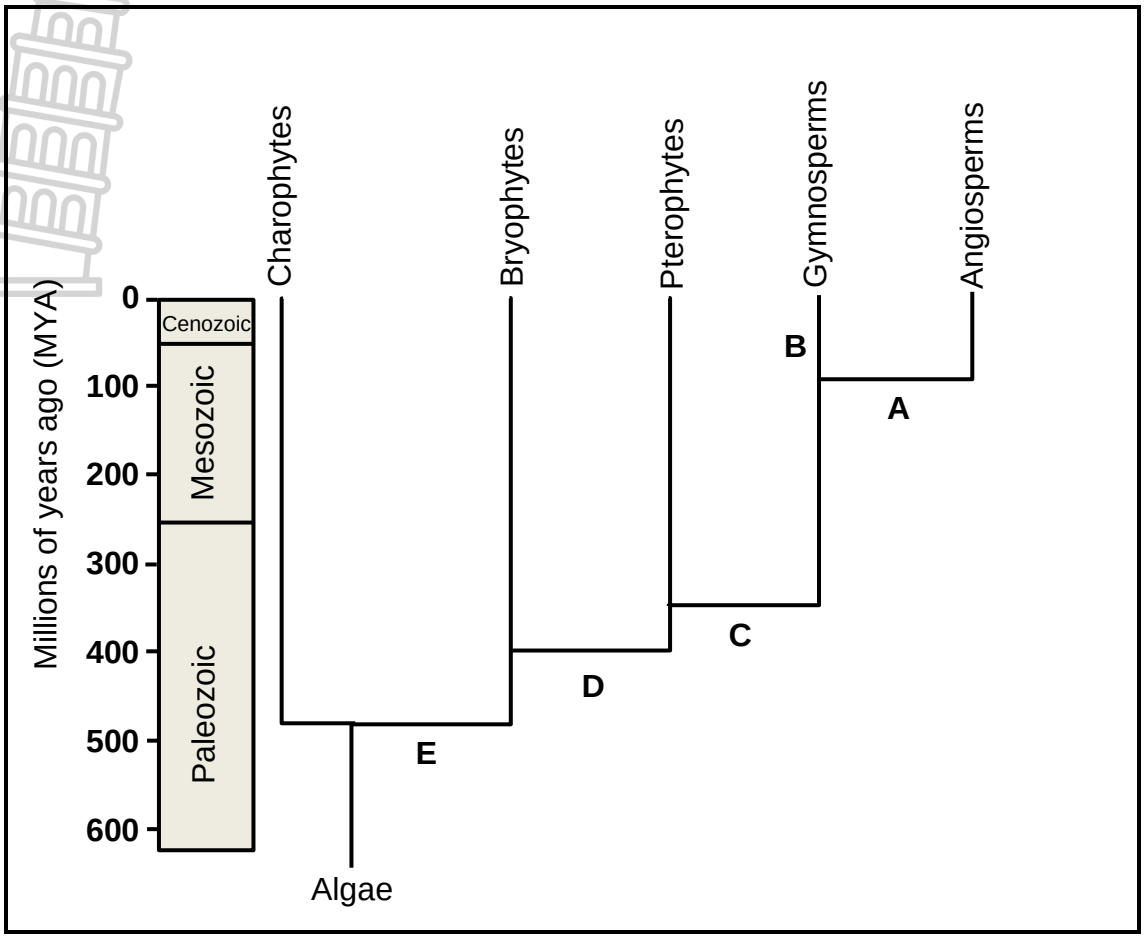
1.2.8 Growing only one type of crop over a given area (8 x 1) (8)

1.3 Indicate whether each of the statements 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 numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Advantage of fungi	A	Wine
		B	Yoghurt
1.3.2	Root-like structures in moss	A	Thallus
		B	Hyphae
1.3.3	Eutrophication	A	High nutrient content
		B	Algal bloom

(3 x 2) (6)

1.4 Study the diagrams below.



1.4.1 Name the kingdom to which the above organisms belong. (1)

1.4.2 Name the plant divisions that were found on earth during the Palaeozoic era. (2)

1.4.3 How many million years ago did seed plants arise on earth? (1)

1.4.4 Give the scientific name for the division in which liverworts, hornworts and mosses are found. (1)

1.4.5 Which LETTERS represent the following characteristics?

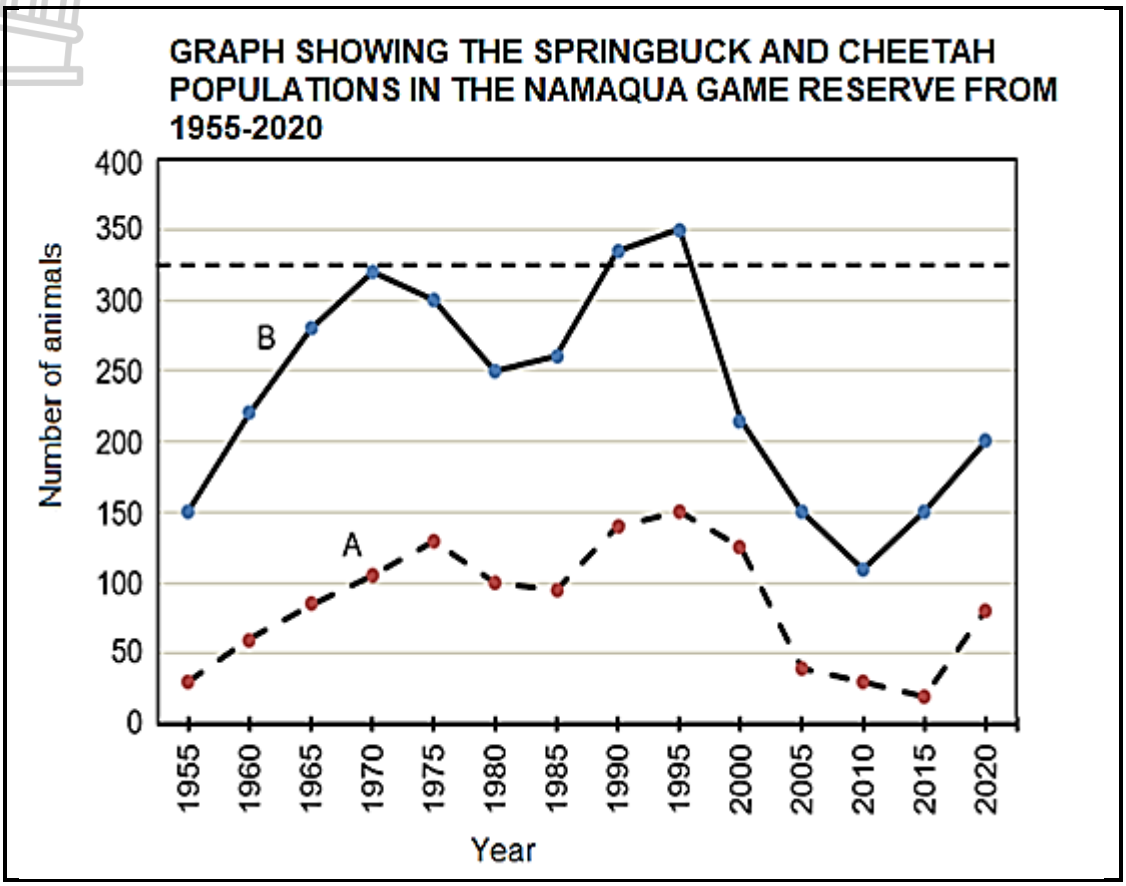
(a) Vascular tissue (1)

(b) Fruit (1)

1.4.6 What is considered to be the ancestor of all land plants? (1)

1.5 The data in the graph below represents the number of springbuck and cheetah in the Namaqua Game Reserve over 65 years. The springbuck is the natural prey of cheetah.

The natural carry capacity for springbuck in this reserve is 325. After this number was exceeded the management of the reserve decided to introduce a culling program.



1.5.1 Name the relationship between cheetahs and springbucks. (1)

1.5.2 Provide definitions for the following words:

(a) Carrying capacity (2)

(b) Culling (2)

1.5.3 Which line (**A** or **B**), represents the cheetah population? (1)

1.5.4 Between which years did the springbuck population exceed the carrying capacity? (2)

1.5.5 In which year was the culling programme introduced for springbuck, according to the graph? (1)

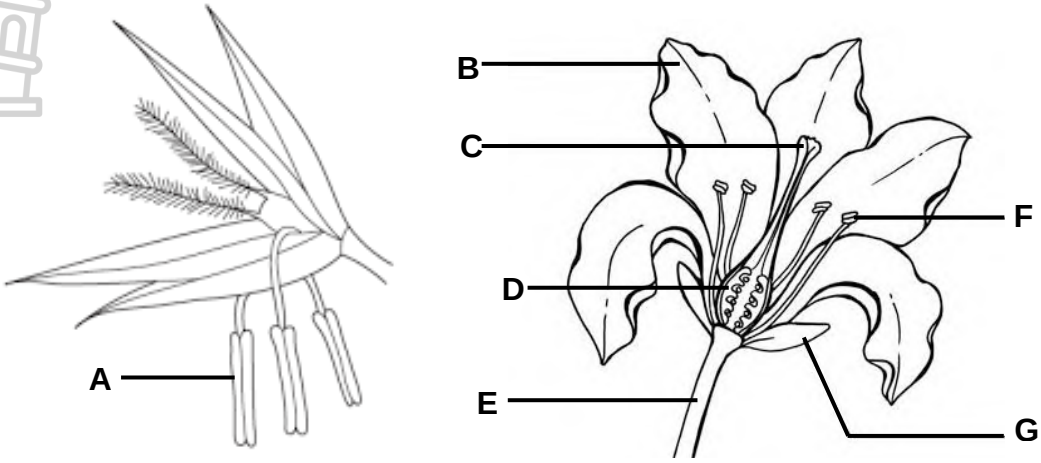
1.5.6 Name ONE other density dependant factor, besides predation, that could naturally reduce the springbuck population. (1)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Study the diagrams of the two flowers below.



Flower 1 **Flower 2**

2.1.1 Name the division/taxa to which flowering plants belong. (1)

2.1.2 Supply labels for:

(a) Structure **A**

(b) Whorl **B**

(c) Structure **C** (3)

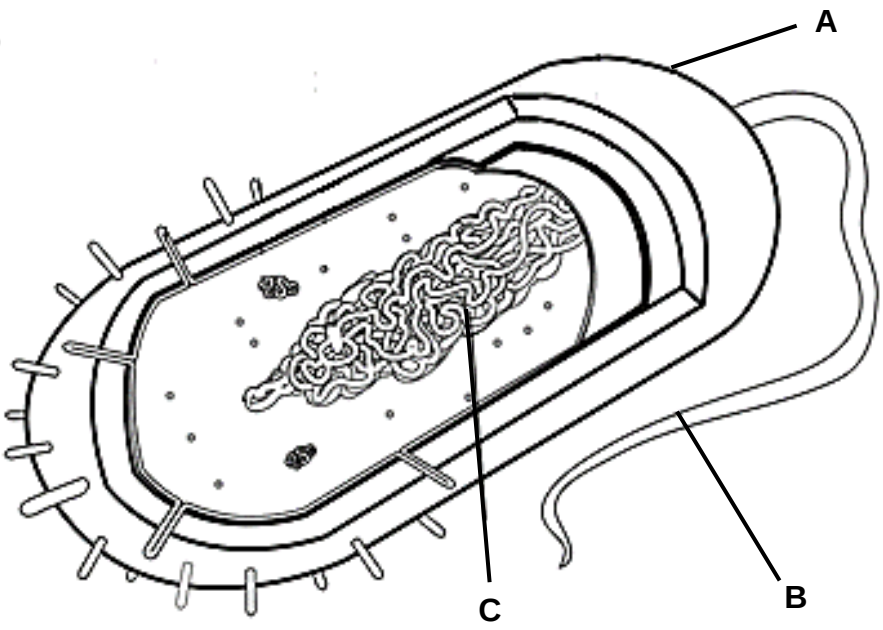
2.1.3 Give the LETTERS of the parts of **Flower 2** that will drop off soon after fertilisation has occurred. (2)

2.1.4 Which flower (**1** or **2**) above, is wind pollinated? (1)

2.1.5 Give TWO visible reasons for your answer in QUESTION 2.1.4. (2)

2.1.6 Name TWO unique features of flowering plants that have allowed them to become the dominant plant species on Earth. (2)

2.2 Study the diagram and read the passage below.



SOUTH AFRICA PERSPECTIVE: TUBERCULOSIS

Tuberculosis (TB) is caused by the bacterium *Myobacterium tuberculosis* and is a serious public health issue in South Africa. About 450,000 people develop the disease every year, and 270 000 of those are also living with HIV. TB is South Africa's leading cause of death. About 89 000 people die from it every year; that's ten people every hour.

HIV infection is a key factor in the TB epidemic. HIV sufferers have a higher risk of contracting TB and a greater chance of dying as they have a weaker immune system.

A vaccine, called the BCG (bacille Calmette-Guerin) is used to prevent TB. It is more effective in children and its efficacy in adults is inconsistent.

[Adapted from https://www.copenhagenconsensus.com-South Africa Perspective: Tuberculosis]

2.2.1 Name the genus to which the bacterium causing TB belongs. (1)

2.2.2 Why is a bacterium considered prokaryotic? (1)

2.2.3 Label structures: (3)

(a) **A**

(b) **B**

(c) **C**

2.2.4 Explain how the BCG would give immunity. (3)

2.2.5 Tabulate ONE difference between a virus and a bacteria. (3)

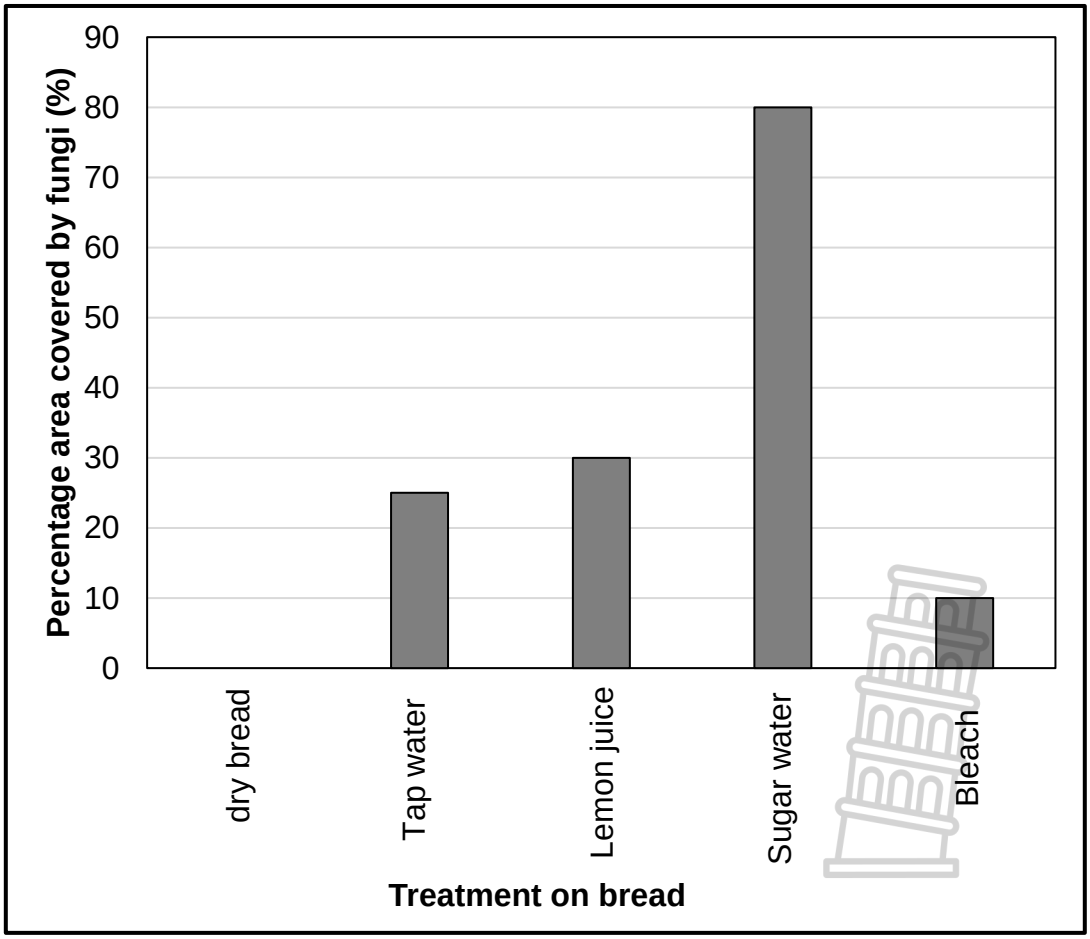
2.2.6 Explain why HIV patients have a higher risk of contracting TB and dying. (2)

2.3 Amahle conducted an investigation to determine how different treatments affect the amount of fungi that grows on bread.

- She took five slices of bread and treated each in a different way as follows:

Slice 1: was left dry
Slice 2: added 20 mℓ tap water
Slice 3: added 20 mℓ lemon juice
Slice 4: added 20 mℓ sugar water
Slice 5: added 20 mℓ bleach (Jik)

- A spray bottle was used to apply the treatment to make sure that it was evenly spread on the bread.
- Each slice was placed in a ziplock bag and kept in a cupboard for one week.
- After one week the bread was removed from the ziplock bags and she observed the growth of the fungi.
- She calculated the percentage area of the bread covered by fungi.
- The results are shown in the graph below.



2.3.1 Why did Amahle put the bags in the cupboard? (2)

2.3.2 Name the independent variable. (1)

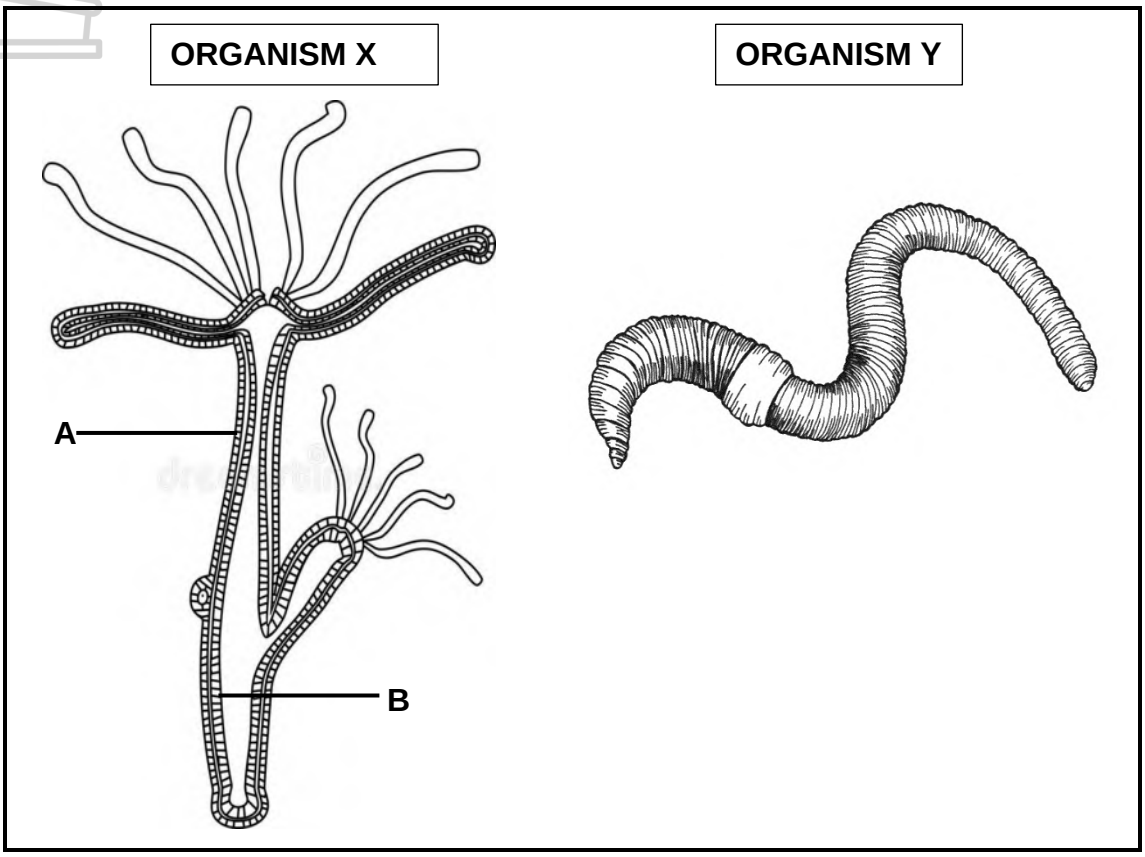
2.3.3 Explain why the dry bread was included in the experiment. (1)

2.3.4 State ONE way Amahle can improve the reliability of her investigation. (2)

2.3.5 Explain why fungi grows best on bread sprinkled with sugar water. (1)

2.3.6 Give TWO ways Amahle ensured that the results of this investigation were valid. (2)

2.4 The diagrams below show animals that belong to two different phyla.



2.4.1 Name the kingdom to which both organisms belong. (1)

2.4.2 Name the phyla to which ORGANISM X belongs. (1)

2.4.3 What type of symmetry is shown by ORGANISM Y? (1)

2.4.4 Provide labels for tissue layers:

(a) **A**

(b) **B** (2)

2.4.5 Describe the role that ORGANISM Y plays in maintaining 'healthy' soil for plants to grow in. (4)

2.4.6 Write a comparison, of how the plans of the two organisms above are suited to their respective mode of movement. (4 x 2) (8)

[50]

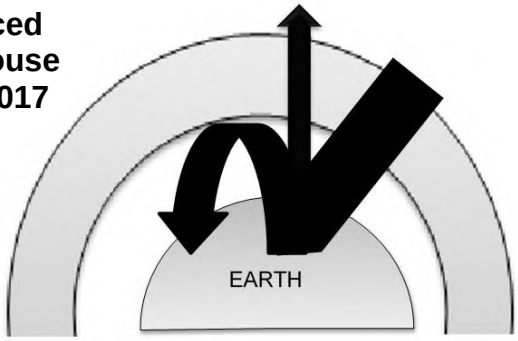
QUESTION 3

3.1 The table below shows the average atmospheric carbon dioxide level over 60 years.

Year	CO_2 Concentration (parts per million)
1962	318,46
1967	322,13
1972	327,52
1977	333,88
1982	341,09
1987	348,99
1992	356,36
1997	363,84
2002	373,08
2007	383,79
2012	393,85
2017	406,55

DIAGRAM 1: Greenhouse effect 1962

DIAGRAM 2 Enhanced Greenhouse effect 2017



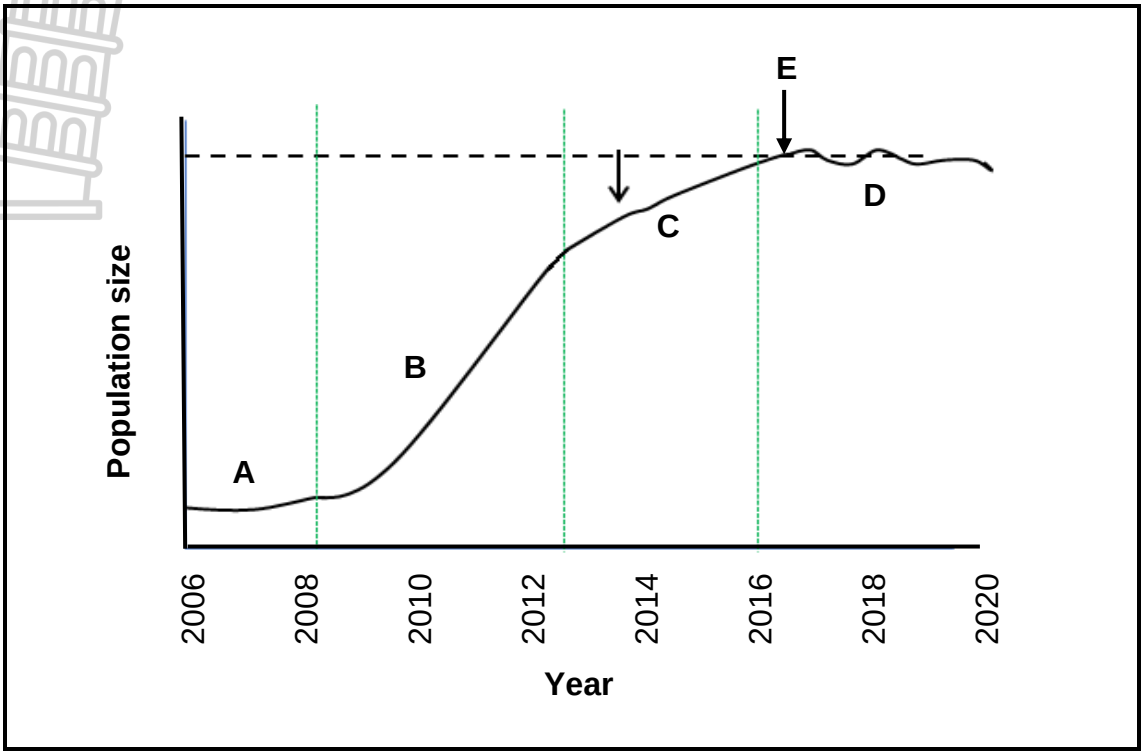
3.1.1 Why is it necessary for the natural greenhouse effect to be maintained? (2)

3.1.2 Name TWO human activities that cause an enhanced greenhouse effect. (2)

3.1.3 DIAGRAM 1 shows the natural greenhouse effect in 1962, while DIAGRAM 2 shows the enhanced greenhouse effect in 2017. Using the data in the table, explain the change shown in the diagrams. (3)

3.1.4 Explain how the increased climate change affects food security. (5)

3.2 Rabbits were introduced to an Eastern Cape farm in 2006. Since then, the rabbit population has increased rapidly. The graph below shows how they have increased.



3.2.1 Provide labels for phases:

(a) **B** (1)

(b) **C** (1)

3.2.2 Name the type of growth form shown in the above graph. (1)

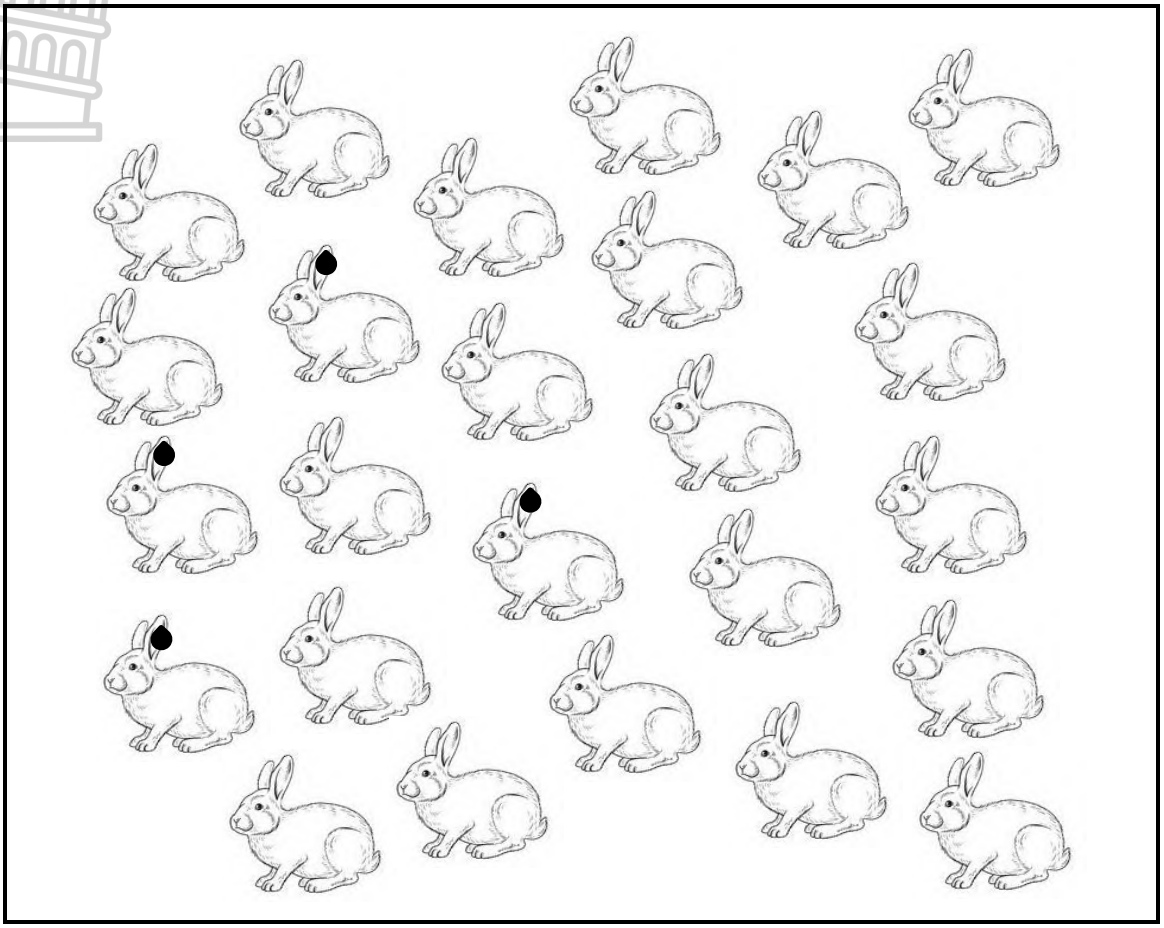
3.2.3 Give the letter of the phase where:

(a) Birth rate equals death rate (1)

(b) Natality exceeds mortality by far (1)

3.2.4 Explain why the rabbit population size did not increase permanently after point **E**. (3)

It was decided to determine the size of the rabbit population on a farm in 2020. **Forty** rabbits were collected at random. Each one was marked with a tag on its ear and then returned to the farm. After one week, a second random selection of rabbits was collected. The diagram below shows the rabbits that were caught during the **second** selection.



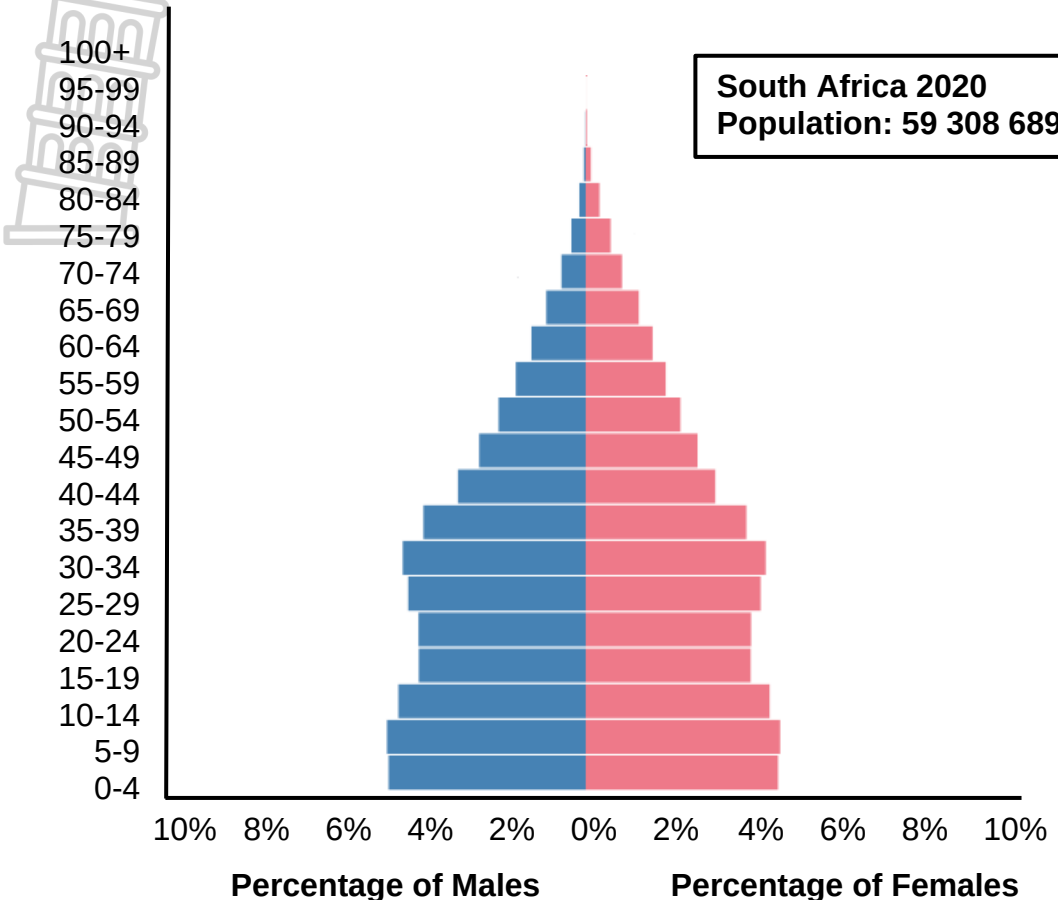
3.2.5 Name the technique that was used to determine the population of rabbits. (1)

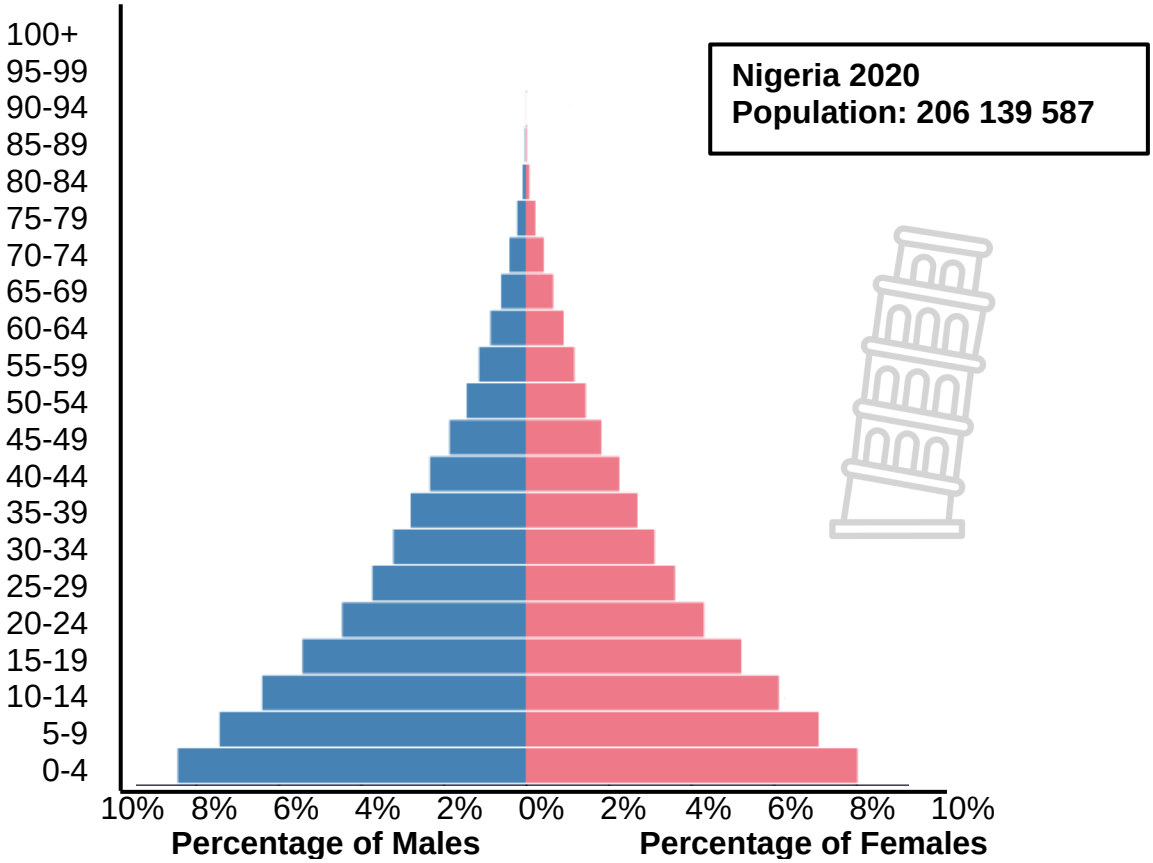
3.2.6 Using the formula below, determine the number of rabbits on the farm in 2020.

$$\text{Population} = \frac{\text{Number originally marked x Number in 2}^{nd}\text{ sample}}{\text{Number marked in second sample}}$$ (3)

3.2.7 Give ONE reason why the estimated size of the population may differ from the real population size. (1)

3.3 The population pyramids below show the population percentages of South Africa and Nigeria in 2020.





3.3.1 Define the term *population*. (2)

3.3.2 What percentage of the male population in South Africa is between 15 and 19 years old? (1)

3.3.3 Which age group makes up the greatest percentage of the population in South Africa? (1)

3.3.4 Which group, males or females, has a higher life expectancy in both countries? (1)

3.3.5 Which pyramid represents that of a developing country (South Africa or Nigeria)? (1)

3.3.6 Give TWO reasons for your answer in QUESTION 3.3.5. (2)

3.3.7 Name ONE density dependant factor that normally stops populations from growing in animals. (1)

3.3.8 Explain why the factor mentioned in QUESTION 3.3.7 has failed to control human populations. (2)

3.4 Read the article below.

SOUTH AFRICA IS DROWNING IN ITS OWN WASTE

South Africans produce enough municipal solid waste to fill an entire football field 10 metres deep, every day. This waste is disposed of at landfill sites.

South Africans generate roughly 54 200 000 tons of general waste per year. Only 10% is recycled, whilst at least 90% is landfilled or dumped. This includes 48 million tons of hazardous waste such as mercury and asbestos containing products, brine, fly ash, waste oils and sewage.

There has been a serious decline in the standard of landfill operation and management throughout South Africa, particularly at municipal level. The majority of municipalities do not comply with regulations of operating a landfill. There is a profitable solution to South Africa's problem. Using waste in the generation of renewable energy and reducing the pressure on ESKOM.

South Africa is in a **WASTE CRISIS** that requires immediate attention and action. A real concern is that we won't even be able to pay for the problem to go away.

[Adapted from http://award.org.za/index.php/2019/02/01/south-africa-is-drowning-in-its-own-waste-are-our-regulators-taking-this-crisis-seriously/]

3.4.1 Name TWO examples of hazardous waste found in South African landfill sites. (2)

3.4.2 Name the gas released by landfill sites that can be used in the generation of renewable energy. (1)

3.4.3 Calculate the number of tons of South Africa's yearly waste that is recycled. (3)

3.4.4 Give TWO problems that landfill sites cause for communities living around them. (2)

3.4.5 Describe ONE way a landfill site can be rehabilitated when it is full. (2)

3.4.6 Explain TWO waste management strategies you would recommend for South African municipal landfill sites. (4)

TOTAL SECTION B: 100
GRANDTOTAL: 150

Province of the
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NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2022

LIFE SCIENCES P2
MARKING GUIDELINE

MARKS: 150

This marking guideline consists of 10 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and '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 marking guideline 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.

SECTION A

QUESTION 1

1.1	1.1.1	D ✓✓		
	1.1.2	B ✓✓		
	1.1.3	B ✓✓		
	1.1.4	D ✓✓		
	1.1.5	C ✓✓		
	1.1.6	C ✓✓		
	1.1.7	D ✓✓		
	1.1.8	C ✓✓		
	1.1.9	D ✓✓	(9 x 2)	(18)
1.2	1.2.1	Asymmetry ✓		
	1.2.2	Sporophyte ✓		
	1.2.3	(Anopheles) mosquito ✓		
	1.2.4	androecium ✓		
	1.2.5	Biological control ✓/ Biocontrol		
	1.2.6	Mutualism ✓		
	1.2.7	Poaching ✓		
	1.2.8	Monoculture ✓	(8 x 1)	(8)
1.3	1.3.1	A ONLY ✓✓		
	1.3.2	NONE ✓✓		
	1.3.3	BOTH A and B ✓✓	(3 x 2)	(6)
1.4	1.4.1	Plantae ✓		(1)
	1.4.2	Charophytes, Bryophytes, Pterophytes, Gymnosperms (1–3 correct) ✓ 4 correct ✓✓		(2)
	1.4.3	350 ✓ MYA		(1)
	1.4.4	Bryophytes ✓		(1)
	1.4.5	(a) D ✓		(1)
		(b) A ✓		(1)
	1.4.6	Algae ✓		(1)
1.5	1.5.1	Predator-Prey ✓ / Predation		(1)
	1.5.2	(a) The maximum population size that an ecosystem can support ✓✓		(2)
		(b) Selectively killing organisms to reduce their population size ✓✓ **OR** Removal of animals of inferior quality/to old for breeding from a herd/flock.		(2)

1.5.3	A ✓		(1)
1.5.4	1990 ✓ and 1995 ✓		(2)
1.5.5	1995 ✓		(1)
1.5.6	Disease ✓ Competition for food ✓/ water/ space	(Any 1 x 1)	(1)
		TOTAL SECTION A:	**50**

QUESTION 2

2.1 2.1.1 Spermatophytes ✓ / Angiosperms (1)

2.1.2 (a) Anther ✓

(b) Corolla ✓

(c) Stigma ✓ (3)

2.1.3 B, C, F,G (1–3 correct) ✓ (All 4 correct) ✓✓ (2)

2.1.4 1 ✓ (1)

2.1.5 Their stigmas are large ✓/feathery
The stamens are long ✓/protrude out of the flower
Anthers are large ✓ to produce lots of pollen (Any 2 x 1) (2)

2.1.6 Fruit ✓
Flowers ✓ (2)

2.2 2.2.1 Myobacterium ✓ (1)

2.2.2 It does not have a (membrane bound) nucleus. ✓ (1)

2.2.3 (a) slime capsule ✓

(b) flagella ✓

(c) nucleoid / DNA ✓ (3)

2.2.4 A person is given a weak strain of the bacteria ✓
the body will produce antibodies to fight the infection ✓
The antibodies will protect them against a new/stronger infection of the same germ ✓ (3)

2.2.5

Virus	Bacteria
Non-living ✓	Living ✓
Acellular ✓	Prokaryotic ✓
Protein coat ✓	Cell wall/membrane ✓

Table ✓ + (Any 1 x 2) (3)

2.2.6 HIV lowers the body's immunity ✓ /white blood cell count therefore it cannot defend the body against TB ✓ (2)

2.3 2.3.1 Fungi grow best in dark ✓ and warm places ✓ (2)

2.3.2 Treatment ✓ on bread (1)

2.3.3 It is the control ✓ (1)

2.3.4 Repeat the investigation ✓ / increase the sample size (1)

2.3.5 Sugar provides energy ✓/food for fungi therefore more food will allow fungi to grow faster ✓ (2)

2.3.6 Use spray bottle to apply treatments evenly ✓
Place bread in zip lock bags ✓
All slices placed in cupboard ✓
All left for one week ✓ /same time
Same sizes slices of bread ✓
Same quantity (200 mℓ) of treatment (Any 2 x 1) (2)

2.4 2.4.1 Animalia ✓ (1)

2.4.2 Cnideria ✓ (1)

2.4.3 Bilateral ✓ (1)

2.4.4 (a) Ectoderm ✓

(b) Endoderm ✓ (2)

2.4.5 Earthworms tunnel through the soil ✓ which aerates the soil ✓ / allows water to infiltrate
They eat decomposed dead organic material ✓
The faeces of earthworms are rich in nutrients for plants and enrich the soil ✓ (4)

2.4.6 Cnideria:
- They are **sedentary/sessile animals** ✓ therefore **radially symmetry** allows them to **obtain food and ward off danger coming from any directions** ✓
- They have **nerves located over the entire body** surface ✓/ there is no cephalization. This allows them to **sense equally all around**. ✓
- The jelly like **mesoglea** ✓ **has a network of nerves** that enables coordinated movement. ✓ (Max. 2 x 2)

Annelids:
- They are **very active and move into new environments** ✓ with new dangers frequently.
  Therefore, they **show cephalization** ✓/ need sense organs accumulated in the area that enters the new environment first
- Since free-living species **move actively** from place to place they **need muscles** ✓
  they have **developed a mesoderm** ✓ from which muscle originate / They are **triploblastic**.
- For muscle to work effectively, the body wall of these organisms needs to work independently from gut walls. ✓ The **development of a coelom** ✓ separated the body wall from the gut wall.

(Max. 2 x 2) (8)
[50]

QUESTION 3

3.1 3.1.1 It warms up the atmosphere ✓ to sustain life. ✓ (2)

3.1.2 Deforestation ✓
Burning of fossil fuels ✓ / driving cars / production in factories
Large scale cattle farming ✓ / rice paddies (Any 2 x 1) (2)

3.1.3 The carbon dioxide concentration in the atmosphere increased ✓
This caused more heat/radiation to be absorbed/trapped by the atmosphere ✓
and less heat/radiation to be reflected ✓ (3)

3.1.4 Food security is decreased ✓*
Changes in rainfall pattern cause:
- Desertification ✓
- Increased flooding ✓
- and wildfires ✓
- which increases soil erosion ✓ resulting in:
  - fewer crops to be planted ✓
  - lower crop yields ✓
  - less food for livestock ✓
- Higher environment temperature negatively affects livestock ✓ / crops
- These factors further decrease food availability ✓
- Food becomes more expensive ✓

✓*Compulsory mark + any 4 (5)

3.2 3.2.1 (a) Geometric ✓/ logarithmic / accelerating growth (1)

(b) Decelerating growth ✓ (1)

3.2.2 Logistic ✓ growth form (1)

3.2.3 (a) D ✓ (1)

(b) B ✓ (1)

3.2.4 - Rabbit population had reached carrying capacity ✓
- Environmental resistance occurs ✓/density dependant factors prevent population from increasing/ food/ space/water becomes limited
- This prevent population from increasing further ✓ (3)

3.2.5 Mark-recapture ✓ method (1)

3.2.6 $\frac{40 \times 25}{4}$ ✓ ✓ = 250 ✓ (3)

3.2.7 The sample may have been taken from an area the rabbits prefer ✓ / don't prefer
Tags may have fallen off ✓ (Any 1 x 1) (1)

3.3 3.3.1 A group of organisms of the same species, occupying the same habitat at the same time, and capable of random breeding. ✓✓ (2)

3.3.2 4% ✓ (1)

3.3.3 5–9 years old ✓ (1)

3.3.4 Females ✓ (1)

3.3.5 Nigeria ✓ (1)

3.3.6 - High birth-rate ✓/ High number of younger people in population
- High death rate ✓ / Less older people in population /Short life expectancy (2)

3.3.7 - Disease ✓
- Lack of food ✓
- Lack of water ✓
- Lack of space ✓ (Any 1 x 1) (1)

3.3.8 **Explanation must be for answer given in QUESTION 3.3.7**
Disease – humans have developed medical technology ✓ so there are fewer deaths ✓
Lack of food – mass produce crops ✓ / monoculture / GM foods to increase crop production ✓
Lack of water – building of dams ✓ to store water for when needed ✓
Lack of space – building high rise apartment building and skyscrapers ✓ / creating cities and towns so that people can live in a smaller area of space ✓ (Any 1 x 2) (2)

3.4 3.4.1 Mercury ✓
Asbestos ✓
Brine ✓
Fly ash ✓
Waste oils ✓
Sewage ✓ (Any 2 x 1) (2)

3.4.2 Methane ✓ (1)

3.4.3 $\frac{10}{100}$ ✓ x 54 200 000 ✓ = 5 420 000 ✓ tons / 5,42 million tons (3)

3.4.4 - Disease carrying animals are attracted to the area by dumpsites ✓
- Dumpsites release dust and unpleasant smells ✓
- Decomposition of pollutants release toxic substances ✓
- Release of methane gas could cause explosions ✓ (Any 2 x 1) (2)

3.4.5 - Dig a hole where solid waste is dumped ✓ and then cover it with soil. ✓
- To prevent the toxic leachate ✓ from reaching the groundwater, a plastic liner ✓ is placed under the dumpsite area.
- Covering of the old landfill site with clay soil, ✓ and then it is covered with topsoil. ✓ (Any 2 x 1) (2)

3.4.6 - **Re-using** ✓ waste products include re-using plastic shopping bags, re-using glass and plastic containers – this helps to reduce the waste produced. ✓
- **Recycling** ✓ waste provides employment, reduces the use of raw materials and energy pollution. ✓
- **Reducing waste** ✓ by charging people extra if they generate more waste ✓
- **Fines** for people that do not separate the waste into different bins ✓ To encourage citizens to manage waste more efficiently ✓
- **Partnership** with recycling companies ✓ for improved collection of different wastes ✓
- **Educate** people to use organic waste ✓ for example to make compost ✓ (Any 2 x 2) (4)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150