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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2019

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 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 answers 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. Write neatly and legibly.

SECTION A**QUESTION 1**

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 Which ONE of the following hormones controls metabolic rate?

- A Testosterone
- B Thyroxin
- C Growth hormone
- D Insulin

1.1.2 Which ONE of the following will occur in the human body on a cold day?

- A Vasodilation in the skin
- B Increase in the activity of sweat glands
- C Decrease in evaporation of sweat from the surface of the skin
- D Increase in blood flow to the surface of the skin

1.1.3 The list below includes some of the factors that affect food security:

- (i) Use of pesticides
- (ii) Soil erosion
- (iii) Genetic modification
- (iv) Use of fertilisers

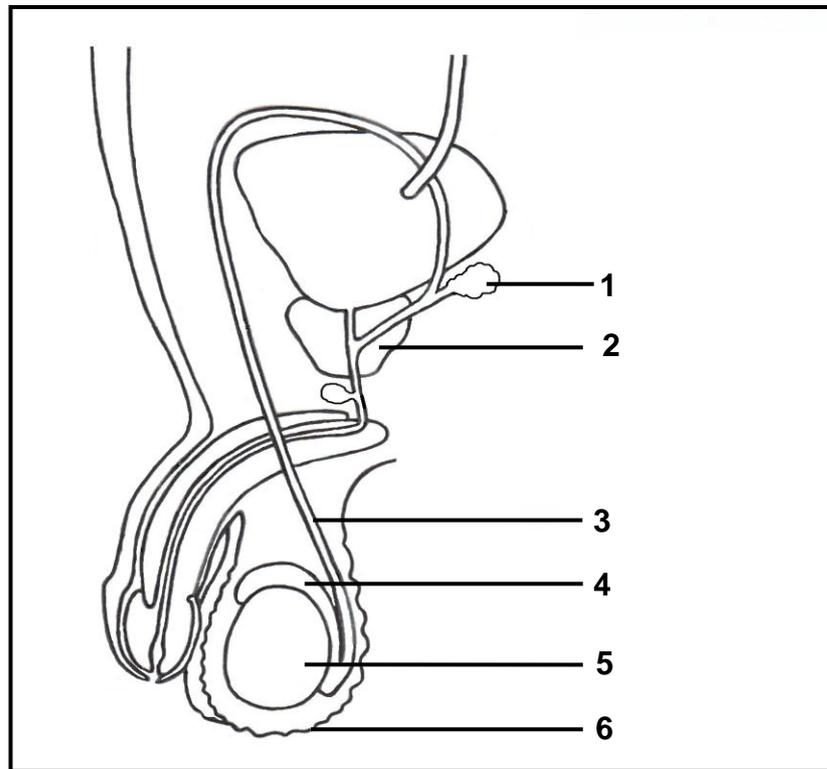
Which ONE of the following combinations includes factors that increase food security?

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

1.1.4 Which part of the neuron transmits impulses towards the cell body?

- A Dendrite
- B Myelin sheath
- C Axon
- D Synapse

QUESTIONS 1.1.5 AND 1.1.6 ARE BASED ON THE DIAGRAM OF THE HUMAN MALE REPRODUCTIVE SYSTEM BELOW.



1.1.5 Which part stores sperm until maturation?

- A 3
- B 4
- C 5
- D 6

1.1.6 A man who had cancer underwent surgery to remove part 1 and part 2.

The man ...

- A will be able to release semen not containing sperm and therefore cannot reproduce.
- B cannot reproduce because he will produce abnormal sperm.
- C cannot reproduce as his sperm will not be able to survive the acidic conditions of the vagina.
- D will be able to reproduce but his sperm will not be able to move fast as they will not have energy.

- 1.1.7 Which ONE of the following shows the results when a cell with 20 chromosomes undergoes mitosis?

	NUMBER OF DAUGHTER CELLS	NUMBER OF CHROMOSOMES
A	2	20
B	2	10
C	4	20
D	4	10

- 1.1.8 Which ONE of the following is a function of amniotic fluid?

- A Transports oxygen to the developing foetus
- B Protects the foetus from temperature changes
- C Produces progesterone and oestrogen
- D Protects the foetus from disease

- 1.1.9 Which part of the ear contains the receptors for hearing?

- A Cochlea
- B Tympanic membrane
- C Oval window
- D Round window

- 1.1.10 Which ONE of the following is a consequence if the round window of the ear hardens?

- A Pressure waves will not be created.
- B Impulses will not be transmitted to the brain.
- C Pressure between the outer and the middle ear will not be equalised.
- D An echo will occur and the sound will be distorted. (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 numbers (1.2.1 to 1.2.9) in the ANSWER BOOK.

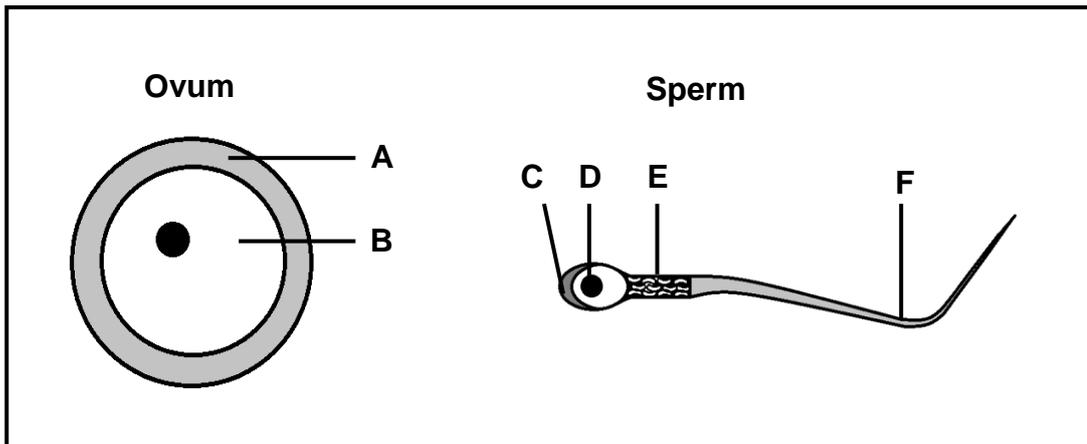
- 1.2.1 The finger-like projections that develop from the outer extra-embryonic membrane
- 1.2.2 Division of the cytoplasm during cell division
- 1.2.3 A plant species that does not belong to an area and which outcompetes the indigenous species of that area
- 1.2.4 A structure in the female reproductive system where semen is deposited during copulation
- 1.2.5 The permanent, large-scale removal of trees and vegetation from an area
- 1.2.6 A hormone that stimulates the mammary glands to produce milk
- 1.2.7 The period of development of the foetus in the uterus
- 1.2.8 A structure in the female reproductive system where fertilisation takes place
- 1.2.9 The stage when secondary sexual characteristics develop in males and females (9 x 1) **(9)**

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

COLUMN I		COLUMN II
1.3.1	The blood vessel that transports oxygenated blood from the placenta to the foetus	A: Umbilical vein B: Umbilical artery
1.3.2	A disorder caused by the degeneration of the myelin sheath of motor neurons	A: Multiple sclerosis B: Alzheimer's disease
1.3.3	A measure of the total amount of carbon dioxide released by an individual per year	A: Greenhouse effect B: Carbon footprint

(3 x 2) **(6)**

1.4 The diagrams below represent the structures of an ovum and a sperm.



1.4.1 Identify part:

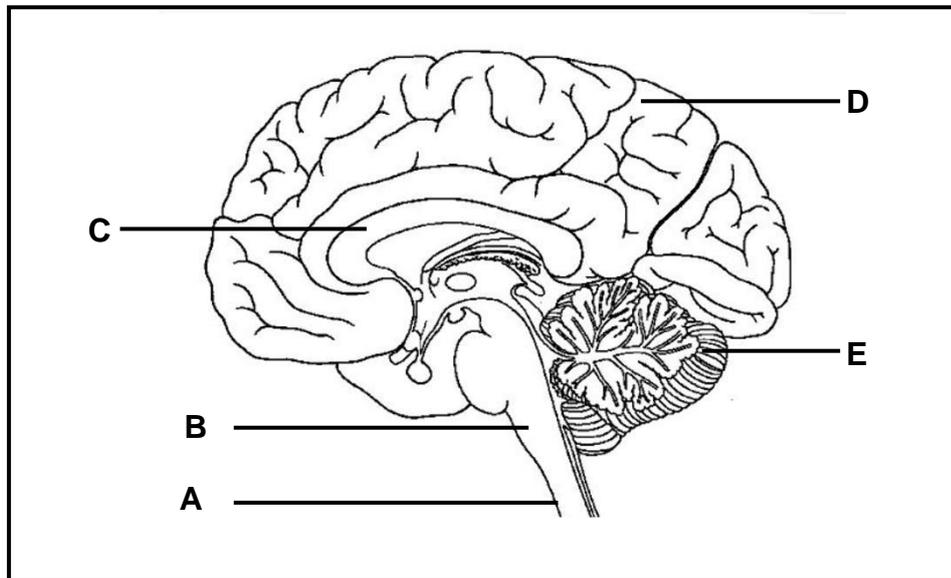
- (a) **A** (1)
- (b) **B** (1)
- (c) **C** (1)

1.4.2 Name the process involving meiosis that leads to the formation of an ovum. (1)

1.4.3 Write down only the LETTER of the part of the sperm that enters the ovum. (1)

1.4.4 Write down only the LETTERS of TWO parts that enable the sperm to move towards the ovum. (2)
(7)

1.5 The diagram below shows some parts of the human central nervous system.



1.5.1 Identify part:

- (a) **A** (1)
- (b) **C** (1)

1.5.2 Write down the LETTER and NAME of the part that:

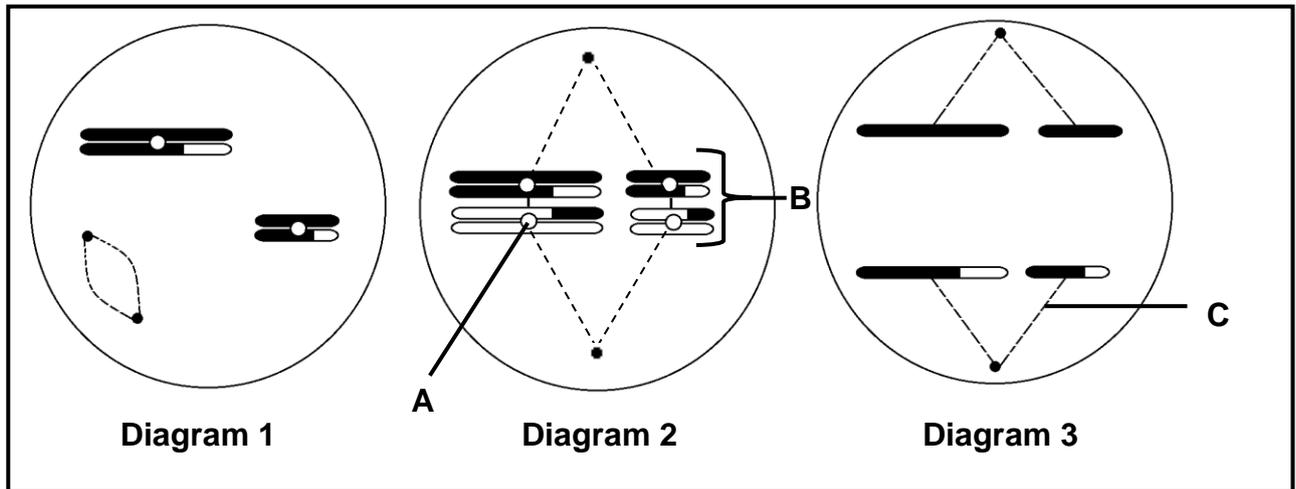
- (a) Has the centre for interpreting taste (2)
- (b) Regulates the heart rate (2)
- (c) Is responsible for motor coordination (2)
- (8)**

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagrams below represent different phases of meiosis in an organism.



- 2.1.1 Identify:
- (a) **A** (1)
 - (b) **B** (1)
 - (c) **C** (1)
- 2.1.2 Identify the phase represented in **DIAGRAM 3**. (1)
- 2.1.3 Write down the numbers of the diagrams to show the sequence in which the phases occur. (2)
- 2.1.4 State **ONE** difference between metaphase **I** and metaphase **II**. (2)
- (8)**

- 2.2 The table below shows a comparison of the composition of the amniotic egg in three different bird species.

COMPOSITION	BIRD SPECIES		
	1	2	3
Yolk (%)	17	36	22
Water content in yolk (%)	77	57	61
Energy (kcal/g)	1,04	1,44	1,14

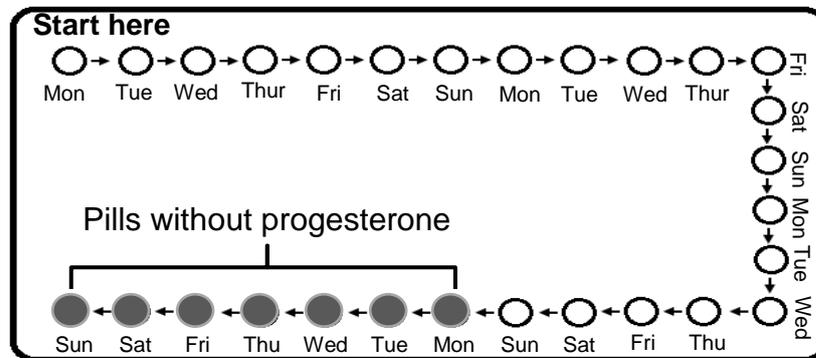
- 2.2.1 Define *ovovivipary*. (2)
- 2.2.2 Which ONE of the bird species (1, 2 or 3) most probably shows a precocial development reproductive strategy? (1)
- 2.2.3 Explain your answer to QUESTION 2.2.2. (2)
- 2.2.4 Which ONE of the bird species (1, 2 or 3) will possibly produce offspring requiring the highest degree of parental care? (1)
- (6)**

- 2.3 The table below indicates the percentage of visually impaired people in the world suffering from different visual defects.

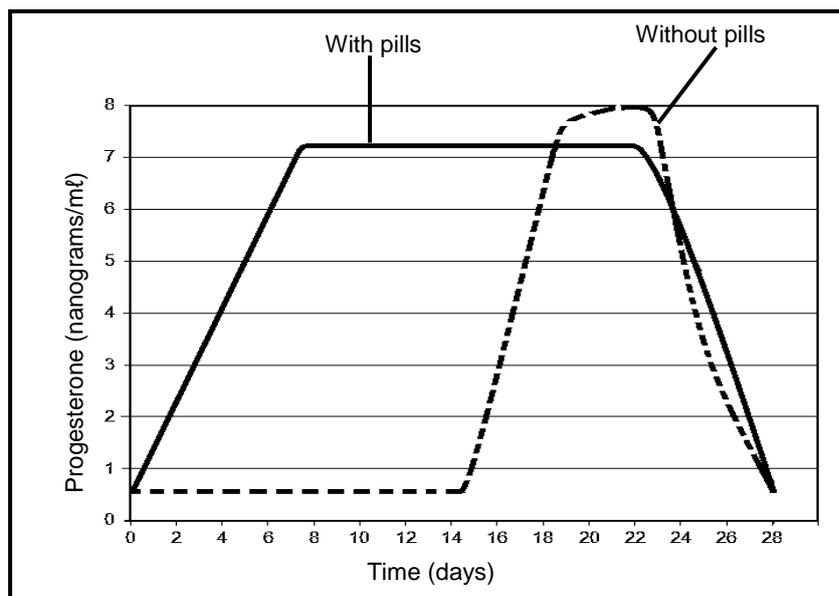
VISUAL DEFECT	PEOPLE (%)
Blindness	2
Long-sightedness	64
Short-sightedness	30
Other	4

- 2.3.1 Which visual defect in the table is the most common among the world population? (1)
- 2.3.2 In some cases where people are blind, the condition is caused by cataracts.
- (a) Explain why people with cataracts may become blind. (2)
- (b) State ONE way in which cataracts can be treated. (1)
- 2.3.3 Explain why long-sighted people need to wear glasses with biconvex lenses as a corrective measure. (4)
- 2.3.4 Name a visual defect that is characterised by an uneven cornea or lens. (1)
- 2.3.5 Draw a pie chart to represent the data in the table. (6)
- (15)**

2.4 Contraceptives are used to prevent pregnancy. Some females use pills that contain progesterone. In one packet there would be 28 pills, of which 21 contain different concentrations of progesterone according to the day in the cycle and the remaining 7 will contain no progesterone. A female has to take one pill daily at the same time in a given sequence, as shown below.



The graph below shows the difference in the progesterone levels during a menstrual cycle of a woman taking contraceptive pills and a woman not taking contraceptive pills.

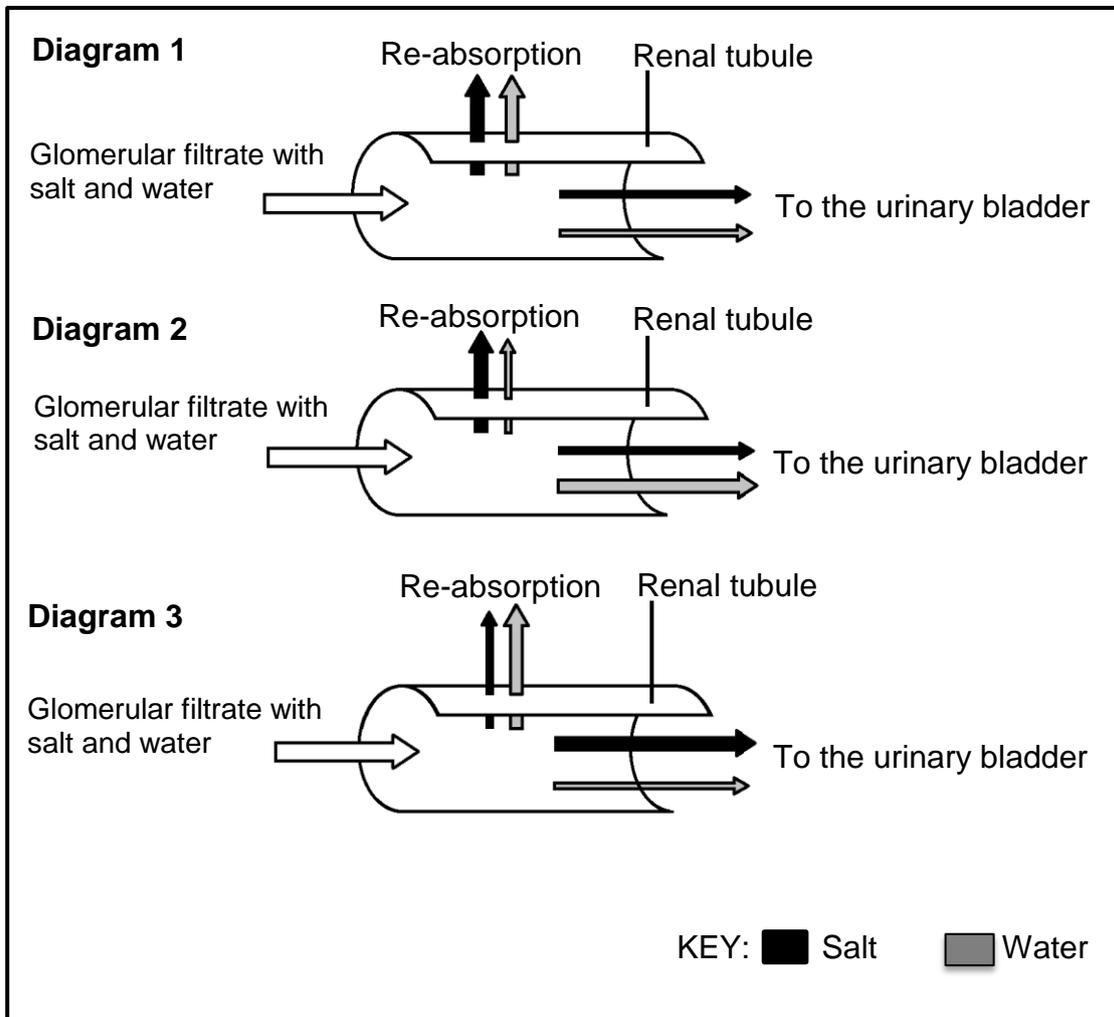


- 2.4.1 The oestrogen levels between days **8** and **22** will remain low in the woman who takes contraceptive pills. Explain why this is the case. (4)
- 2.4.2 Ovulation took place on day **14** in the woman not taking contraceptive pills. Explain the evidence in the graph that supports this conclusion. (2)
- 2.4.3 Suggest **ONE** reason for including pills with no hormones in the contraceptive pill packet. (1)

2.5 Describe the development of a zygote until implantation occurs. (4)
[40]

QUESTION 3

3.1 The diagrams below show the re-absorption of salt and water through the tubules of a nephron in the kidney under three different conditions. The width of the arrows represents the amounts of salt and water.



- 3.1.1 Name the hormone in a human body that is responsible for controlling the: (1)
- (a) Water content (1)
- (b) Salt content (1)
- 3.1.2 Name the gland that secretes the hormone in QUESTION 3.1.1(b). (1)
- 3.1.3 Which diagram (1, 2 or 3) would represent a person who had eaten salty chips on a hot day without any intake of water? (1)
- 3.1.4 Explain your answer to QUESTION 3.1.3. (5)
- (9)**

3.2 Read the extract below.

People with Type I diabetes mellitus are usually insulin-dependent (must inject themselves with insulin to control their blood glucose levels). It has been determined that these people also lose their ability to secrete glucagon within five years of being diagnosed and they become glucagon deficient.

During a stressful situation adrenalin is secreted, which has the same effect as glucagon on the blood glucose levels.

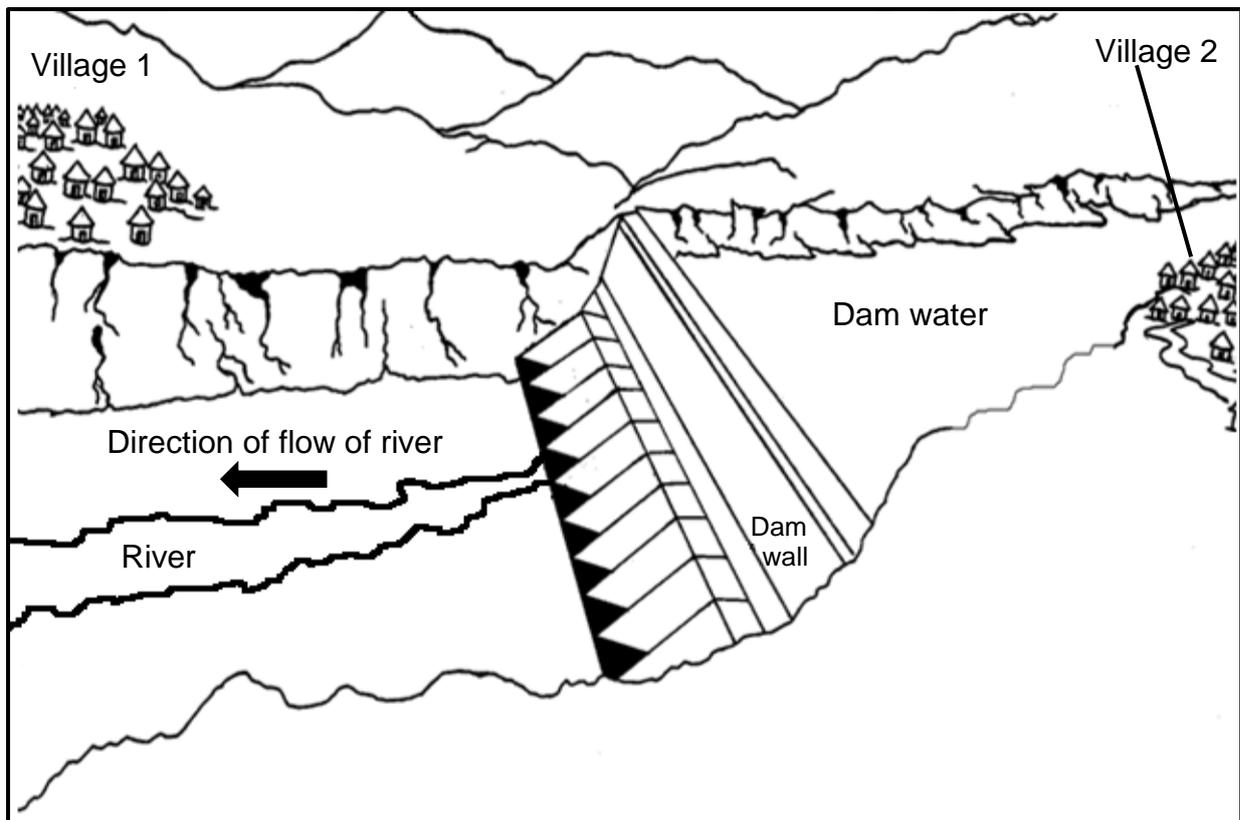
An investigation was conducted to determine the influence of adrenalin on the blood glucose levels of Type I diabetics who were also glucagon deficient.

The investigation was conducted as follows:

- 100 male patients with Type I diabetes mellitus, who were also glucagon deficient, participated in the investigation.
- They were then given the same amount of food and water at the same time for a period of three days.
- Their blood glucose levels were measured on the morning of the third day.
- A solution with a low concentration of adrenalin was then administered intravenously (injected).
- After 20 minutes, the blood glucose concentration in each person was measured again.
- The blood glucose levels before and after administering adrenalin were compared.

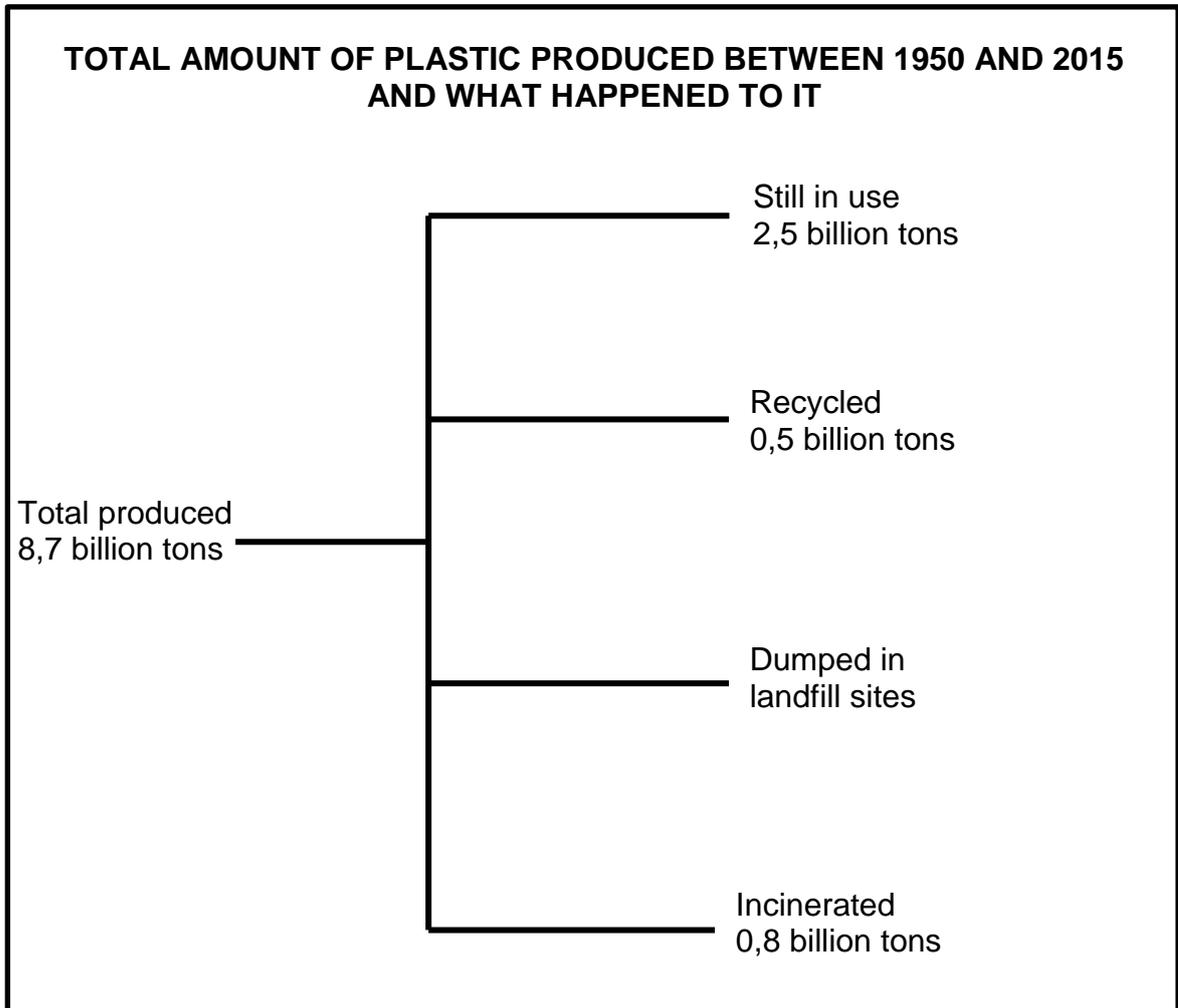
- 3.2.1 Name the gland that secretes glucagon. (1)
- 3.2.2 Identify the independent variable in the investigation. (1)
- 3.2.3 State THREE other factors that should have been kept constant during the investigation. (3)
- 3.2.4 Explain why the blood glucose levels were measured before injecting adrenalin on the third day. (2)
- 3.2.5 Explain why the adrenalin was injected instead of given orally. (2)
- 3.2.6 Explain what would be the expected results after adrenalin was injected into the patients. (2)
- 3.2.7 Give a reason for the use of 100 patients in the investigation instead of only 10 patients. (1)
- (12)**

3.3 The diagram below shows a dam that was built in a flowing river.



- 3.3.1 Explain how the presence of a dam can affect the biodiversity in the river. (2)
 - 3.3.2 Village 2 is a farming village that uses fertilisers to increase their crop yield.
Describe the impact of fertilisers on the quality of water when they are washed into the dam during heavy rains. (5)
 - 3.3.3 Explain ONE economic benefit of the constructed dam to the people living in Village 2. (2)
- (9)**

3.4 The diagram below shows the total amount of plastic produced between 1950 and 2015 and what happened to it.



- 3.4.1 Calculate how much plastic (in billions of tons) produced between 1950 and 2015 ended up in landfill sites. Show ALL calculations. (2)
 - 3.4.2 Describe the impact of incinerating (burning) plastic on global warming. (4)
 - 3.4.3 Explain TWO strategies that municipalities could implement to increase the amount of plastic that is recycled by a community. (4)
- (10)**
[40]

TOTAL SECTION B: 80

SECTION C**QUESTION 4**

Both plants and humans respond to gravity.

Explain why the root and the stem grow in different directions when a pot plant is placed horizontally on the ground, receiving light equally from all directions.

Also describe the role of the maculae in maintaining balance when a person tilts his/her head to one side without falling over.

Content: (17)
Synthesis: (3)
(20)

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

TOTAL SECTION C: 20
GRAND TOTAL: 150