basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2023

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 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–D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

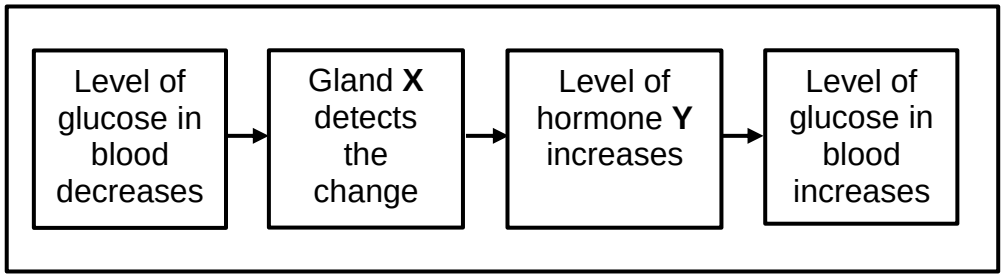
1.1.1 Which ONE of the following parts controls the amount of light entering the eye by influencing the size of the pupil?

A Sclera
B Cornea
C Retina
D Iris

1.1.2 The function of the umbilical vein is to transport …

A carbon dioxide from the foetus to the mother.
B nutrients from the foetus to the mother.
C carbon dioxide from the mother to the foetus.
D nutrients from the mother to the foetus.

1.1.3 The diagram below represents the events that occur during the homeostatic control of blood glucose.



Which ONE of the following represents gland **X** and hormone **Y**?

	Gland X	**Hormone Y**
A	Pancreas	Glucagon
B	Pituitary	Glucagon
C	Pancreas	Insulin
D	Pituitary	Insulin

1.1.4 Which ONE of the following is CORRECT regarding the homeostatic control of the carbon dioxide concentration in the blood?

A The lungs have receptors.
B High oxygen levels is the stimulus.
C Breathing muscles are the effectors.
D The process is controlled by the cerebrum.

1.1.5 The plant hormones that can be used to kill broad-leaved weeds are …

A abscisic acid only.
B abscisic acid and gibberellins.
C auxins only.
D abscisic acid and auxins.

1.1.6 A girl looking at a car moving away from her is able to focus on the letters on the number plate.

Which ONE of the following changes occurred in her eyes?

A The suspensory ligaments slackened.
B The ciliary muscles relaxed.
C Light rays were refracted more.
D The lens became more convex.

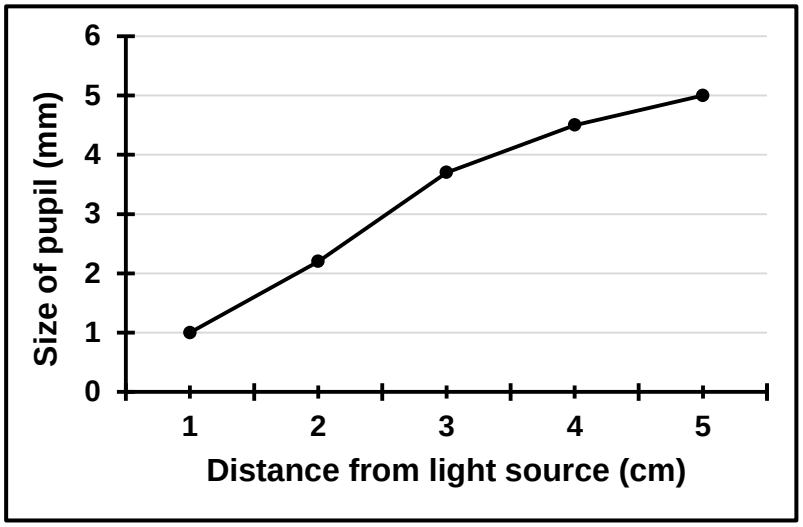
1.1.7 One of the characteristics of a sperm that causes it to move faster is the …

A oval-shaped head.
B haploid nucleus.
C presence of enzymes in the acrosome.
D absence of a middle piece.

1.1.8 In a person suffering from long-sightedness, …

A the eyeball is longer than normal.
B light rays fall behind the retina.
C light rays are refracted more by the lens.
D distant objects will appear blurred.

1.1.9 The graph below shows the results of an investigation done to determine the effect of light intensity on the size of the pupil.



Which ONE of the following statements is a conclusion that can be made from the results?

A As the distance from the light source increases, the size of the pupil increases.
B As the distance from the light source decreases, the size of the pupil increases.
C As the size of the pupil increases, the distance from the light source increases.
D As the size of the pupil decreases, the distance from the light source increases.

1.1.10 The following is a list of events that occur in the female body:

(i) Puberty
(ii) Ovulation
(iii) Development of the corpus luteum
(iv) Oogenesis
(v) Thickening of the endometrium

Which ONE of the following is a combination of events that are influenced by LH (luteinising hormone)?

A (i), (ii), (iii), (iv) and (v)
B (ii), (iii), (iv) and (v) only
C (ii) and (iii) only
D (iii) only (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 1.2.8) in the ANSWER BOOK.

1.2.1 A reproductive strategy where the young receives nutrients through the placenta

1.2.2 The duct that transports semen and urine to the outside of the body

1.2.3 The part of the nervous system that consists of cranial and spinal nerves

1.2.4 The form in which excess glucose is stored in the liver

1.2.5 The structure that serves as a micro-filter during pregnancy

1.2.6 The pigmented layer of the eye that absorbs excess light

1.2.7 The part of a neuron that plays a role in the speed at which a nerve impulse is transmitted

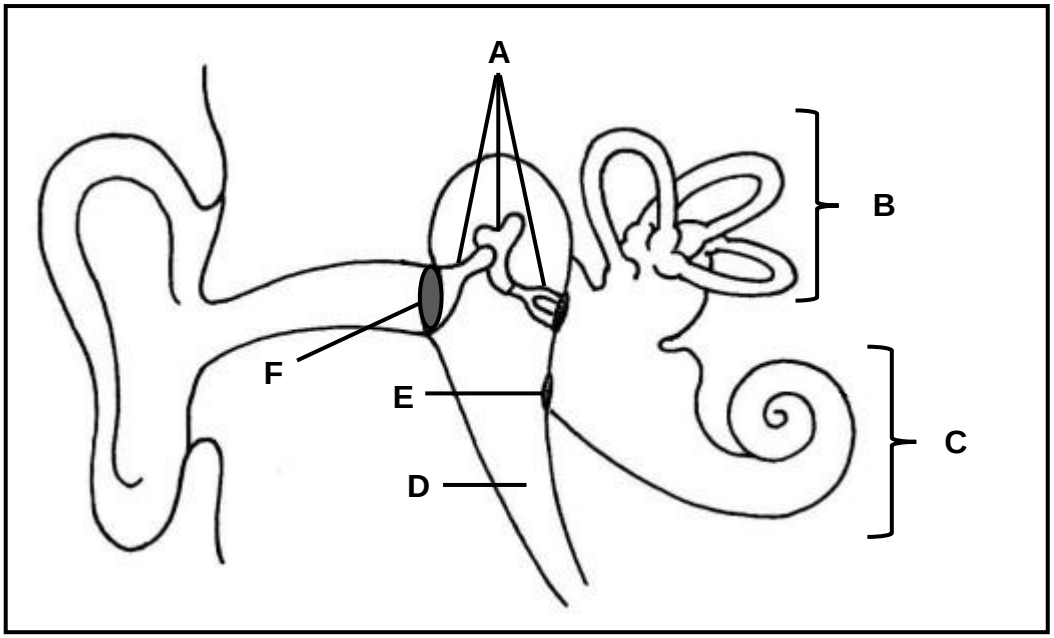
1.2.8 The part of the male reproductive system which temporarily stores sperm until they mature (8 x 1) **(8)**

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	A process that produces four mature gametes in humans from a single diploid cell	A: Oogenesis B: Spermatogenesis
1.3.2	A defence mechanism that protects plants against herbivores	A: Thorns B: Chemicals
1.3.3	The nerve that transmits impulses from the retina to the brain	A: Optic nerve B: Auditory nerve

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

1.4 The diagram below represents the human ear.



1.4.1 Identify part:

(a) **B** (1)

(b) **E** (1)

1.4.2 Give the LETTER and NAME of the part that:

(a) Is filled with air (2)

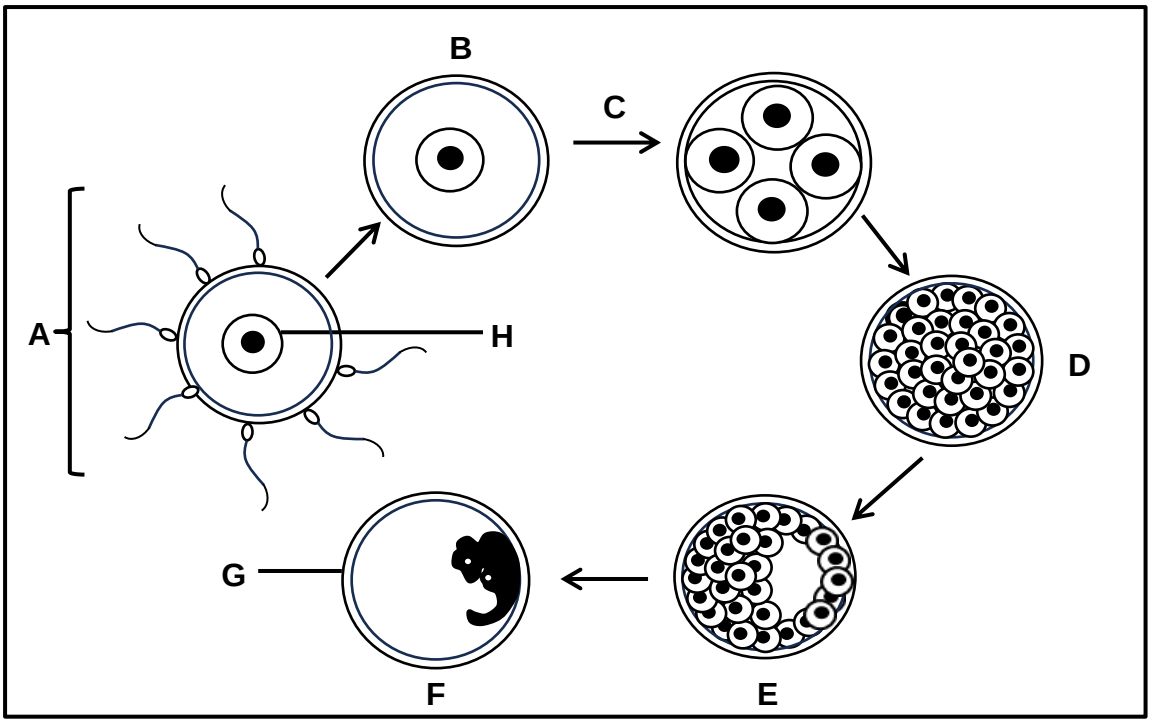
(b) Contains the organ of Corti (2)

1.4.3 Give the LETTER of the part:

(a) Where grommets are inserted (1)

(b) That amplifies vibrations (1)
(8)

1.5 The diagram below shows events that may take place inside a human female body.



1.5.1 Identify structure:

(a) **B** (1)

(b) **D** (1)

(c) **E** (1)

1.5.2 Name the:

(a) Process taking place at **A** (1)

(b) Inner wall of the uterus where structure **E** implants (1)

1.5.3 State the type of cell division that takes place at **C**. (1)

1.5.4 How many chromosomes are normally found in **H**? (1)

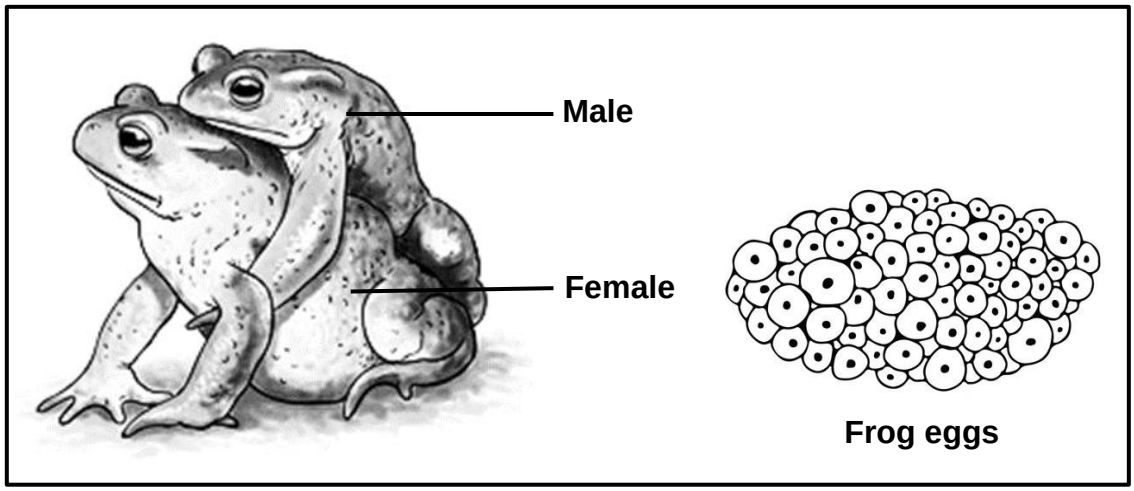
1.5.5 Identify the extra-embryonic membrane **G**. (1)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 In some frog species, during mating, the male climbs onto the back of the female and grasps her with his front legs. During this time, the female will release about 6 000 ova, while the male releases sperm onto them. This mating behaviour is called amplexus.



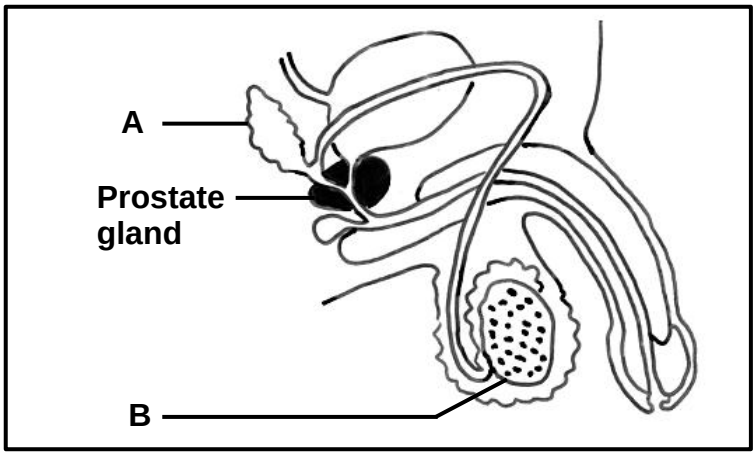
2.1.1 Name the type of fertilisation that occurs during reproduction in frogs. (1)

2.1.2 Explain why the fertilised eggs of these frogs do not survive on land. (2)

2.1.3 Explain how amplexus increases the chances of fertilisation in frogs. (2)

2.1.4 From the information above, explain ONE other strategy that contributes to the reproductive success of the frog species. (2)
(7)

2.2 The diagram below represents the male reproductive system.



2.2.1 Name:

(a) Part **A** (1)

(b) The hormone secreted by **B** (1)

2.2.2 Explain ONE function of the fluid secreted by the prostate gland during reproduction. (2)

2.2.3 Prostate cancer is one of the most common types of cancer among men.

The table below shows the number of men per 100 000 men of different age groups that were diagnosed with prostate cancer in a certain country over a period of 14 years.

AGE GROUP	NUMBER OF PROSTATE CANCER CASES (PER 100 000 MEN)
<49	5
50–54	135
55–59	288
60–64	488
65–69	720
70–74	764
75–79	693
>80	473

(a) According to the table, which age group of men is most likely to develop prostate cancer? (1)

(b) Draw a histogram to represent the data for men from the age group 60–64 to the age group 75–79. (6)
(11)

2.3 Read the extract below.

OVARIAN CYSTS IN FEMALES

Ovarian cysts are fluid-filled structures that develop inside the ovaries of some women. The two most common types of cysts in women of reproductive age are follicular cysts and corpus luteum cysts.

Follicular cysts develop when a Graafian follicle fails to rupture and release the ovum. The follicle continues to grow because of continued hormonal stimulation.

A corpus luteum cyst develops when the corpus luteum does not degenerate, even when a person is not pregnant.

Women often show no symptoms and the cysts disappear, but in rare cases ovarian cysts keep on increasing in size. A very large cyst can cause intense pain and may rupture, leading to internal bleeding. Such cysts will require surgical removal.

2.3.1 From the extract, give:

(a) TWO structures in the ovary that may develop into cysts (2)

(b) TWO symptoms associated with very large cysts (2)

2.3.2 Name the hormone:

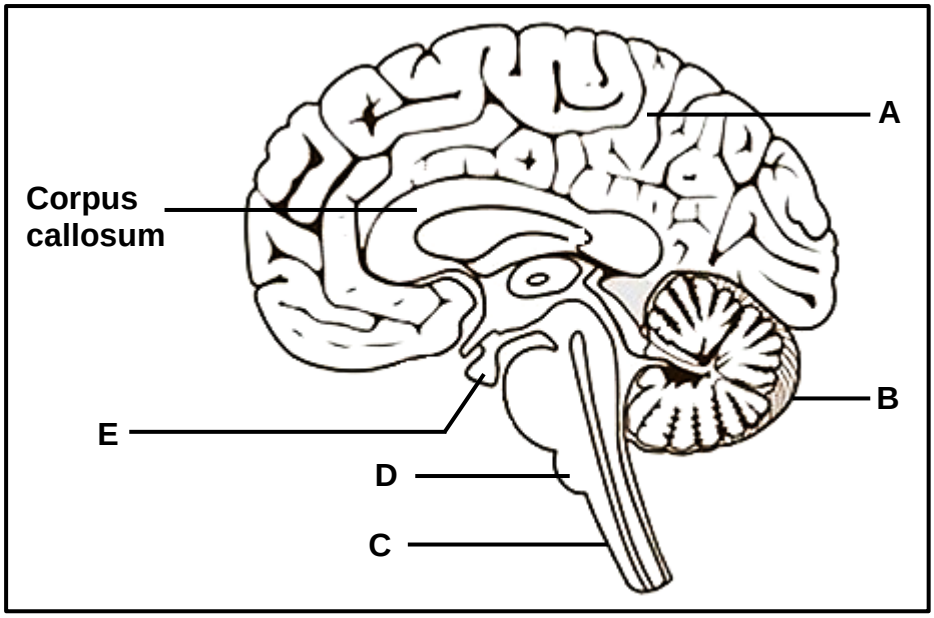
(a) Responsible for the growth of the follicle under normal conditions (1)

(b) That will be high in concentration in the blood of women where follicular cysts develop (1)

2.3.3 Give a reason for your answer to QUESTION 2.3.2(b). (1)

2.3.4 Explain why a woman will not be able to fall pregnant if she has a corpus luteum cyst that does not disappear. (5)
(12)

2.4 The diagram below represents part of the central nervous system of a human.



2.4.1 Identify:

(a) Part **C** (1)

(b) Gland **E** (1)

2.4.2 Give the LETTER of the part that controls voluntary actions. (1)

2.4.3 Describe the location of the corpus callosum. (2)

2.4.4 A learner suffered a brain injury during a rugby match. He could still breathe properly but he experienced occasional loss of memory and balance.

Explain why:

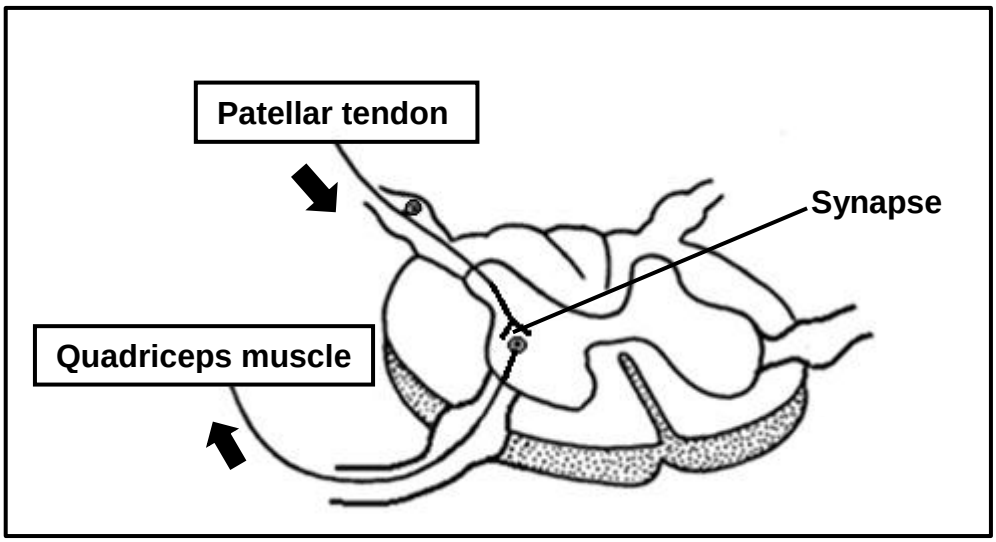
(a) The learner could still breathe properly (2)

(b) It is possible that the injury affected part **B** (2)

(c) The hearing of the learner could also be affected because of the injury (2)
(11)

2.5 The efficiency and speed of the knee-jerk reaction is very important for balance and movement. The stimulation of the patellar tendon, just below the knee cap (patella), causes the contraction and relaxation of the quadriceps muscle in the upper leg.

The diagram below represents the reflex arc for the knee-jerk reaction containing only ONE synapse. The arrows indicate the transmission of nerve impulses.



2.5.1 What is a *reflex action*? (2)

2.5.2 State:

(a) ONE reason why a synapse is significant (1)

(b) The importance of the knee-jerk reaction (1)

2.5.3 Describe the pathway of the impulse in this reflex arc to bring about the knee-jerk reaction. (5)
(9)
[50]

QUESTION 3

3.1 Read the extract below.

ALZHEIMER'S DISEASE AND EXERCISE

Age and family history are the known risk factors for Alzheimer's disease. The most common symptom of Alzheimer's disease is a worsening ability to remember new information.

Regular exercise may help to reduce the risk of developing Alzheimer's disease because it can improve blood flow to the brain and help to maintain the volume of the hippocampus. The hippocampus is located deep inside the cerebrum and plays a major role in learning ability and orientation.

Scientists conducted an investigation to determine if regular exercise reduces the risk of Alzheimer's disease in humans.

They:

- Used 37 female participants between the ages of 65 and 75 in an exercise programme
- Used participants that did not show symptoms of Alzheimer's disease at the start of the investigation
- Conducted the investigation three times a week for three months

The results showed an improvement in higher-order thinking abilities and an increased blood flow to the cerebrum.

3.1.1 State ONE change in the nerve tissue of the brain that can cause Alzheimer's disease. (1)

3.1.2 From the extract, state:

(a) ONE symptom of Alzheimer's disease (1)

(b) A genetic risk factor (1)

(c) TWO functions of the hippocampus (2)

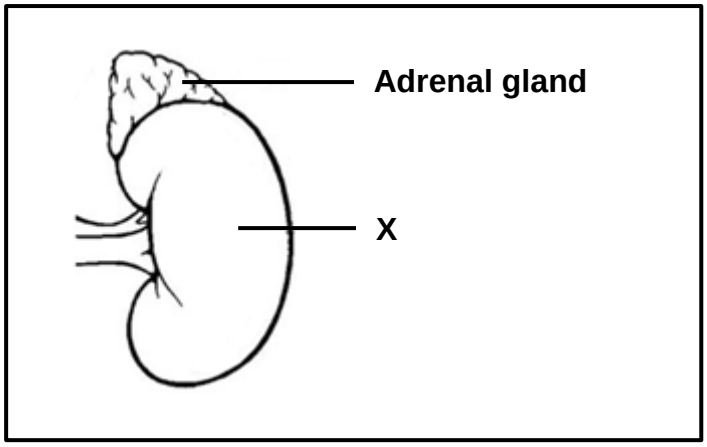
3.1.3 Name TWO factors that were considered when selecting the participants for this investigation. (2)

3.1.4 State TWO ways in which the scientists improved the reliability of their results. (2)

3.1.5 Explain why this investigation cannot be used to conclude that exercise reduces the risk of getting Alzheimer's disease. (2)

3.1.6 From the extract, explain why it is expected that regular exercise can reduce the risk of Alzheimer's disease. (3)
(14)

3.2 The diagram below shows the location of the adrenal gland in the human body.



3.2.1 Identify:

(a) Organ **X** (1)

(b) The system to which the adrenal gland belongs (1)

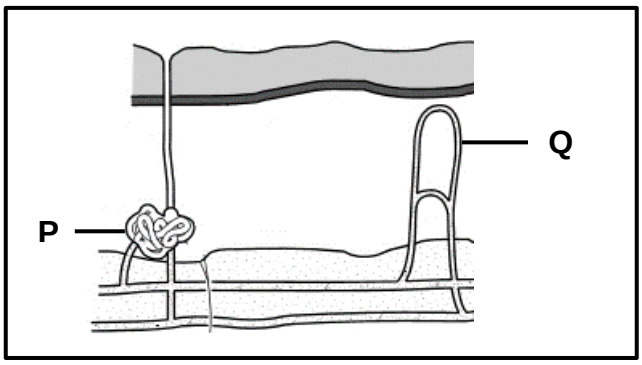
3.2.2 State TWO characteristics of the type of glands that belongs to the system identified in QUESTION 3.2.1(b). (2)

3.2.3 Describe the interaction between the adrenal gland and organ **X** in maintaining homeostasis when salt levels in the blood are low. (5)

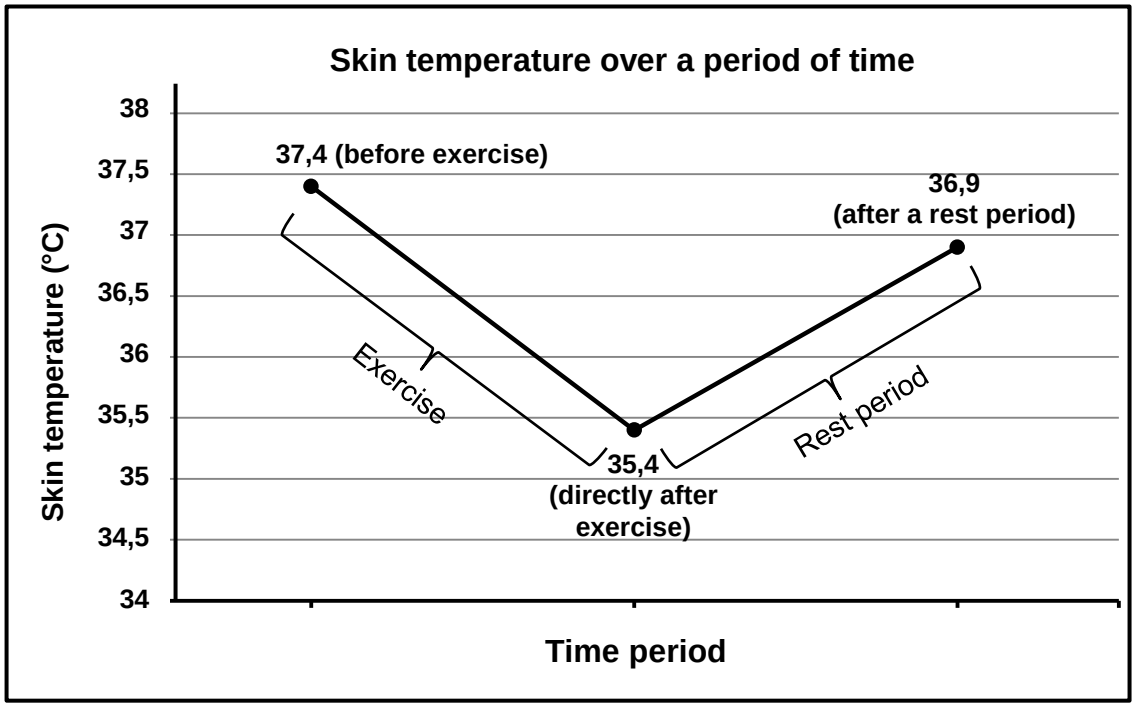
3.2.4 Explain the effect that a secretion of the pituitary gland will have on organ **X** when a person experiences dehydration. (5)
(14)

3.3 A twelve-year-old boy participated in physical exercise for 45 minutes, followed by a 15-minute rest period. The skin temperature of the boy was measured and the results were recorded.

The diagram below represents the skin of the boy before exercise.



The graph below shows the changes in skin temperature over a period of time.



3.3.1 Name the:

(a) Homeostatic mechanism that brings about the change in skin temperature (1)

(b) Part of the brain that is responsible for the mechanism named in QUESTION 3.3.1(a) (1)

3.3.2 From the diagram, identify the following parts:

(a) **P** (1)

(b) **Q** (1)

3.3.3 Calculate the percentage decrease in the average skin temperature of the boy before and directly after exercise.
Show ALL working. (3)

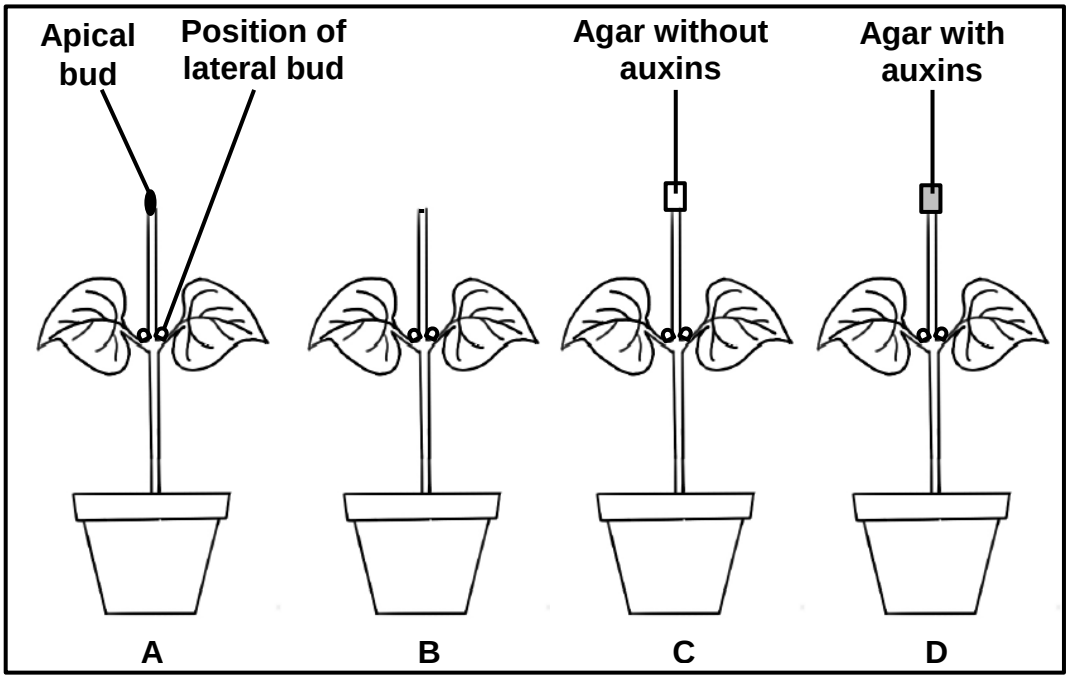
3.3.4 Explain the roles of part **P** and **Q** in the change in skin temperature from before exercise to directly after exercise. (6)
(13)

3.4 An investigation was done to determine the effect of auxins on the growth of lateral branches. (The elongation of lateral buds results in the growth of lateral branches.)

The procedure was as follows:

- Four potted plants (**A**, **B**, **C** and **D**) of the same species were used.
- Plant **A** was left untreated.
- The apical bud of plant **B** was removed.
- The apical bud of plant **C** was removed and replaced with agar jelly (a jelly-like substance through which other substances can diffuse).
- The apical bud of plant **D** was removed and replaced with agar jelly containing auxins.
- The plants were exposed to the same environmental conditions.
- The length of the lateral buds of each plant was measured at the beginning of the investigation and again after three weeks.

The diagram below shows the setup of the investigation at the beginning.



The results are shown in the table below.

Plant	Length of the lateral buds (mm)	
	At the beginning	After three weeks
A	7,0	7,3
B	6,9	10,4
C	7,2	10,3
D	7,1	7,2

3.4.1 For this investigation, state the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.4.2 Explain why all the plants were exposed to the same environmental conditions. (2)

3.4.3 Explain why agar without auxins was used in plant **C**. (3)

3.4.4 State a conclusion for this investigation. (2)
(9)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150