Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2018

LIFE SCIENCES P1

MARKS: **150**

TIME: **2½ hours**

This question paper consists of 19 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.
12. Round off all calculations to two decimals after the comma.

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 (1.1.1–1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 The structure holding two sister chromatids together is called a …

A centrosome.
B chiasma.
C centromere.
D centriole.

QUESTIONS 1.1.2 AND 1.1.3 are based on the information in the table below. It shows the amount of waste products dumped in landfills each year and the time taken for each type of product to break down (decompose).

Type of product	Amount of waste (in tons)	Time to break down waste (in years)
Plastic bags	200	300
Leather shoes	30	20
Batteries	20	100
Nylon fibre	100	50
Aluminium cans	50	75

1.1.2 What is the percentage contribution of aluminium cans to the total amount of waste generated from the products listed?

A 12,5%
B 75%
C 50%
D 18,8%

1.1.3 The statements below refer to the information given in the table above.

(i) Plastic bags take 250 years more than nylon fibre to decompose
(ii) Aluminium cans decompose faster than nylon fibre
(iii) Leather shoes decompose fastest
(iv) Batteries are responsible for the largest proportion of waste produced.

Which of these statement(s) is/are correct?

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

1.1.4 Negative feedback control involves the following four stages:

(i) Effectors bring about corrective responses.
(ii) A receptor detects a change in the internal environment.
(iii) Factor brought back to normal levels.
(iv) Nervous or hormonal messages are sent to effectors.

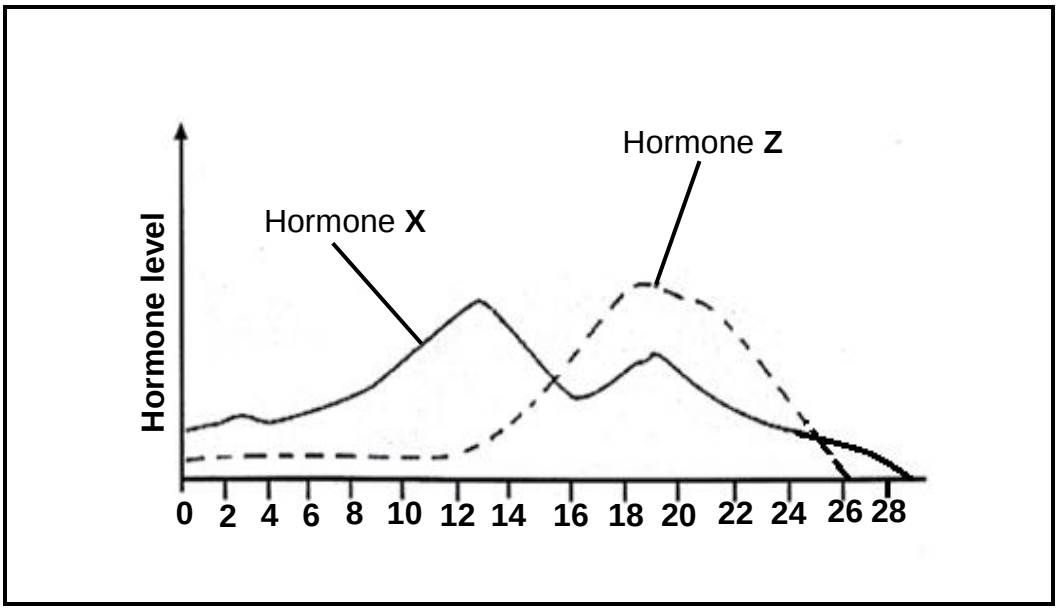
The order in which these stages occur is:

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

1.1.5 A woman may become pregnant even though her right fallopian tube is blocked. This is because …

A the corpus luteum secretes progesterone.
B ovulation may take place from the left ovary.
C fertilisation takes place in the uterus.
D menstrual blood flushes the blockage out.

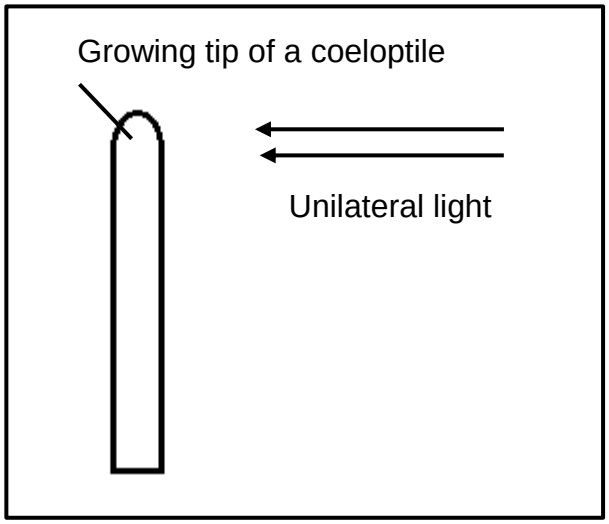
1.1.6 The graph below shows the different levels of two hormones involved in the menstrual cycle.



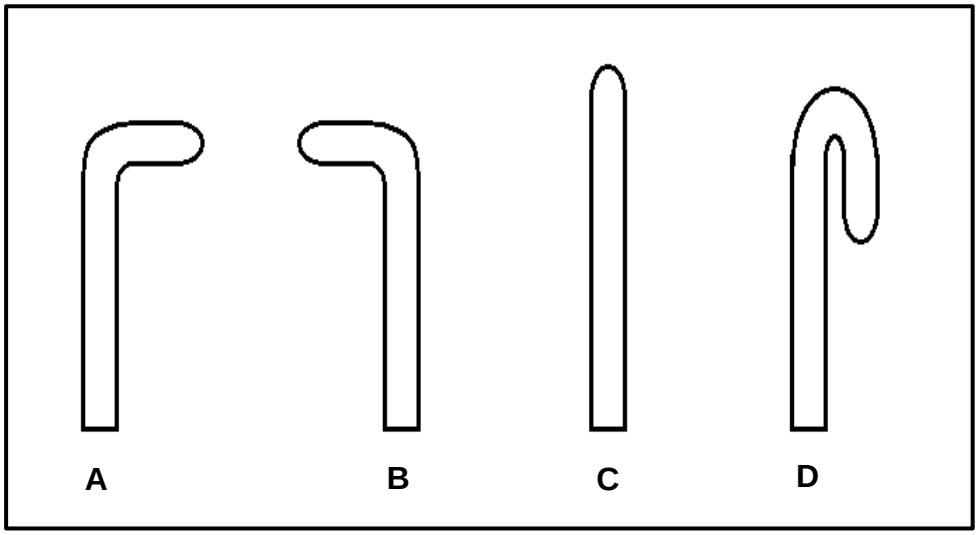
If fertilisation was to take place, what would happen to the level of hormone **Z** after day 18?

A Decrease as indicated in the graph
B Decrease at first and then increase
C Not decrease
D Follow the same pattern as hormone **X**, as indicated in the graph

1.1.7 The diagram below represents a growing tip of a coleoptile (young plant shoot) exposed to unilateral light.



Which ONE of the following diagrams **A, B C** or **D** correctly represents the direction of growth of the coleoptile after a week?



1.1.8 Testosterone supplements have been used illegally in competitive sports to enhance performance. The reason for this is that testosterone …

A reduces excessive sweating.
B increases the absorption of oxygen.
C promotes muscle building.
D stimulates haemoglobin production.

1.1.9 Which ONE of the following is a sustainable method used to improve food security that will not damage the environment?

A Excessive use of fertilisers to improve yield
B Continuous use of pesticides to reduce pests
C Practice of monoculture as a farming method
D Practice of crop-rotation as a farming method

1.1.10 A study was conducted to determine the effectiveness of various contraceptive methods. The results of the study are given below.

Contraceptive method	Contraceptive failure within the first year of its use (%)
Spermicides (creams containing chemicals that kill sperm cells)	28
Condom (male and female)	21
Diaphragm (structure placed in the female reproductive system to prevent pregnancy)	12
Sterilisation (male and female)	0,5

A correct conclusion that can be made from the results is that …

A using spermicides is the most effective method of contraception.
B using condoms is the most popular method of contraception.
C sterilisation is the most effective method of contraception.
D using a diaphragm is the least effective method of contraception.

(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 (1.2.1–1.2.10) in the ANSWER BOOK.

1.2.1 The phase of meiosis where individual chromosomes arrange themselves on the equator of the spindle

1.2.2 The vesicle which contains enzymes found in the head of a sperm cell

1.2.3 The hormone which increases the absorption of glucose by the cells

1.2.4 The maintenance of a constant internal environment in the human body

1.2.5 The hormone produced by the pituitary gland which stimulates the development of the Graafian follicle

1.2.6 The process that takes place at the end of meiosis, to bring about the separation of daughter cells

1.2.7 The site of fertilisation in the female reproductive system

1.2.8 The process that traps heat in the Earth's atmosphere by gases such as carbon dioxide

1.2.9 The hollow ball of cells which develops from a zygote

1.2.10 The fluid in which the human foetus grows and develops

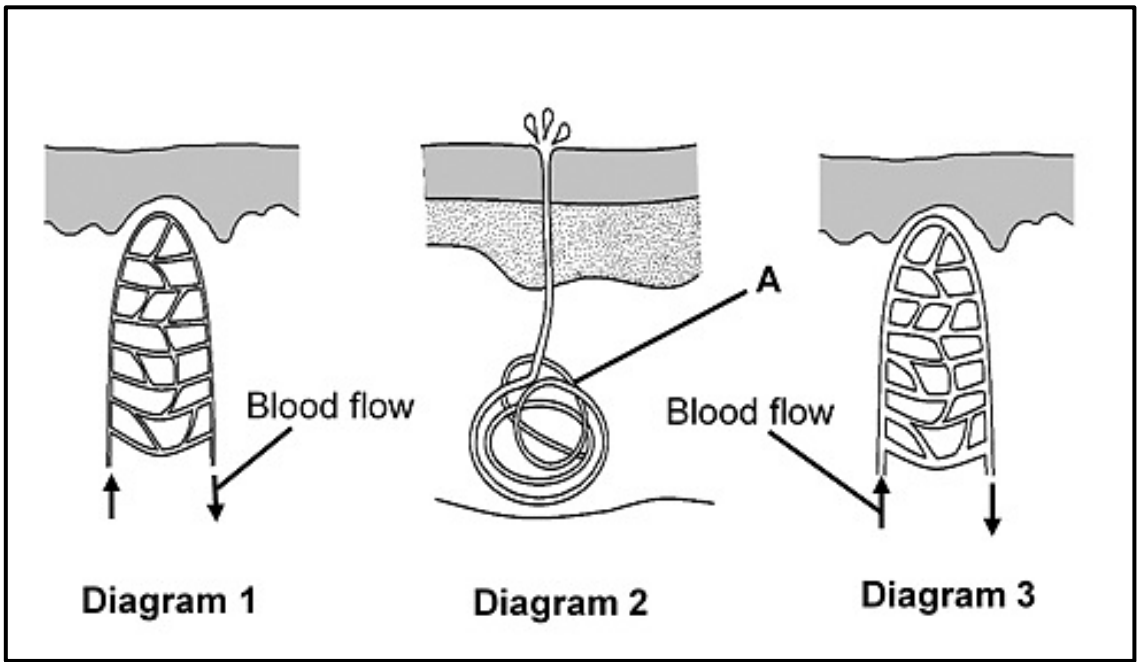
(10 x 1) (10)

1.3 Indicate whether each of the statements in COLUMN I apply 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 (1.3.1–1.3.4) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Growth response of plants to gravity	A B	Geotropism Hydrotropism
1.3.2	The release of ovum from the ovary	A B	Ovulation Ovarian cycle
1.3.3	Produces oestrogen	A B	Pituitary gland Graafian follicle
1.3.4	The shedding of the uterine lining which is accompanied by bleeding	A B	Menstruation Menstrual cycle

(4 x 2) (8)

1.4 The diagrams below represent parts of the human skin.



1.4.1 Identify the part labelled **A**. (1)

1.4.2 Give the NUMBERS of the diagrams **(1**, **2** and **3)** that represent the body's response to high environmental temperatures. (2)

1.4.3 Would the skin release more heat through radiation in **Diagram 1** or **Diagram 3**? (1)

1.4.4 Give the NUMBER of the diagram (**1**, **2** or **3**) that represents vasoconstriction. (1)

1.4.5 Which part of the brain controls thermoregulation in humans? (1)

1.5 The list below shows animals with different reproductive strategies.

snakes; fishes; chickens; chimpanzees; humans; whales; crocodiles

Name the organisms from the list with the following reproductive strategies:

1.5.1 External fertilisation (1)

1.5.2 Internal fertilisation with altricial development (2)

1.5.3 Internal fertilisation with precocial development (1)

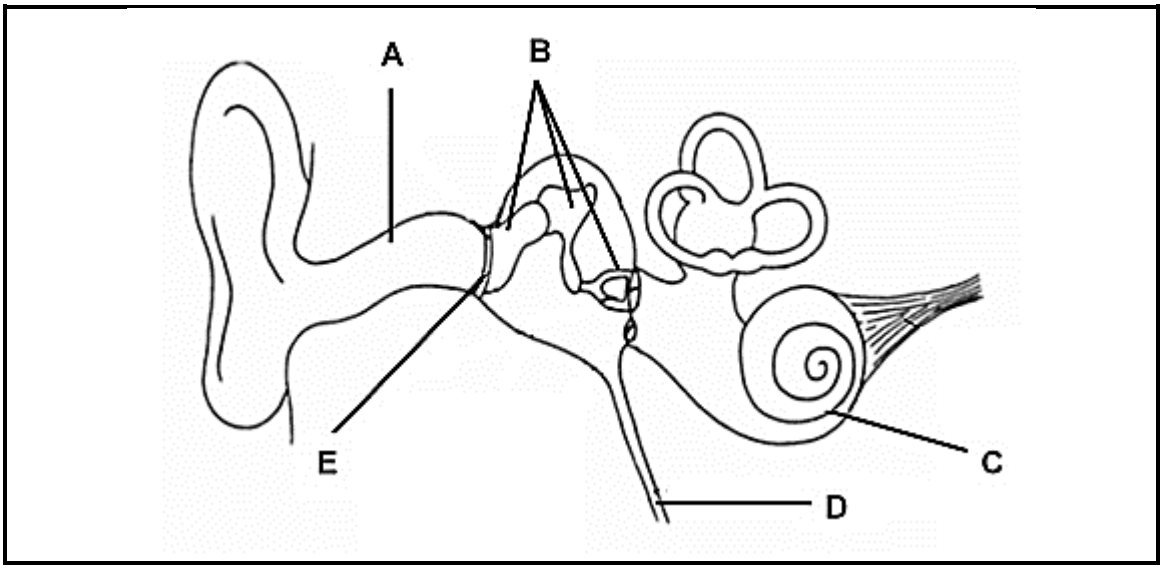
1.5.4 Viviparous animals (2)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Study the diagram below and then answer the questions which follow.



2.1.1 Write down the LETTER ONLY of the part which:

(a) Amplifies the vibrations from the tympanic membrane (1)

(b) Contains the receptors for hearing (1)

2.1.2 Otosclerosis is a genetic form of hearing loss caused when the stirrup becomes immovable. Explain how this condition can cause hearing loss. (3)

2.1.3 Two devices used to treat deafness are hearing aids and cochlear implants. The way in which they function is given in the table below:

Device	Method of functioning
Hearing aid	Receives, transmits and amplifies sound vibrations
Cochlear implant	Receives sound vibrations and converts them into an electrical impulse which is transmitted directly to the auditory nerve

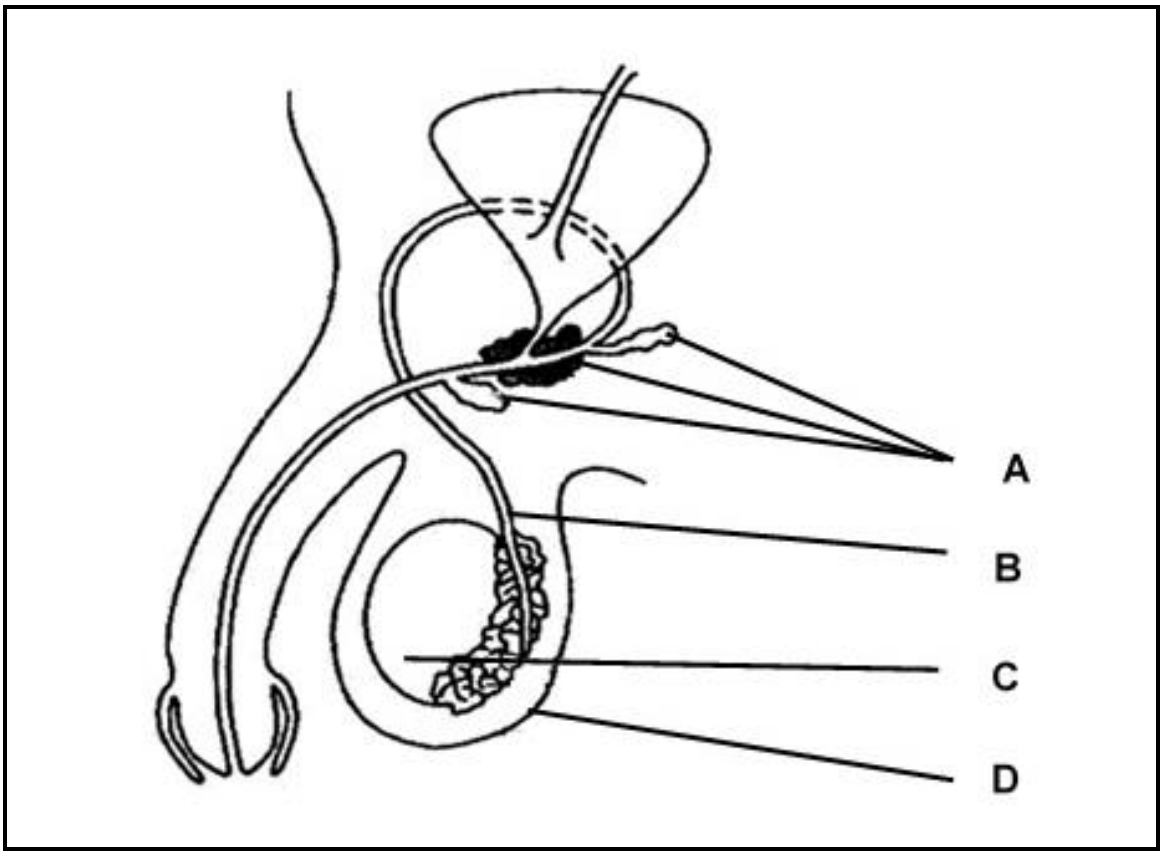
By referring to the diagram above, give the letters of the parts where the defect may occur:

(a) When a hearing aid is used (2)

(b) When a cochlear implant is used (1)

2.1.4 The vestibular branch of the auditory nerve transmits impulses from the semi-circular canals to the cerebellum. Explain the consequence if this nerve is infected by a virus. (2)

2.2 The following diagram represents the male reproductive organs.



2.2.1 Give the LETTER of the part with the following function:

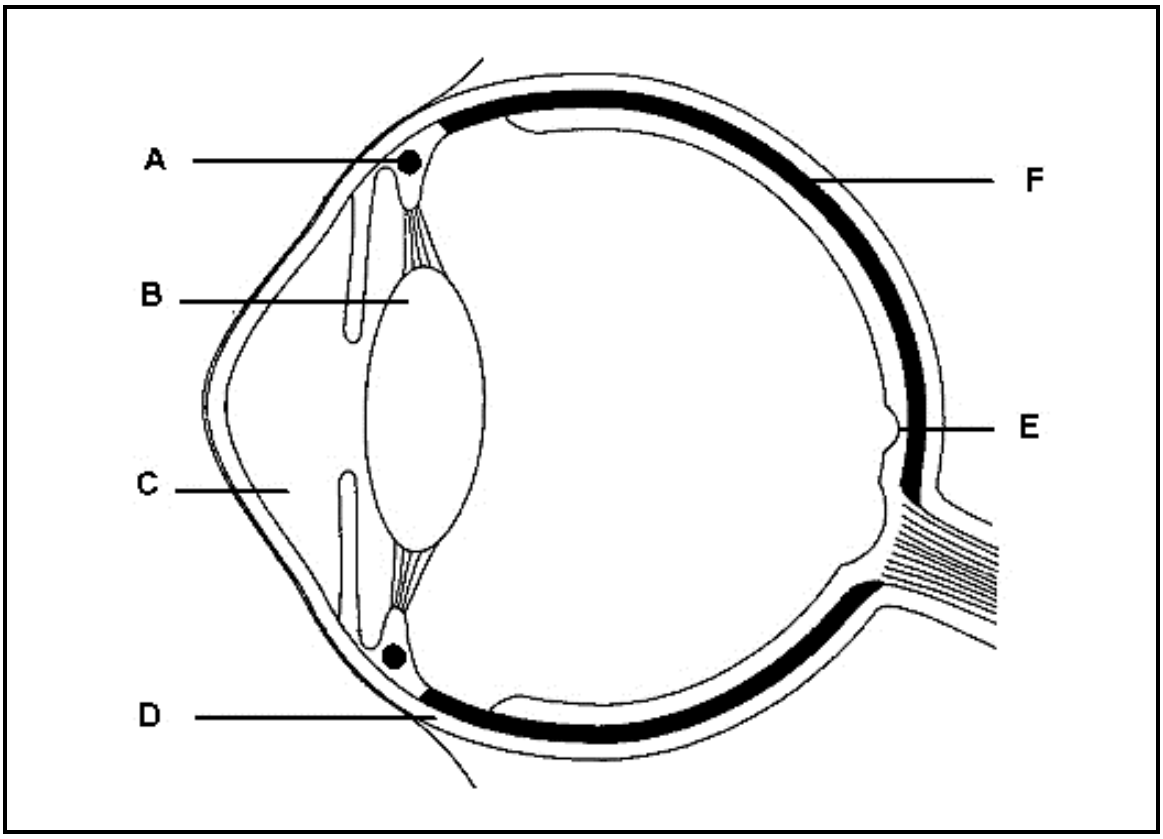
(a) Sperm production (1)

(b) Secretes a fluid which produces a medium for the sperm to swim (1)

2.2.2 Part **B** is surgically cut during a vasectomy.

Explain how this procedure can serve as a method of contraception. (3)

2.3 The following diagram represents the structure of the human eye.



2.3.1 Identify parts:

(a) **D** (1)

(b) **E** (1)

(c) **F** (1)

2.3.2 Give the LETTERS of two labelled parts involved in the refraction of light. (2)

2.3.3 The muscle labelled **A** can go into spasm (a constant state of contraction). Explain the consequence of this condition for distant vision. (3)

2.3.4 Explain why shining a powerful laser beam directly into a person's eye, can result in the loss of vision. (2)

2.4 The table below shows the height variation in nine-year old children. The information was collected from 425 children during an investigation at a school.

Height (cm)	134	135	136	137	138	139	140	141	142	143	144	145	146
Number of children	10	15	20	30	40	60	75	65	45	35	15	10	5

2.4.1 Which hormone is responsible for stimulating the growth of young children? (1)

2.4.2 How did the investigator ensure reliability of this investigation? (1)

2.4.3 Give the percentage of children in the investigation who were 138 cm to 140 cm in height. Show ALL calculations. (2)

2.4.4 Draw a line graph to represent the data in the table representing the children from 140 cm to 146 cm in height. (6)

2.5 Read the following passage on global warming.

Carbon dioxide is one of the 'greenhouse gases' that contributes to global warming. Humans and their activities play a notable role in the increase in CO_2 concentration in the atmosphere. Our carbon footprint is a powerful tool for understanding the impact of our lifestyle on global warming. The best way to calculate CO_2 emissions is based on the consumption of fuels such as petrol, diesel and oil. The long-term results of an enhanced greenhouse effect are a rise in global temperatures. It is estimated that by the year 2100 the atmospheric temperature will have increased by between 1,4 °C and 5,8 °C.

2.5.1 What is meant by the term *carbon footprint*? (2)

2.5.2 According to the extract, what is the best way to calculate our carbon footprint? (1)

2.5.3 Mention TWO ways in which the government could contribute to the reduction of the carbon footprint of the country. (2)

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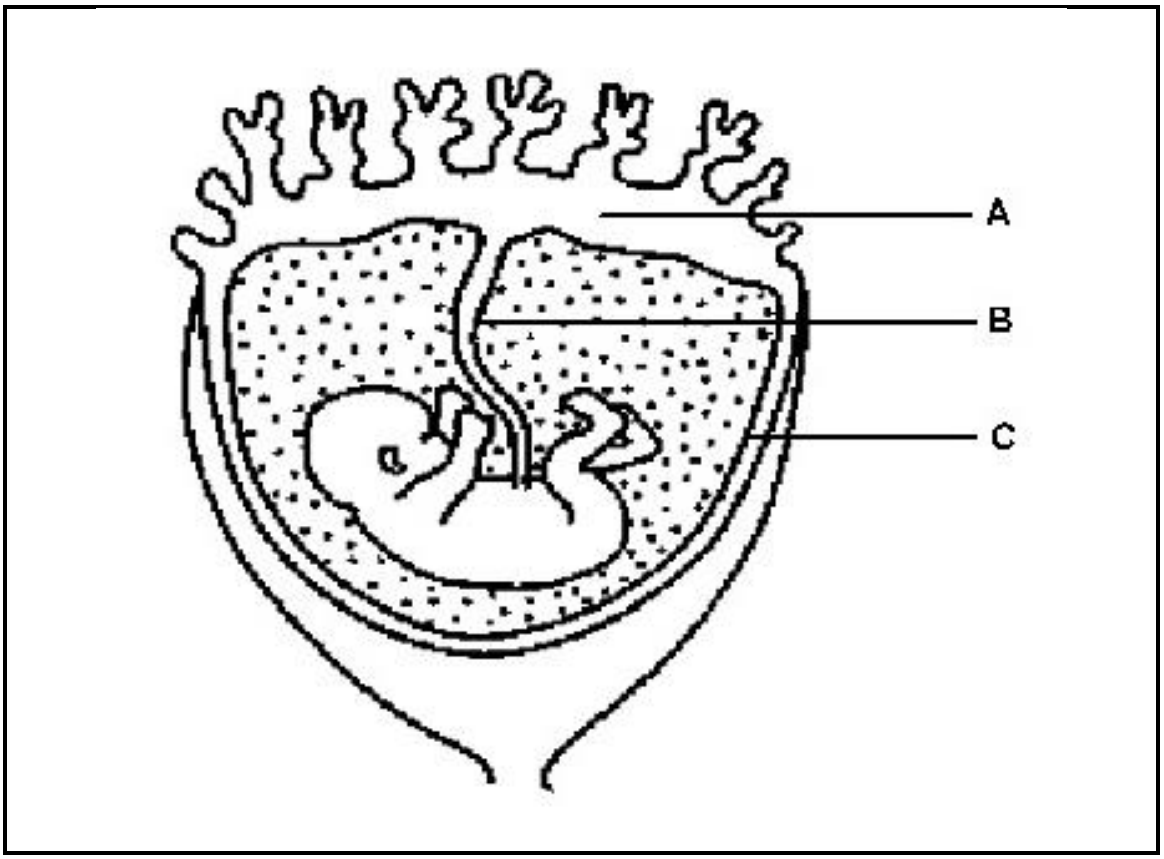
QUESTION 3

3.1 The diagram below represents a developing human foetus in the uterus.



3.1.1 Name TWO blood vessels found in the part labelled **B**. (2)

3.1.2 Tabulate ONE difference in the composition of blood flowing to and from the foetus in part **B**. (3)

3.1.3 Name the process that enables the exchange of substances between the foetus and the mother at **A**. (1)

3.1.4 During pregnancy, one complication is that a part of **A** may tear away from the uterus.

Explain the consequences to the foetus of such damage. (3)

3.2 A botanist investigated the effect that abscisic acid had on the germination of seeds.

The procedure was as follows:

- He placed equal numbers of lettuce seeds in two potting trays (**A** and **B**). Each tray contained the same soil and was subjected to the same environmental conditions throughout the investigation.
- The percentage of seeds that had germinated in tray **A** was calculated every 10 days for 40 days.
- At the same time a sample of seeds was taken from tray **B** and the concentration of hormone in the seeds was determined.

The results of the investigation are provided in the table below:

Time (days)	% seeds germinated in Tray A	Concentration of abscisic acid in seeds in Tray B (in ng/g)
0	0	350
10	10	70
20	65	50
30	80	20
40	95	10

3.2.1 Formulate a hypothesis for this investigation. (2)

3.2.2 Identify each of the following in this investigation:

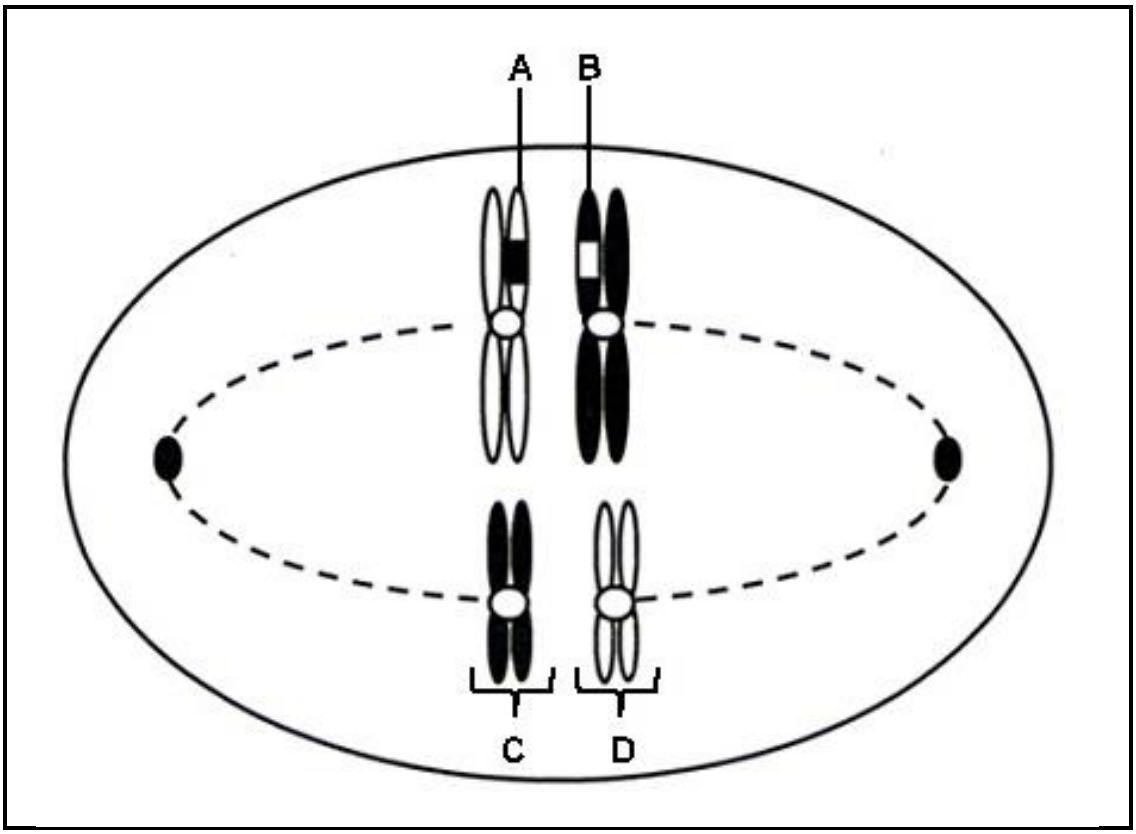
(a) Dependent variable (1)

(b) Independent variable (1)

3.2.3 State TWO ways in which the botanist ensured the validity of the investigation. (2)

3.2.4 What would the concentration of abscisic acid be in the seeds in tray **A** after 50 days? (1)

3.3 The diagram below represents a cell during a certain phase of meiosis.



3.3.1 Identify the phase of meiosis represented by the above diagram above. (1)

3.3.2 Give ONE visible reason for your answer in QUESTION 3.3.1. (1)

3.3.3 Describe the process that caused the inheritance of a combination of both parental characteristics in chromatids **A** and **B**. (3)

3.3.4 State TWO reasons why these chromosomes are homologous. (2)

3.4 In an investigation conducted by a group of Grade 12 learners, water samples were taken from three rivers (**A**, **B** and **C**) and stored in separate glass bottles. The samples were incubated at 37 °C for two days and tested for a type of bacterium called *Escherichia coli* (*E. coli*). *E. coli* bacteria normally live in the large intestine of humans.

A chemical indicator was used to determine the presence of *E. coli* in the water. If the chemical indicator changes from red to cloudy yellow, *E. coli* is present.

The results of the investigation are shown in the table below:

Colour of chemical indicator	**River A**	**River B**	**River C**
Before incubation	Red	Red	Red
After incubation	Red	Cloudy yellow	Red

3.4.1 According to the information in the table, which river contained *E. coli*? (1)

3.4.2 Give a reason for your answer in QUESTION 3.4.1. (1)

3.4.3 State ONE way in which *E. coli* could get into the river. (1)

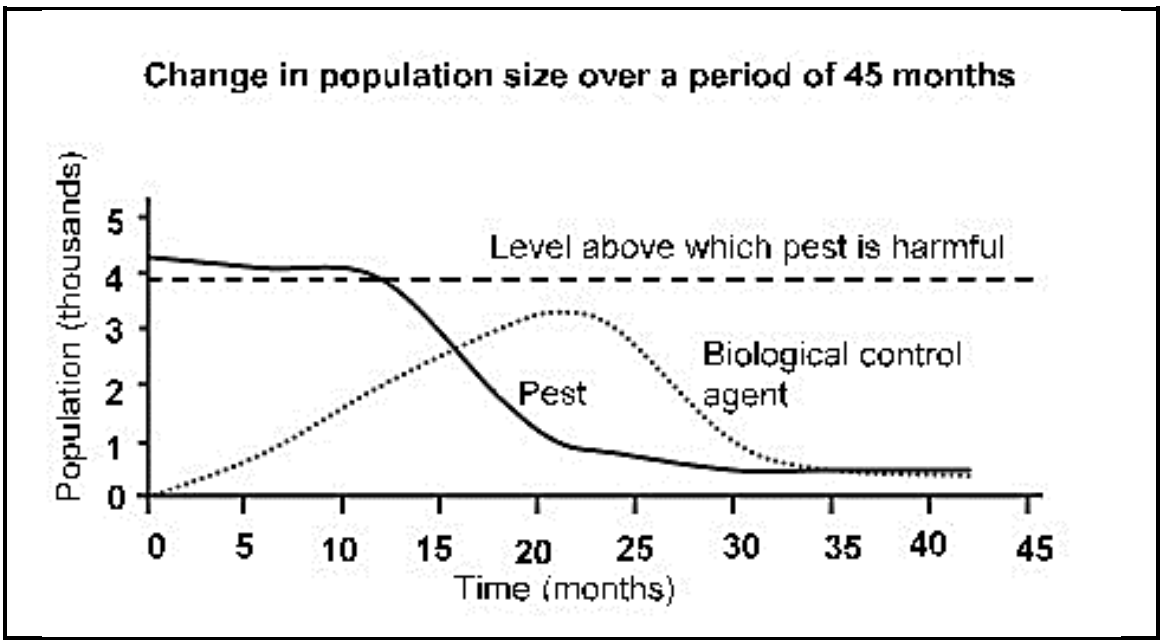
3.4.4 Explain why the water samples were incubated at 37 °C. (2)

3.4.5 Explain how high levels of bacteria in water will affect the oxygen levels in the water. (2)

3.5 Read the extract and graph below.

Pest control involves the use of pesticides to kill pests that compete with humans for food. Pesticides get into the tissue of healthy plants and kill them thus reducing crop production. Pesticides are expensive, they increase the cost of food and thus reduce access to food by poor consumers. One way to control pest populations, as a farming practice, is to use biological control.

The following graph shows how the population of a pest changed after a biological control agent was introduced to get rid of the pest instead of using expensive pesticides.



3.5.1 What is meant by the term *biological control*? (2)

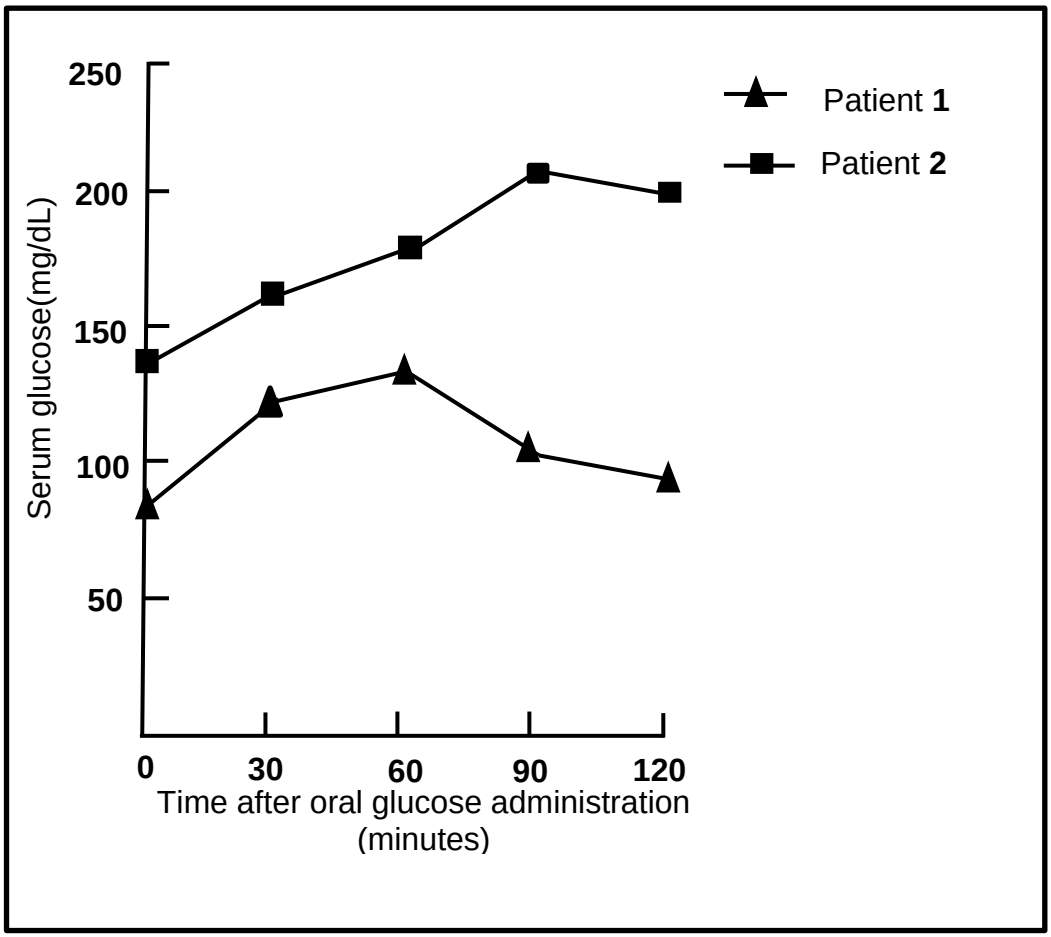
3.5.2 Describe the relationship between the pest and the control species between 15 and 20 months. (2)

3.5.3 Explain ONE reason why the control system above would be considered a good farming practice. (2)

3.6 An oral glucose tolerance test is used to determine if a person is normal or is already diabetic.

This test was performed on two people. After fasting for 12 hours, each person was given the same glucose solution to drink and then their blood glucose levels were measured every 30 minutes for two hours.

The results of the investigation are shown in the graph below.



3.6.1 Give TWO reasons from the graph why patient **2** is diabetic. (2)

3.6.2 Explain why patient **1** is able to survive without food for a longer period than patient **2**. (2)

[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

A crab nips Thando's toe while he is paddling in a rock pool. Although he does not see the crab, he immediately pulls his foot away.

Describe the sequence of events that allowed him to respond immediately, as well as the significance of this quick response. Also, describe the neural pathway which will enable him to see the crab.

Content: (17)
Synthesis: (3)

NOTE: No marks will be awarded for answers in the form of flow charts, diagrams or tables.

TOTAL SECTION C: 20
GRAND TOTAL: 150