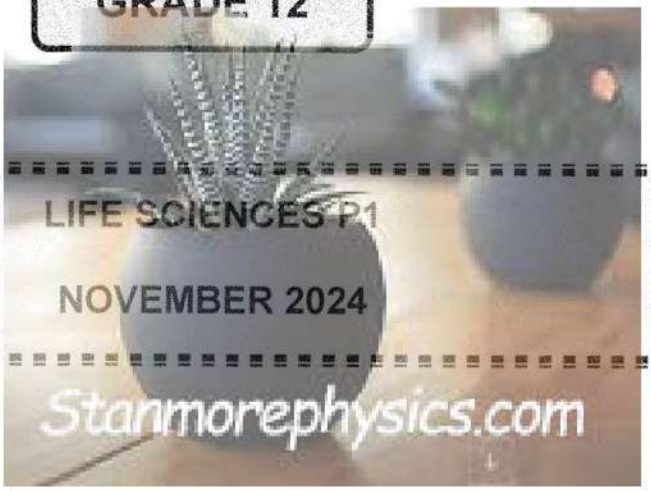
basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12



LIFE SCIENCES P1

NOVEMBER 2024

MARKS: 150

TIME: 2½ hours

This question paper consists of 18 pages.

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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.

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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 The hormone responsible for the regulation of salt content in the human body is …

A testosterone.
B aldosterone.
C prolactin.
D glucagon.

1.1.2 Which ONE of the following is a stage in human embryonic development?

A Choroid
B Amnion
C Morula
D Chorion

1.1.3 When the carbon dioxide level in the blood increases above normal, the …

A rate and depth of breathing decrease.
B receptor cells in the diaphragm are stimulated.
C heart beats slower.
D receptor cells in the carotid artery in the neck are stimulated.

1.1.4 Which ONE of the following changes occurs under the influence of adrenalin?

A An increased blood supply to the skeletal muscles
B Decreased blood pressure
C Decreased muscle tone of skeletal muscles
D An increased blood supply to the digestive system

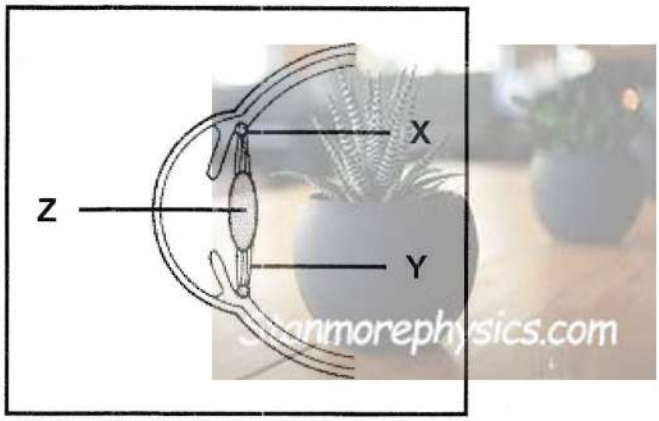
1.1.5 A girl is barefoot and steps onto a thorn, causing a reflex action.

Which ONE of the following represents the CORRECT pathway of the reflex arc?

A Pain receptor → motor neuron → sensory neuron → leg muscle
B Foot muscle → sensory neuron → motor neuron → pain receptor
C Foot muscle → motor neuron→ sensory neuron→ pain receptor
D Pain receptor → sensory neuron → motor neuron → leg muscle

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1.1.6 The diagram below represents a part of the human eye.



A spectator in a soccer stadium is seated 200 metres away from the field.

Which ONE of the following describes the condition of structures **X**, **Y** and **Z** when he looks at the ball placed in the middle of the field?

	MUSCLE IN X	STRUCTURE Y	PART Z
A	Relaxed	Slack	More convex
B	Contracted	Slack	Less convex
C	Relaxed	Taut	Less convex
D	Contracted	Taut	More convex

1.1.7 Which ONE of the following is involved in thermoregulation?

A Corpus callosum
B Hypothalamus
C Cerebellum
D Spinal cord

1.1.8 The following is a list of factors regarding a developing foetus:

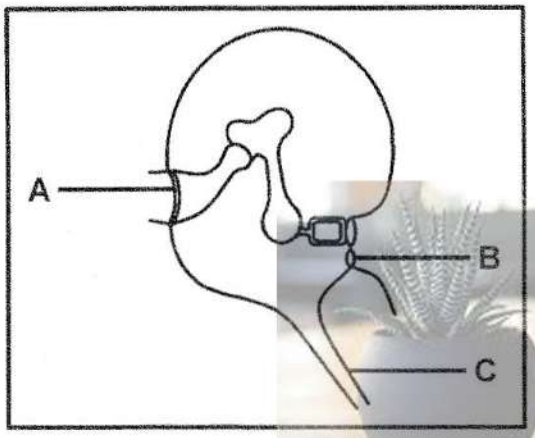
(i) Temperature regulation
(ii) Protection
(iii) Free movement
(iv) Nutrition

For which combination of factors is the amniotic fluid responsible?

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

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1.1.9 The diagram below shows a part of the human ear.

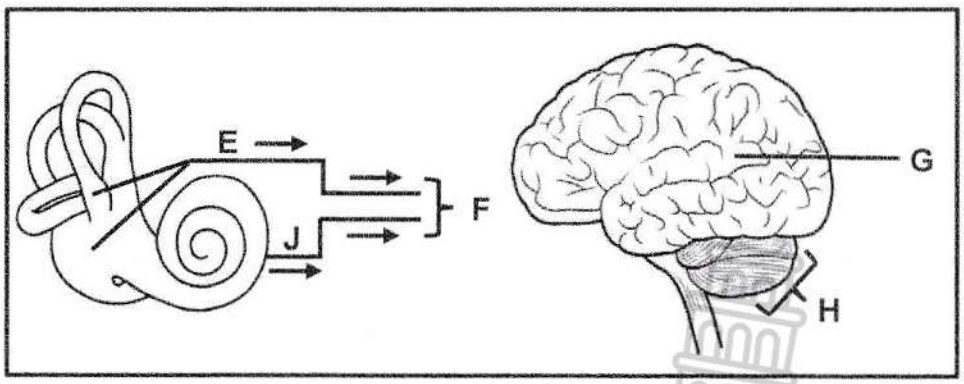


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Which ONE of the following occurs when there are excess waves in the inner ear?

A Pressure is released at **A**
B Pressure is released at **C**
C Pressure is absorbed at **B**
D Pressure is absorbed at **A** and **C**

1.1.10 The diagrams below represent the transmission of impulses from a structure in the inner ear to the brain.



The nerve impulses for balance are transmitted as follows:

A J → F → H
B E → F → H
C E → F → G
D J → F → G

(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 The structure that connects the foetus to the placenta

1.2.2 The part of the nervous system that consists of sympathetic and parasympathetic sections

1.2.3 Receptors in the ear that detect changes in speed and direction of movement of the head

1.2.4 The ossicle that transfers vibrations to the oval window

1.2.5 The growth reaction of a plant in response to gravity

1.2.6 The part in the inner ear where the organ of Corti is located

1.2.7 A plant hormone that stimulates the germination of seeds

1.2.8 A structure in the head of a sperm cell that contains enzymes

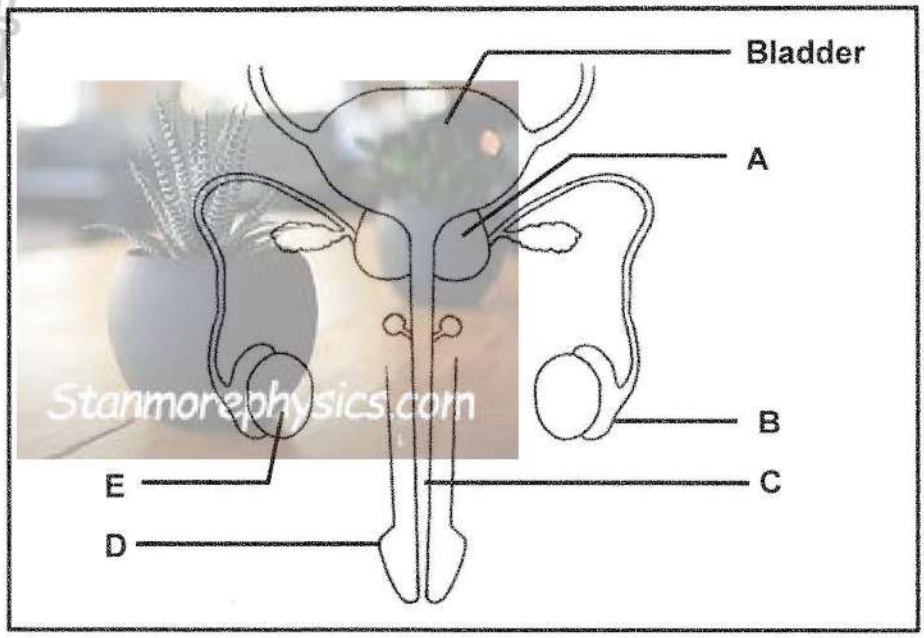
(8 x 1) **(8)**

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	Acts as a micro-filter for the developing foetus	A: Placenta B: Cervix
1.3.2	The part of the brain that controls heart rate	A: Corpus callosum B: Medulla oblongata
1.3.3	The area on the retina where there are no rods or cones	A: Blind spot B: Cornea

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

1.4 The diagram below represents the front view of the human male reproductive system.



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1.4.1 Give the LETTER and NAME of the structure that:

(a) Forms part of both the urinary and reproductive systems (2)

(b) Stores sperm temporarily (2)

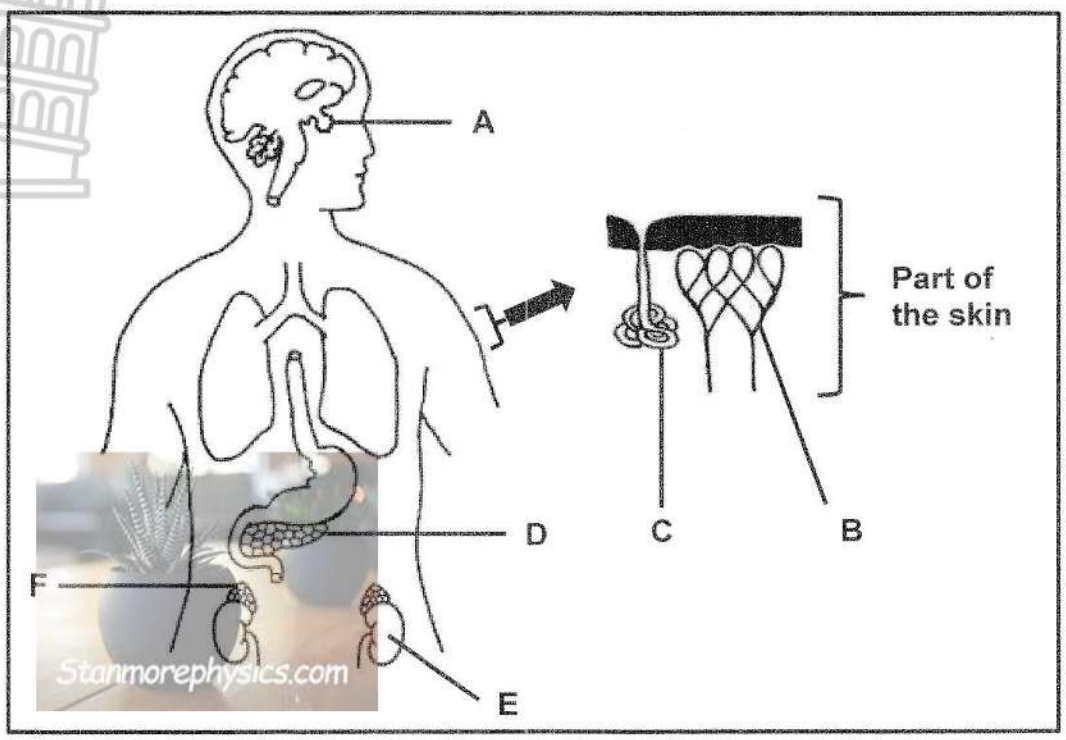
(c) Secretes testosterone (2)

1.4.2 Identify:

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

(b) The type of gametogenesis that takes place in part **E** (1)
(8)

1.5 The diagram below represents some structures involved in homeostasis in the human body.



1.5.1 Write the LETTERS of the parts that serve as endocrine glands only. (2)

1.5.2 Give the LETTERS and NAMES of the parts responsible for the regulation of body temperature. (4)

1.5.3 Name the following with regard to the regulation of water content in the blood:

(a) Hormone secreted by part **A** (1)

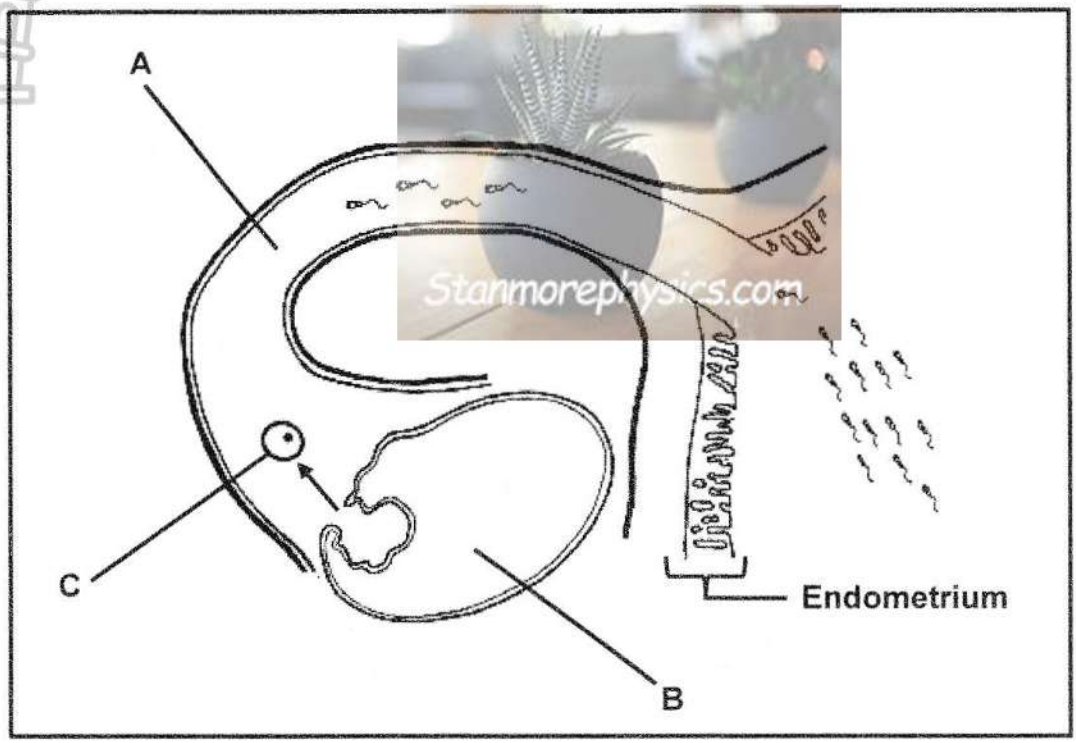
(b) Target organ **E** (1)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a part of the female reproductive system.



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2.1.1 Identify part:

(a) **A** (1)

(b) **B** (1)

2.1.2 Give TWO:

(a) Characteristics of the endometrium that make it suitable for implantation (2)

(b) Visible reasons why there is an increased chance of fertilisation in this female (2)

2.1.3 Identify and describe the type of gametogenesis that leads to the formation of structure **C**. (6)

2.1.4 In an ectopic pregnancy, the fertilised ovum can become implanted in part **A**. This normally results in the death of the embryo and may endanger the mother's life.

Explain why an ectopic pregnancy may result in the death of an embryo. (3)
(15)

2.2 The table below shows the levels of two hormones during the menstrual cycle of a healthy human female.

DAY OF MENSTRUAL CYCLE	OESTROGEN LEVEL (pg/mℓ)	PROGESTERONE LEVEL (ng/mℓ)
4	55	0,23
8	70	0,03
10	280	0,03
12	300	0,03
14	140	3,0
16	110	12,5
20	80	15,0
24	70	5,0
28	65	0,8

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2.2.1 On which day of this menstrual cycle is the level of progesterone the highest? (1)

2.2.2 Name the reproductive hormone that will begin to increase from day 24 of this female's menstrual cycle. (1)

2.2.3 Use data from the table to explain your answer to QUESTION 2.2.2. (2)

2.2.4 Calculate the percentage increase in the oestrogen level from day 8 to day 10. Show ALL your working. (3)

2.2.5 How would the progesterone level differ after day 20 if this female was pregnant? (1)

2.2.6 Explain what causes the change in the progesterone level stated in QUESTION 2.2.5. (2)
(10)

2.3 Read the passage below.

CATARACTS – THE MOST COMMON CAUSE OF BLINDNESS

Cataracts are primarily formed when protein structures in the lens of the eye start to disintegrate and clump together. Cataracts is the most common cause of blindness and the main cause of vision loss in people over 40 years of age.

Two types of cataracts that occur are nuclear cataracts and subcapsular cataracts. In nuclear cataracts, the cataracts form in the central region of the lens and gradually spread outwards. In subcapsular cataracts, the cataracts develop at the back of the lens and it is most common in people with diabetes.

2.3.1 According to the passage, which type of cataract is associated with a disorder of the pancreas? (1)

2.3.2 Use information in the passage to explain why cataracts cause vision loss. (5)
(6)

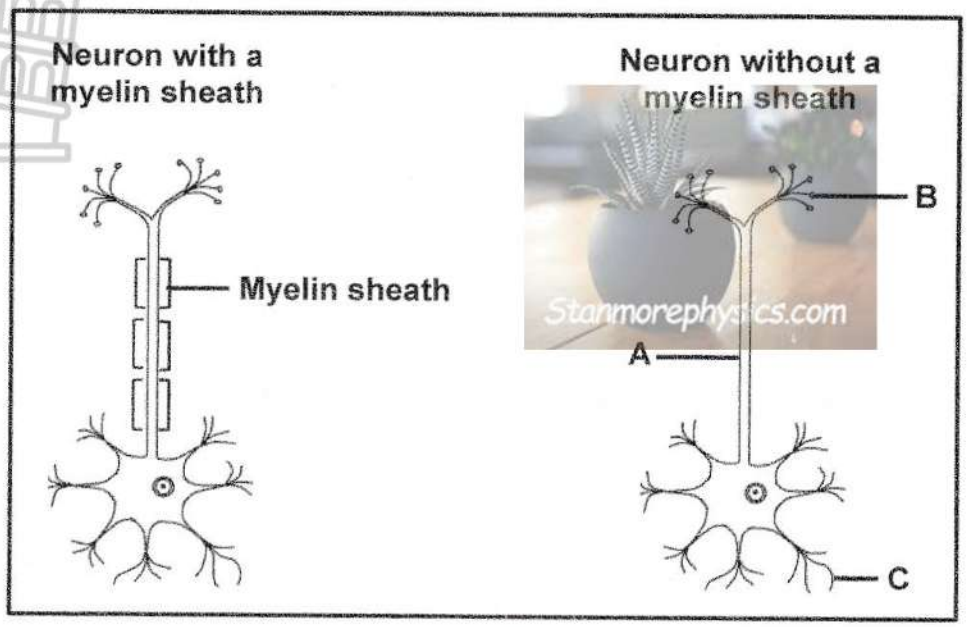
2.4 A man is long-sighted.

Explain how:

2.4.1 The structure of his eyeball affects his vision when he reads a book without glasses (3)

2.4.2 Wearing glasses with convex lenses will improve his vision when he reads a book (2)
(5)

2.5 The diagrams below represent a neuron with a myelin sheath (myelinated) and a neuron without a myelin sheath (unmyelinated).
(The diagrams are NOT drawn to scale.)



2.5.1 Identify the type of neuron shown in the diagrams. (1)

2.5.2 Give ONE visible reason for your answer to QUESTION 2.5.1. (1)

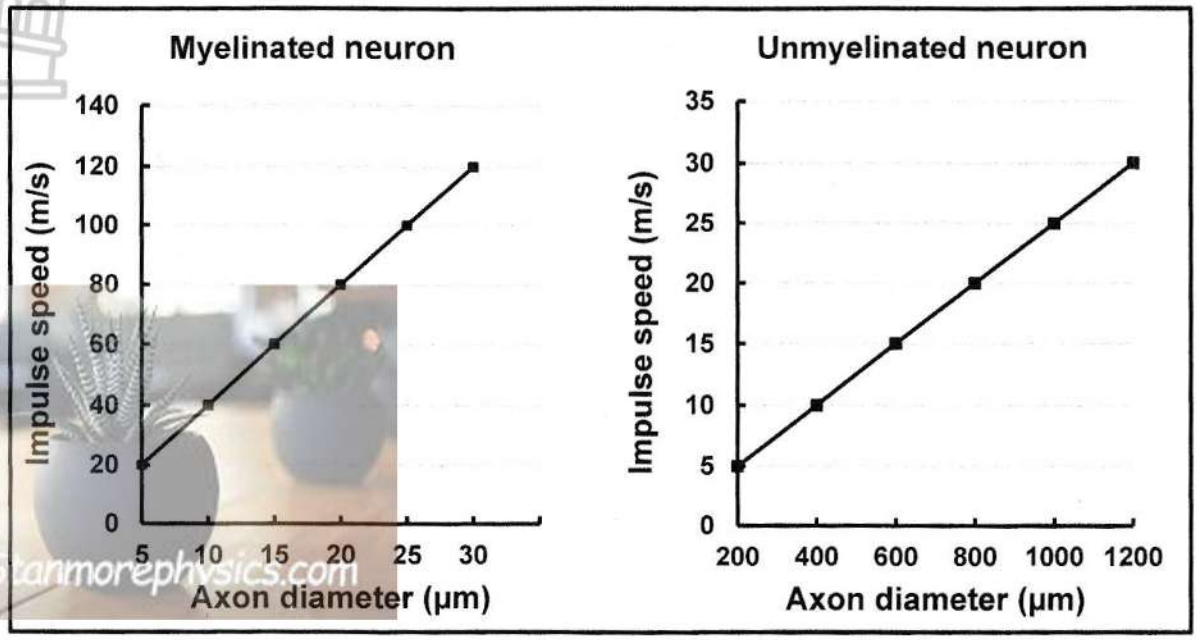
2.5.3 Describe the function of the type of neuron identified in QUESTION 2.5.1. (3)

2.5.4 Use the letters **A**, **B** and **C** to indicate the direction in which an impulse moves through the neuron. (2)

2.5.5 Name the disorder associated with degeneration of the myelin sheaths of neurons. (1)
(8)

2.6 In the human body, the axons of myelinated neurons have much smaller diameters than the axons of unmyelinated neurons.

The graphs below show the speed of nerve impulses in myelinated neurons and in unmyelinated neurons with different axon diameters.



2.6.1 Give the axon diameter (in µm) at which an impulse moves at 20 m/s in:

(a) A myelinated neuron (1)

(b) An unmyelinated neuron (1)

2.6.2 Use the graphs to describe the following:

(a) Difference in impulse speed for myelinated and unmyelinated neurons (2)

(b) Relationship between *axon diameter* and *impulse speed* (2)
(6)
[50]

QUESTION 3

3.1 The passage below describes the breeding habits of vultures.

> Vultures are birds of prey that feed on the flesh of dead animals.
>
> A female vulture lays only one to two fertilised eggs, which are then protected by both parents during incubation. Incubation is the period from the time an egg is laid up to the time it hatches. Vultures have a short incubation period of 32 to 45 days. This short incubation period is typical of birds displaying altricial development. After hatching, the parents feed the young chicks as often as 20 times a day.

3.1.1 Give ONE reason from the passage why vultures:

(a) Are considered as oviparous (1)

(b) Have a high survival rate even though few eggs are laid (1)

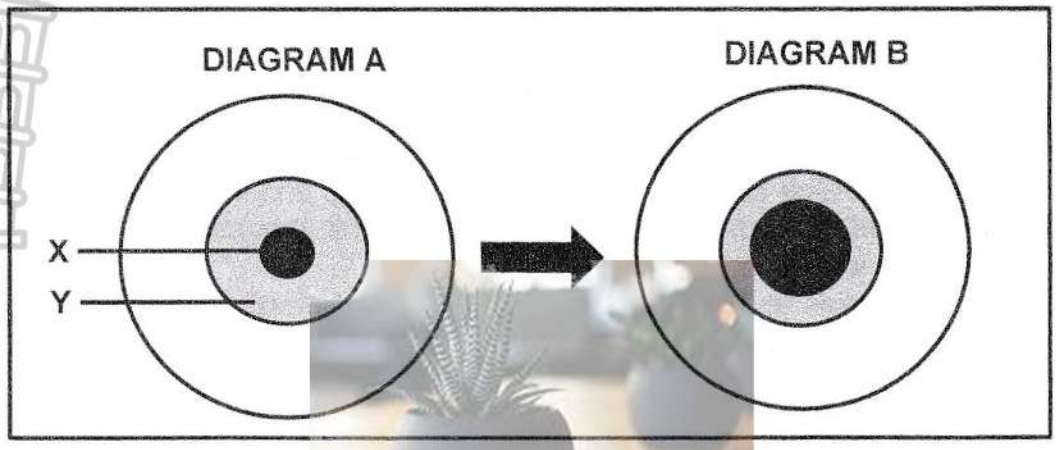
3.1.2 Fertilisation in vultures takes place internally.

State TWO advantages of internal fertilisation. (2)

3.1.3 State TWO characteristics of chicks that display altricial development. (2)

3.1.4 Explain why birds with altricial development would have short incubation periods. (2)
(8)

3.2 The diagrams below represent the pupillary mechanism in the human eye.



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3.2.1 Identify part:

(a) **X** (1)

(b) **Y** (1)

3.2.2 Explain why the pupillary mechanism is considered to be a reflex action. (3)

3.2.3 Name the TWO effector muscles that are involved in the pupillary mechanism. (2)

3.2.4 Explain the significance of the change in the diameter of part **X** from diagram **A** to diagram **B**. (4)
(11)

3.3 An investigation was conducted to determine the effect of insulin on blood glucose levels.

The procedure was as follows:

- Two groups of ten people each were selected.
- One of the groups consisted of healthy individuals and the second group, which served as a control, consisted of people with diabetes.
- Each group was given 75 g of glucose to ingest.
- Their blood was tested again after 60 and 90 minutes to determine the levels of glucose and insulin.

NOTE:

- The normal level of glucose in the blood is between 3,9 mmol/ℓ and 5,6 mmol/ℓ.
- The normal level of insulin in the blood, 60 minutes after glucose ingestion, is between 18 mU/ℓ and 276 mU/ℓ.

The results are recorded in the table below.

	GROUP X			GROUP Y		
Time after glucose ingestion (minutes)	0	60	90	0	60	90
Average level of glucose in blood (mmol/ℓ)	6,8	8,9	8,7	4,5	6,2	4,5
Average level of insulin in blood (mU/ℓ)	4	2	2	8	142	108

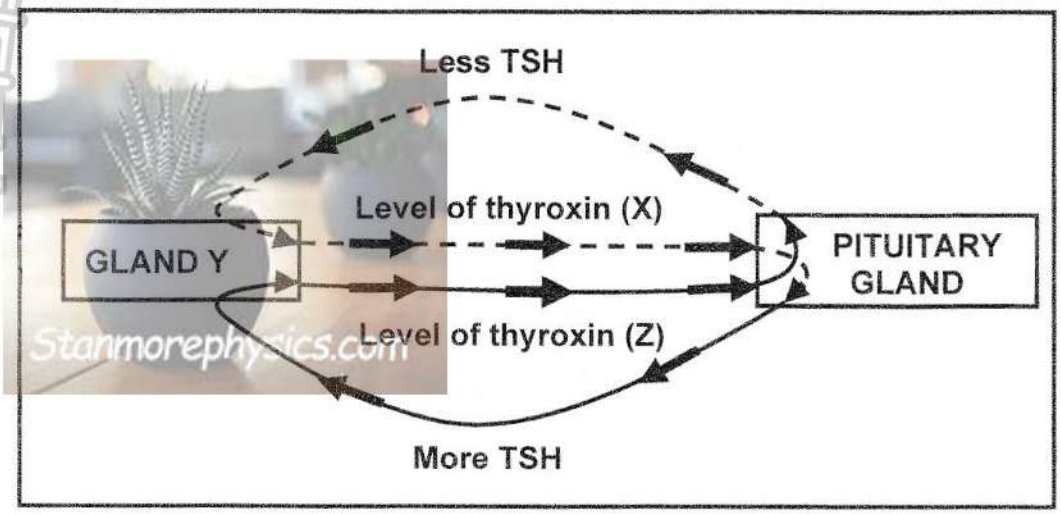
3.3.1 State the purpose of the control group in this investigation. (2)

3.3.2 Describe TWO ways in which insulin decreases blood glucose levels. (4)

3.3.3 Which group (**X** or **Y**) consists of healthy individuals? (1)

3.3.4 Use data in the table to explain your answer to QUESTION 3.3.3. (3)
(10)

3.4 The flow diagram below shows the homeostatic control of thyroxin in the human body.



3.4.1 Identify:

(a) The type of interaction represented by the diagram (1)

(b) Gland **Y** (1)

(c) The disorder that is characterised by the enlargement of gland **Y** (1)

3.4.2 State ONE function of thyroxin. (1)

3.4.3 Describe the role of the pituitary gland in correcting the level of thyroxin at **X**. (4)

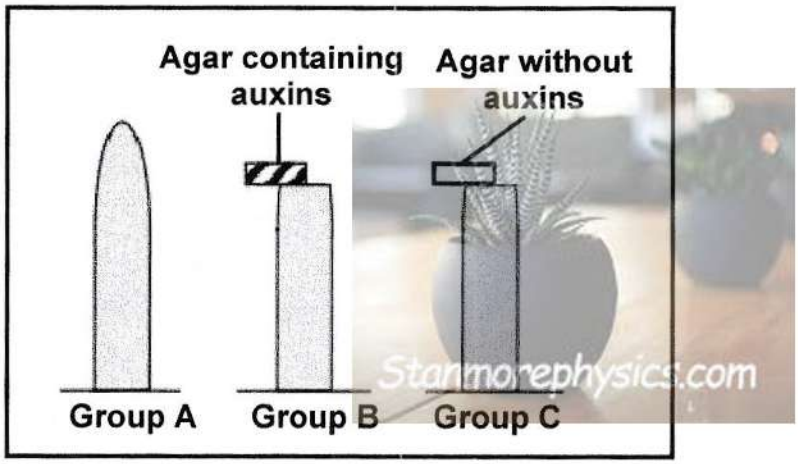
3.4.4 Explain why a continuous undersecretion of thyroxin may lead to an increase in body mass. (2)
(10)

3.5 An investigation was conducted to determine the effect of auxins on plant tropism.

The investigation was conducted as follows:

- Twelve plants of the same species were divided into three groups (group **A**, **B** and **C**), of four plants each.
- All the plants were kept in darkness for 72 hours during the investigation.
- The growing tips of **group A** received no treatment.
- The growing tips of **group B** were cut off and replaced by a piece of agar that contained auxins (agar is a jelly-like substance through which other substances can diffuse).
- The growing tips of **group C** were cut off and replaced by a piece of agar without auxins.

The diagram below shows how the growing tips of the three groups were treated.



3.5.1 For this investigation give:

(a) The independent variable (1)

(b) TWO variables that were controlled (2)

3.5.2 Give the expected results of the plants in:

(a) Group **A** (1)

(b) Group **C** (1)

3.5.3 How was the reliability of this investigation ensured? (2)

3.5.4 After 72 hours, the stems of the plants in group **B** bent towards the right-hand side.

Explain these results. (4)

(11)

[50]

TOTAL SECTION B: 100

GRAND TOTAL: 150

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