BERGVLIET HIGH SCHOOL

Grade 11 **LIFE SCIENCES PAPER 2** **20 November 2024**

Time: 2hr 30min **150 Marks**

Examiner: G. O'Connor

Moderators: M. Brouwer, M. Wentworth, S. Lambrechts

Name: _____

Life Sciences Teacher: _____

SECTION A	**Q1**	**50**		
SECTION B	**Q2**	**50**		
	Q3	**50**		
TOTAL		**150**		**%**

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions. There are **14** numbered pages.
2. Write ALL the answers on your FOOLSCAP paper.
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. Answer the questions according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Only draw diagrams or flow charts when asked to do so.
8. The diagrams in this question paper are NOT necessarily all drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator.
11. Write neatly and legibly.

DETACH THIS SHEET AND STAPLE IT TO THE FRONT OF YOUR FOOLSCAP

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 to D) next to the question number (1.1.1 to 1.1.10), for example 1.1.11 D.

1.1.1 The sporangia on the under surface of fern leaves are called…

A sporophylls
B sori
C cones
D sporogonia

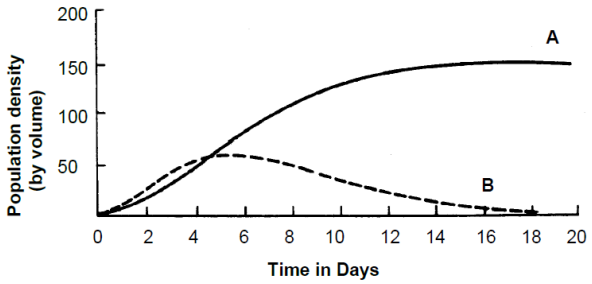
1.1.2 All of the following increase intraspecific competition except:

A Too much food
B Lack of water
C Too little space
D Too few mates

1.1.3 A group of organisms of the same species, occupying the same habitat at the same time is called ...

A a niche
B a community
C a population
D a species

1.1.4 Two species of paramecium were found in a pond. The graph below shows the population growth of the two species (**A** and **B**) that feed on the same bacteria.



The graph above shows an example of…

A parasitism
B predator-prey relationship
C interspecific competition
D resource partitioning

1.1.5 Which ONE of the following is an advantage of radial symmetry?

A Cephalisation cannot develop
B Can react to stimuli in all directions
C Movement is rapid and in a forward direction
D Specialised sensory organs cannot develop

1.1.6 Which of the following will cause a decrease in the size of a population?

(i) emigration
(ii) immigration
(iii) natality
(iv) predation

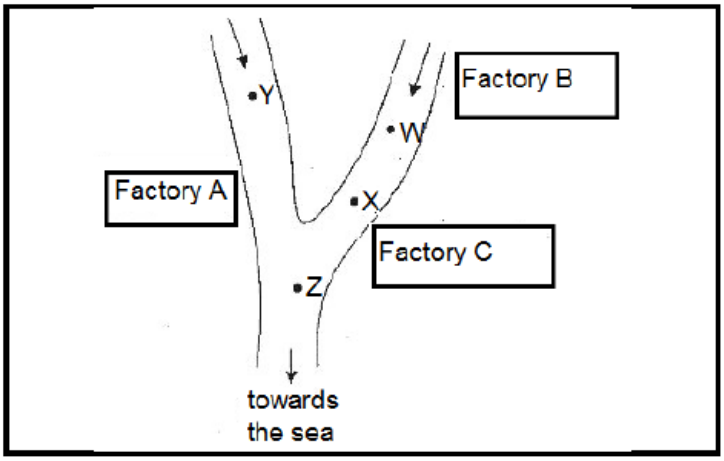
A (i) and (iii)
B (ii) and (iv)
C (iii) and (iv)
D (i) and (iv)

1.1.7 How does a vaccine work?

A It triggers the immune system to produce antibodies to fight the pathogen
B It attacks the pathogen as soon as it enters the body
C It prevents the pathogen from entering the body
D It allows the blood to filter out the pathogen

1.1.8 The diagram below shows the path of water flowing downstream towards the sea.

Situated near the water are three factories, A, B and C, which discharge the same type and same amount of chemical waste into the water daily.



Which ONE of the following parts of the water would be least polluted?

A W
B X
C Y
D Z

1.1.9 The dominant generation in Pteridophtyes is…

A gametophyte
B sporophyte
C spermatophyte
D seeds

1.1.10 Besides carbon dioxide, which other greenhouse gas is the main cause of global warming?

A CFCs
B Sulfur dioxide
C Nitrous oxide
D Methane

(10 x 2 = 20)

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 1.2.10).

1.2.1 A measure of the total greenhouse gas emissions by an individual, company or a country per year.

1.2.2 Animals that remain attached to a substrate for their entire life cycle.

1.2.3 The functional role and position of a species within a community.

1.2.4 The layer that shields the Earth from the damaging effects of the sun.

1.2.5 The movement of individuals of a species out of a habitat.

1.2.6 Plants without true roots, stems and leaves.

1.2.7 An animal phylum that lacks true tissues and organs.

1.2.8 Organisms that have a definite nucleus.

1.2.9 The increase of nitrates and phosphates in water bodies resulting in algal bloom.

1.2.10 An ecological body or natural system which absorbs carbon dioxide from the atmosphere.

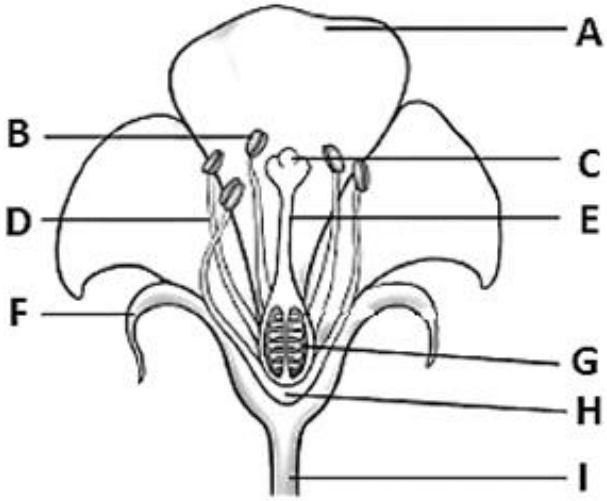
(10 x 1 = 10)

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 number (1.3.1 to 1.3.3)

	COLUMN I	COLUMN II
1.3.1	Factors decreasing water availability	A: destruction of wetlands B: exotic/alien plants
1.3.2	Kittens competing for their mother's milk	A: interspecific competition B: intraspecific competition
1.3.3	White blood cells that produce antibodies in response to pathogens	A: Lymphocytes B: Phagocytes

(3 × 2 = 6)

1.4 Examine the diagram of the flower below and answer the questions that follow.



1.4.1 Provide the labels for:

a) **E** (1)

b) **D** (1)

1.4.2 Give the LETTER of the part that…

a) becomes the fruit after fertilisation. (1)

b) receives pollen grains. (1)

c) produces male gametes. (1)

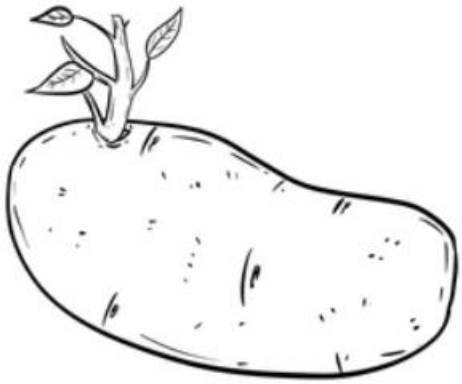
1.4.3 Give the name of the part made up of **B** and **D** combined. (1)

1.4.4 Is the flower shown more likely pollinated by wind or by insects? (1)

1.4.5 Give ONE observable reason for your answer to QUESTION 1.4.4 above. (1)

(8)

1.5 If you leave a potato in your kitchen for too long, it will start to grow roots. This potato can then be planted and used to grow a new potato plant.



1.5.1 Is this an example of asexual or sexual reproduction in plants? (1)

1.5.2 **Tabulate** TWO advantages and TWO disadvantages of the type of reproduction mentioned in your answer to QUESTION 1.5.1. (5)

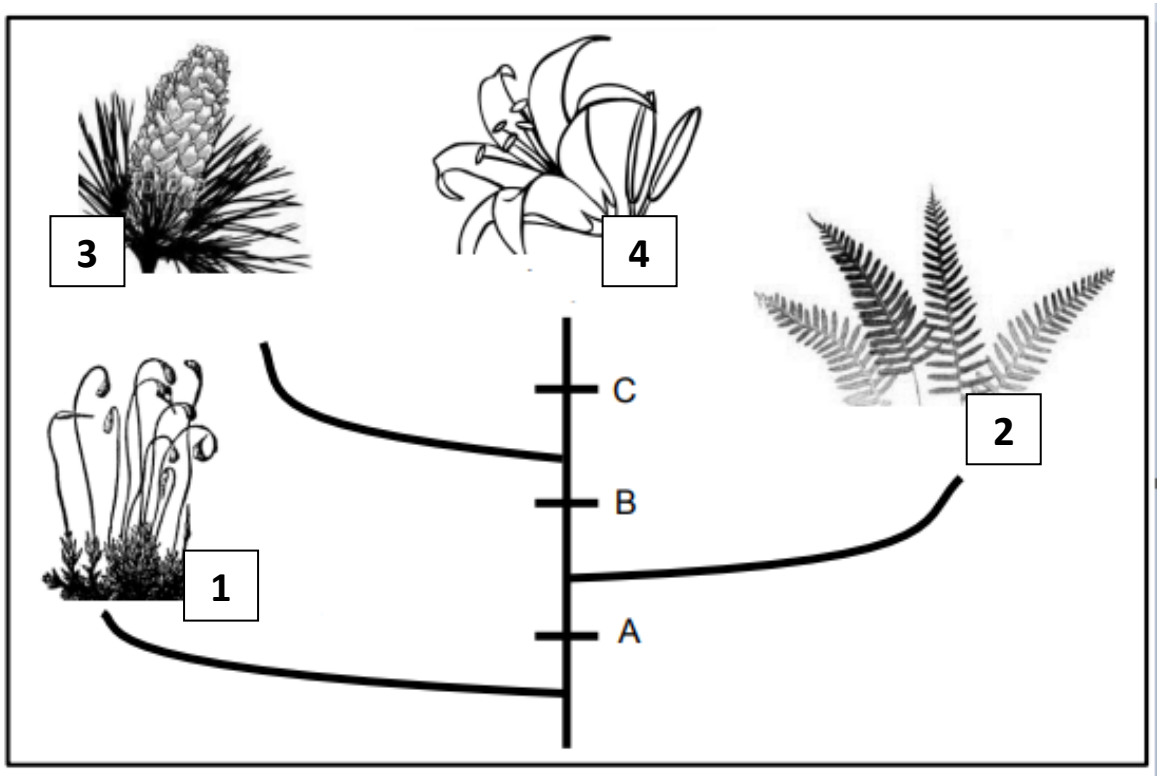
(6)

TOTAL SECTION A: [50]

SECTION B

QUESTION 2

2.1 The diagram below is a cladogram of plants stemming from their algal ancestors. A, B and C indicate key structural features in the evolution of higher plants. Study the diagram and answer the questions that follow.



2.1.1 Give the names of divisions **1**, **2**, **3** and **4**. (4)

2.1.2 State the important adaptations that evolved at each of the positions labelled **A, B** and **C.** (3)

2.1.3 Explain why the plants depicted in divisions **2**, **3**, and **4** can grow taller than those in division **1**. (2)

2.1.4 Explain how the dependency on water for reproduction is reduced in division **4**. (2)

(11)

2.2 Toothbrushes can become contaminated with micro-organisms over time and pose a health risk.

A group of scientists carried out an investigation to determine which toothbrush sterilising method is the most effective at reducing bacterial growth.

The investigation was conducted as follows:

- 24 adult volunteers who were neither under dental treatment nor using antibiotics or antiseptic mouthwashes were selected.
- The volunteers were divided into four groups.
- The first group had to put their toothbrushes in Dettol once a day for five minutes then was washed thoroughly with water and kept as usual.
- Group 2 had to put their toothbrushes in a cup containing two teaspoons of table salt in 240ml water once a day for five minutes. The volunteers of this group were given a special cup and spoon in order to control the weight.
- Group 3 had to put their toothbrushes in hot tap water once a day for five minutes.
- Group 4 used their toothbrushes in a normal way without the use of any kind of sterilization.
- After 21 days toothbrushes were collected and transported to the laboratory in sterile bags.

The identification of the bacteria isolated from the toothbrushes was performed and the percentage of bacterial contamination was calculated and recorded.

The table below shows the results of the investigation.

Group	Sterilizing Agent	Bacterial contamination (%)
1	Dettol	12,5
2	Salt	37,5
3	Hot water	50
4	None	100

2.2.1 Identify the:

a) independent variable. (1)

b) dependent variable. (1)

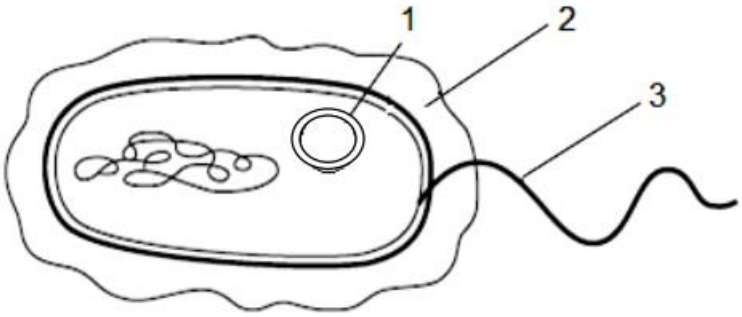
2.2.2 State TWO factors that were kept constant during the experiment. (2)

2.2.3 Explain why group **4** was included in the investigation. (2)

2.2.4 Why were none of the sterilizing methods able to kill 100% of the bacteria? (1)

(7)

2.3 *E. coli* is the most common bacterium found on toothbrushes. Below is the structure of an *E. coli* bacterial cell:



2.3.1 State:

a) the kingdom to which *E. coli* belongs. (1)

b) label **1.** (1)

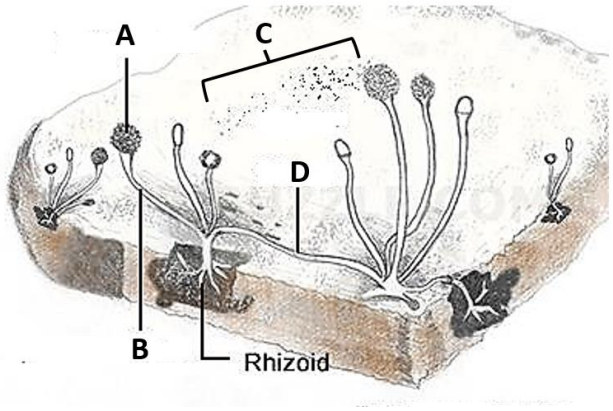
c) The function of label **2.** (1)

2.3.2 If a person becomes infected with *E. coli*, they are prescribed antibiotics. State TWO ways in which antibiotics work. (2)

2.3.3 Describe how *E. coli* is used in the production of insulin for the treatment of diabetes. (5)

(10)

2.4 Below is a slice of bread that has been left in a lunchbox in someone's locker over the weekend, with mould that has grown:



2.4.1 Give labels for:

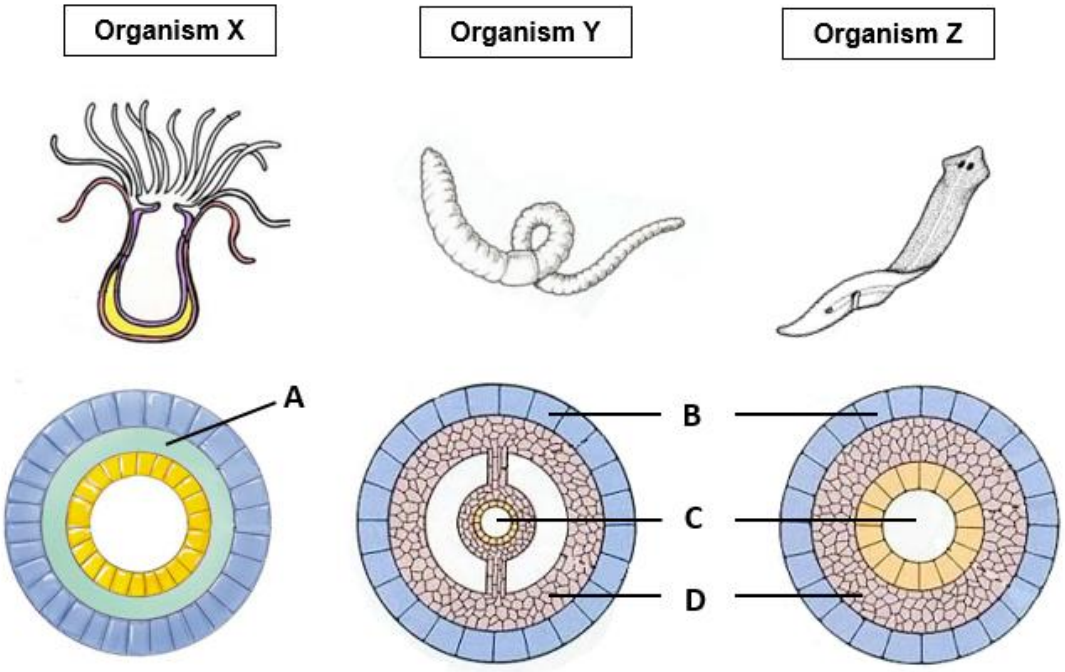
a) **A** (1)
b) **B** (1)
c) **D** (1)

2.4.2 State the condition that made the locker suitable for the growth of the bread mould. (1)

2.4.3 NAME and DESCRIBE the mode of nutrition of the bread mould. (4)

(8)

2.5 The diagrams below show animals that belong to 3 different phyla, and a cross section through each.



2.5.1 To which phylum does organism **X** belong? (1)

2.5.2 Give the LETTER(s) of the organism (**X, Y** or **Z**) that …

a) has radial symmetry. (1)

b) shows cephalisation. (2)

c) has a diploblastic body plan. (1)

d) is acoelomate. (1)

e) has a closed gut. (1)

2.5.3 Give ONE advantage of having:

a) a through-gut. (1)

b) a coelom. (1)

2.5.4 Provide labels for:

a) **A** (1)

b) **B** (1)

c) **C** (1)

2.5.5 Give the LETTER of the layer that forms…

a) the nervous system and sense organs. (1)

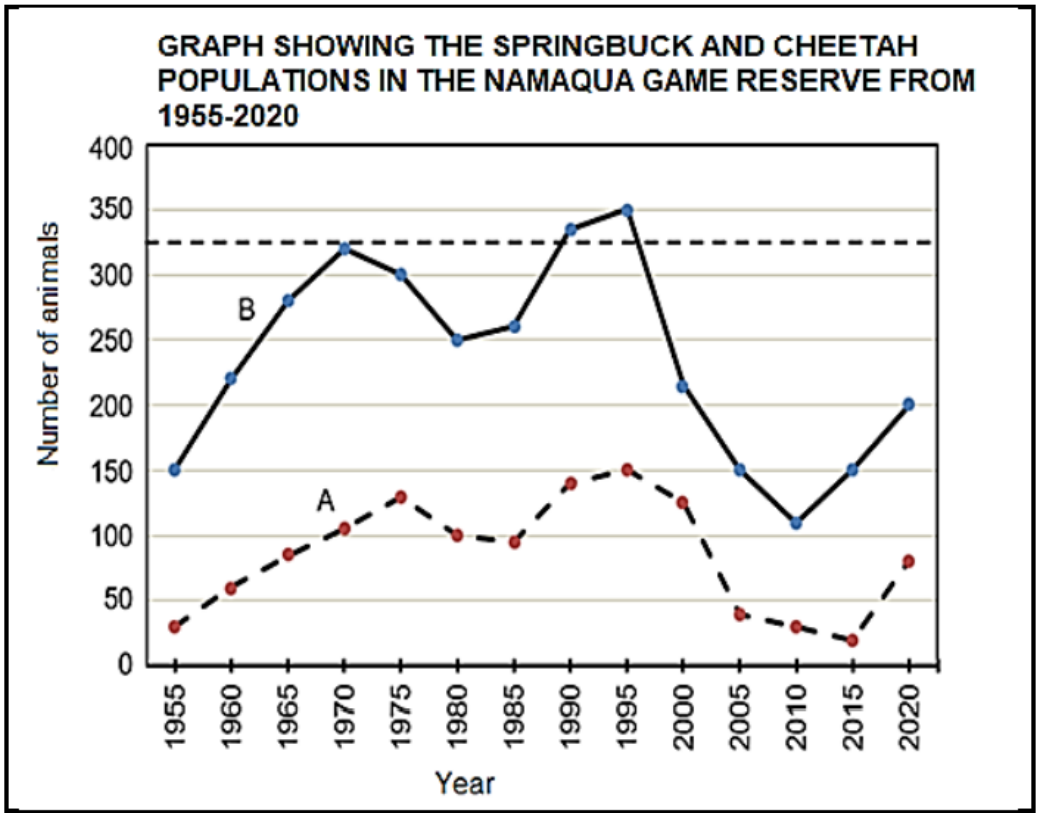
b) the internal organs. (1)

(14)

[50]

QUESTION 3

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



3.1.1 Name the type of relationship between cheetahs and springbucks. (1)

3.1.2 Define *carrying capacity*. (2)

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

3.1.4 Give a reason for your answer to QUESTION 3.1.3. (1)

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

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

3.1.7 State ONE density-independent factor that could cause the sudden dying out of the cheetah population. (1)

3.1.8 Explain what would happen to the population of springbuck if the population of cheetah were to die out suddenly. (2)

(10)

3.2 Read the article about food security below and answer the questions that follow.

South Africa's biggest retailer, Shoprite, has published its inaugural Food Security Index for 2024, showing that the country's food security levels are at their lowest point since 2012.

According to Shoprite, the concept of 'food security' was first defined at the 1996 World Food Summit.

Over the years, a global food price crisis in 2012, a drought in 2015/2016, COVID-19 lockdown in 2020, inflation due to the war in Ukraine and tough economic circumstances in 2023 have all negatively affected food security in South Africa.

South Africa peaked at 64.9 on the Index in 2019 after having been at 46.2 during following the drought in 2016. This number dropped to 45.3 in 2023 (zero indicates severe food insecurity).

"It means that, on average, more South Africans experienced greater or deeper food insecurity in 2023, compared to any other year between 2012 and 2023," the group said. By 2023, 11.8% of households said they were consuming a lower variety of food than usual given economic constraints.

"One of most concerning observations drawn from the Index is that child hunger remains a major issue."

The index found that one in four of the poorest households reported that children in their homes went hungry in 2023.

Shoprite flagged a host of interventions that can be made by policymakers to improve food security in the country, including turning to alternative sources of nutrition, increasing access to foods through VAT changes and keeping better record and track of nutritional outcomes in the country.

"National Treasury must strongly consider zero-rating VAT on certain key food products, especially protein-rich items used by lower-income households," it said.

Adapted from: Shoprite food security warning for South Africa – BusinessTech

3.2.1 Define *food security.* (3)

3.2.2 According to the article, give TWO reasons why food security has decreased in South Africa. (2)

3.2.3 According to the article, give TWO interventions that could be put in place to improve food security in the country. (2)

3.2.4 Below is a table showing the national food security index in South Africa from 2016 – 2023, rounded off to the nearest whole number.

YEAR	FOOD SECURITY INDEX
2016	46
2019	65
2020	57
2021	56
2022	55
2023	45

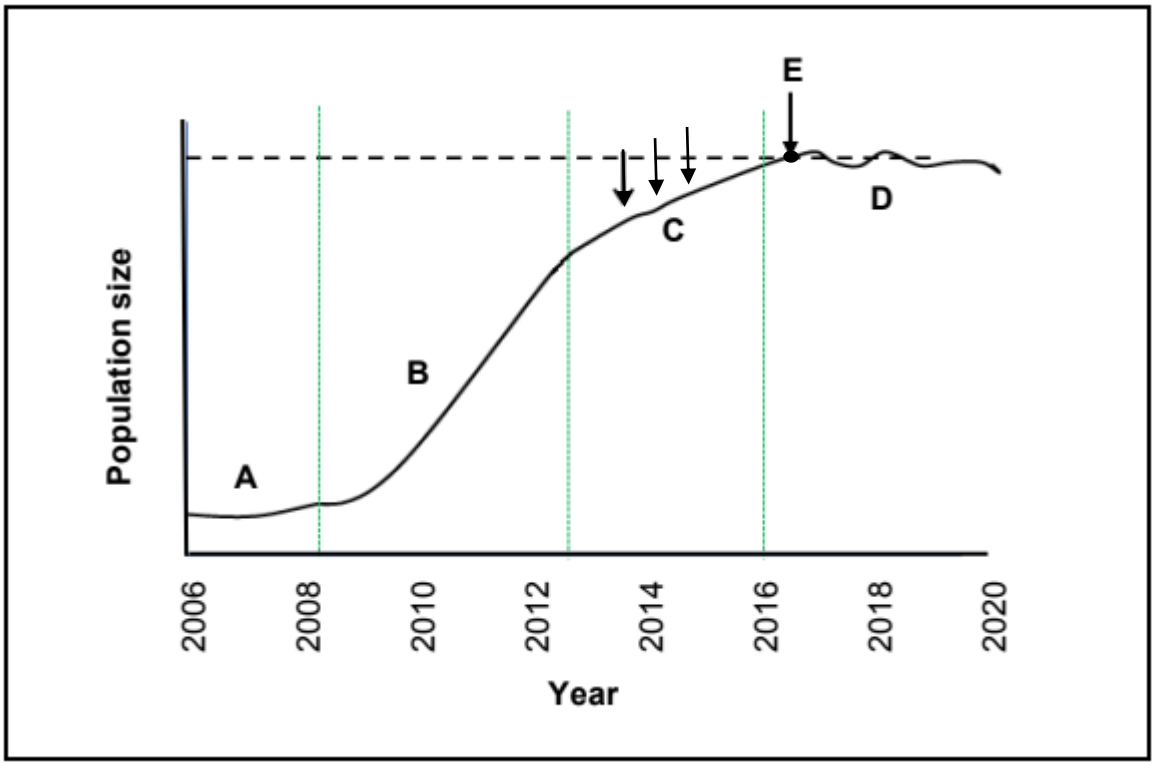
a) Calculate the percentage increase of the food security index from **2016 to 2019.** (3)

b) Draw a line graph of the food security values from **2019 to 2023**. (6)

3.2.5 Explain why droughts can impact food security negatively. (2)

(18)

3.3 An invasive species of fish was introduced into a lake in 2006 by careless pet owners. The graph below shows how the population has grown over time.



3.3.1 Provide names for phases:

a) **A** (1)

b) **B** (1)

c) **C** (1)

3.3.2 What type of growth is shown in this graph? (1)

3.3.3 Give the LETTER of the phase where:

a) Birth rate equals death rate. (1)

b) Birth rate far exceeds the death rate. (1)

3.3.4 Explain why the gradient in phase **A** is so shallow compared to other phases. (2)

3.3.5 Explain why the fish population did not increase permanently after point **E**. (3)

3.3.6 What do the arrows in phase **C** represent? (1)

(12)

3.4 The graph below shows the average carbon dioxide concentration in the atmosphere between 2009 and 2013, as measured at the Mauna Loa Observatory in Hawaii.

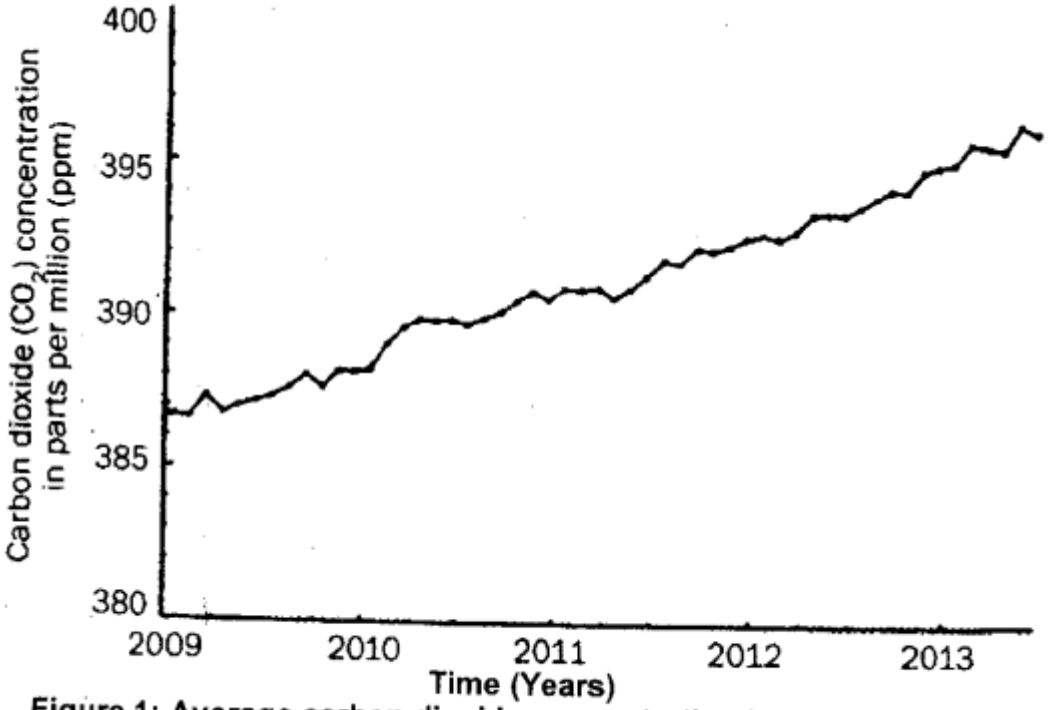


Figure 1: Average carbon dioxide concentration in the atmosphere since January 2009, at Mauna in Hawaii

3.4.1 Carbon dioxide is a *greenhouse gas.* What is meant by that term? (1)

3.4.2 Why does the Earth need greenhouse gases? (2)

3.4.3 Describe how deforestation could lead to an increase in the carbon dioxide concentration in the atmosphere. (2)

3.4.4 Give ONE human activity, besides deforestation, which may have led to the increase in carbon dioxide as seen in the graph. (1)

3.4.5 Explain how the excess carbon dioxide in the atmosphere could lead to climate change. (4)

(10)

[50]

TOTAL SECTION B: [100]

TOTAL MARKS: 150