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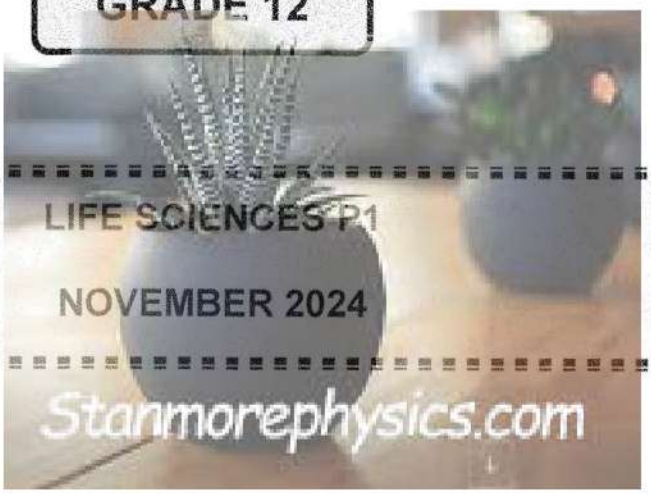
basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12



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

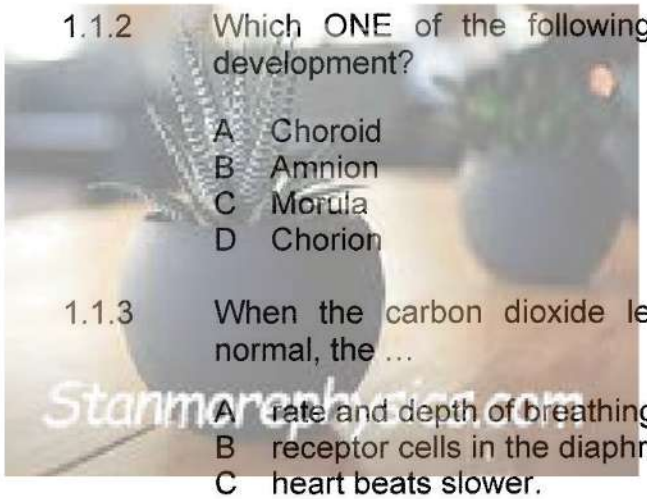
1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

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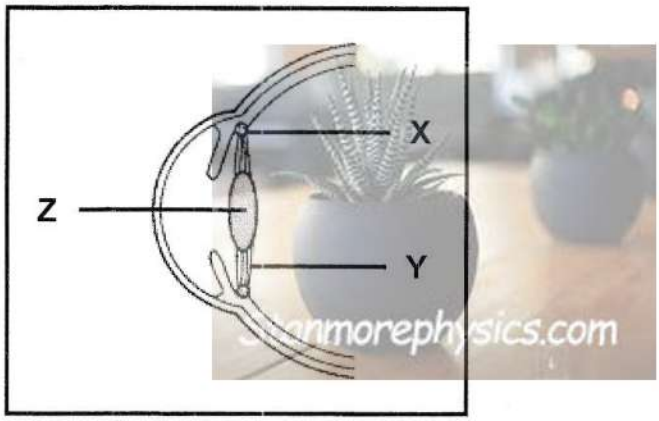
1.1.6 The diagram below represents a part of the human eye.



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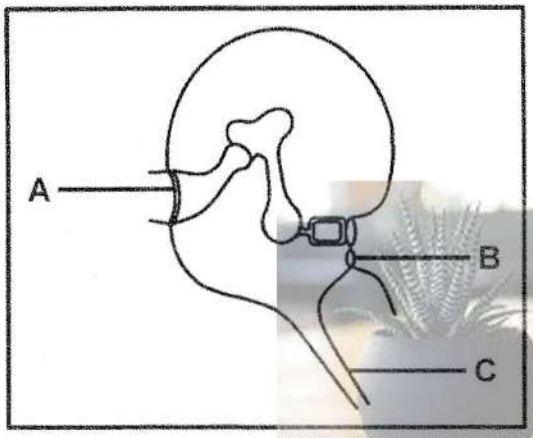
1.1.9 The diagram below shows a part of the human ear.



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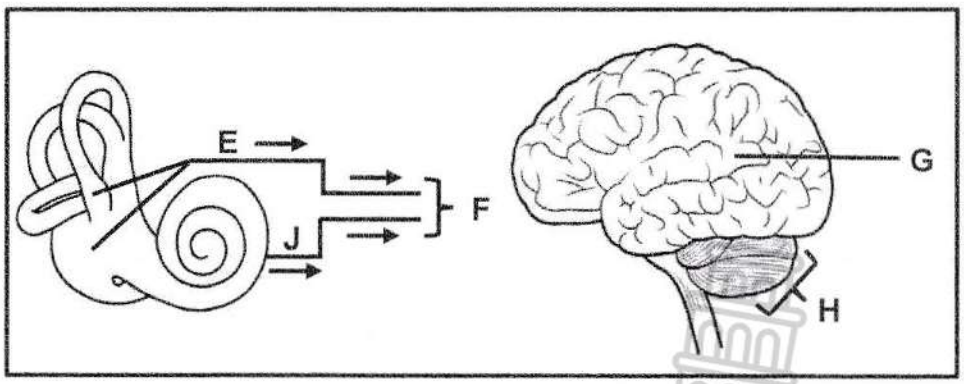
Which ONE of the following occurs when there are excess waves in the inner ear?

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)**

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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)**

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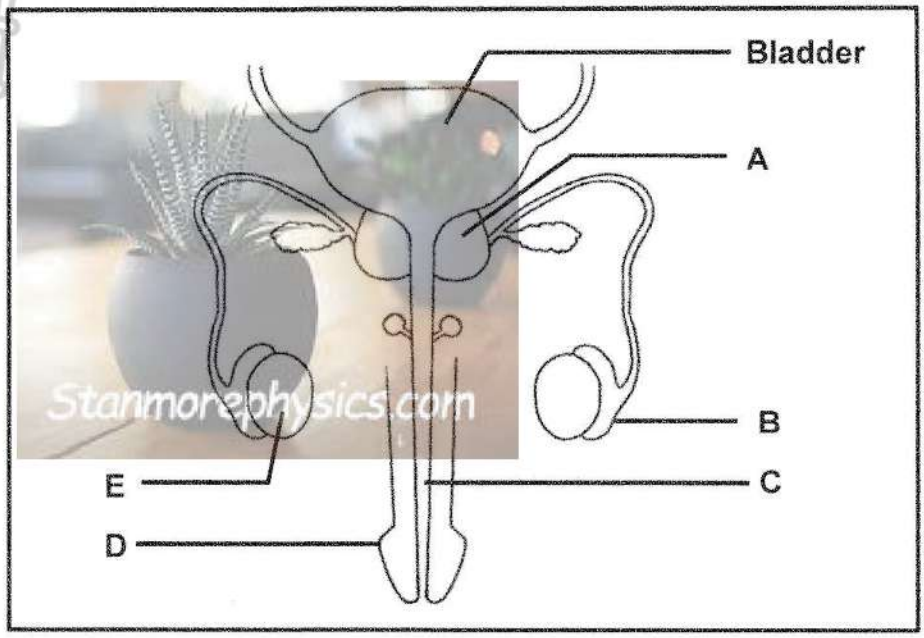
1.4 The diagram below represents the front view of the human male reproductive system.



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)

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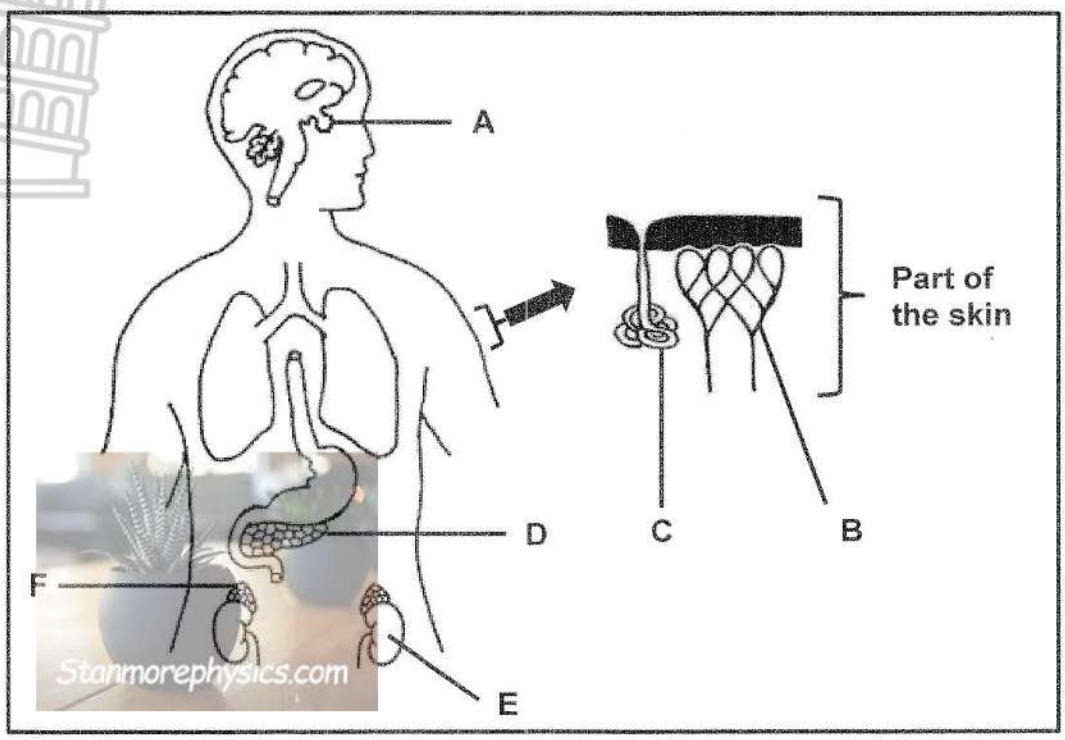
1.5 The diagram below represents some structures involved in homeostasis in the human body.



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

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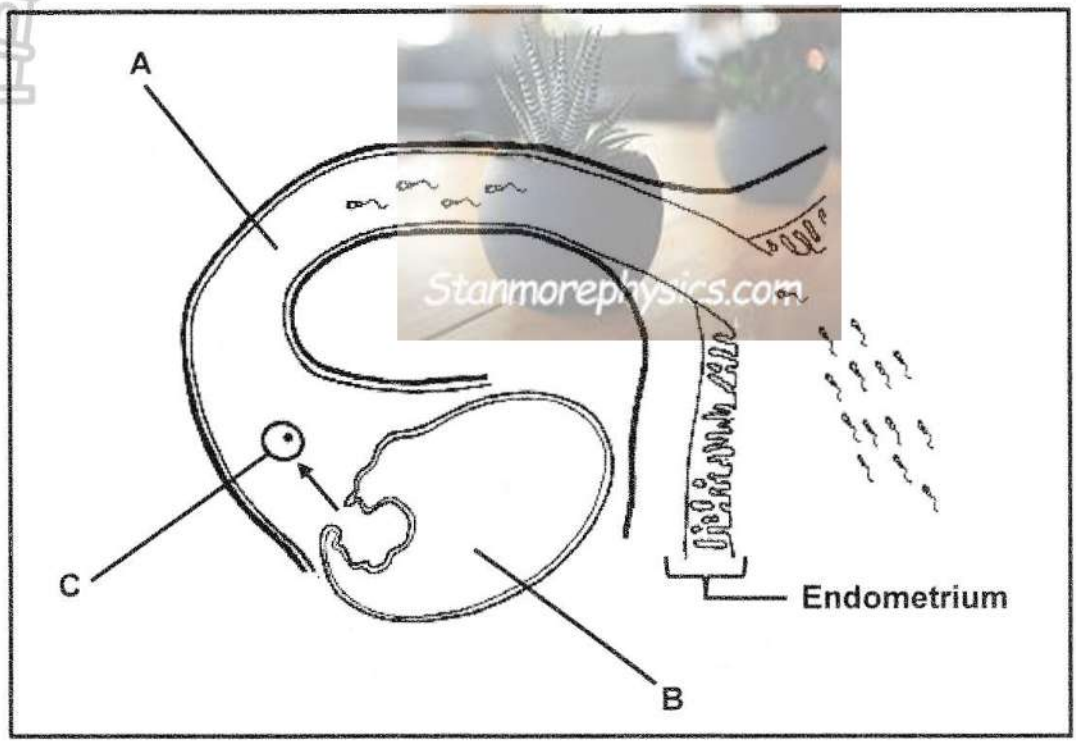
SECTION B

QUESTION 2

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



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)

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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

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)

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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)

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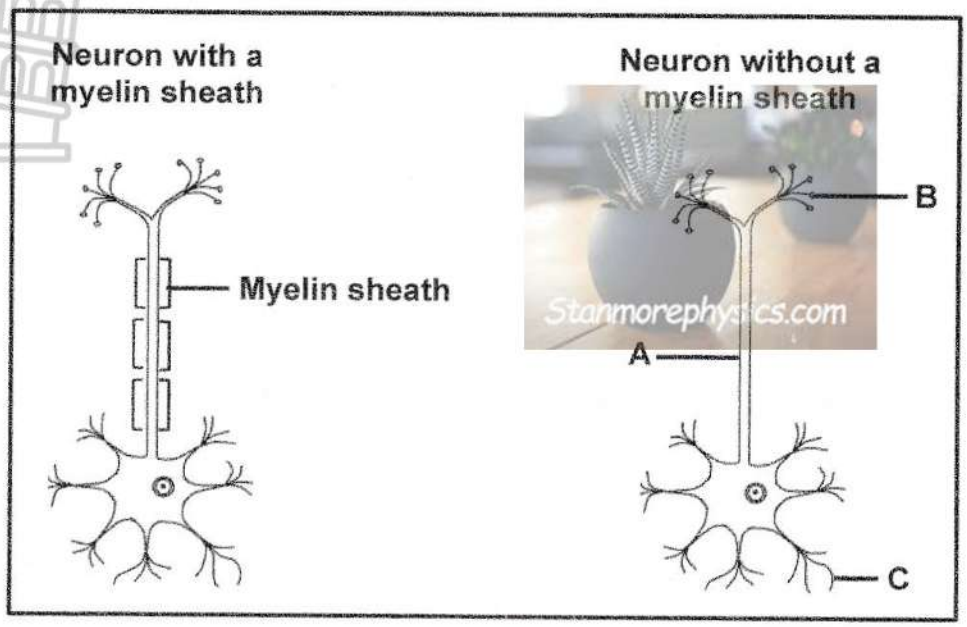
2.5 The diagrams below represent a neuron with a myelin sheath (myelinated) and a neuron without a myelin sheath (unmyelinated).
(The diagrams are NOT drawn to scale.)



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)

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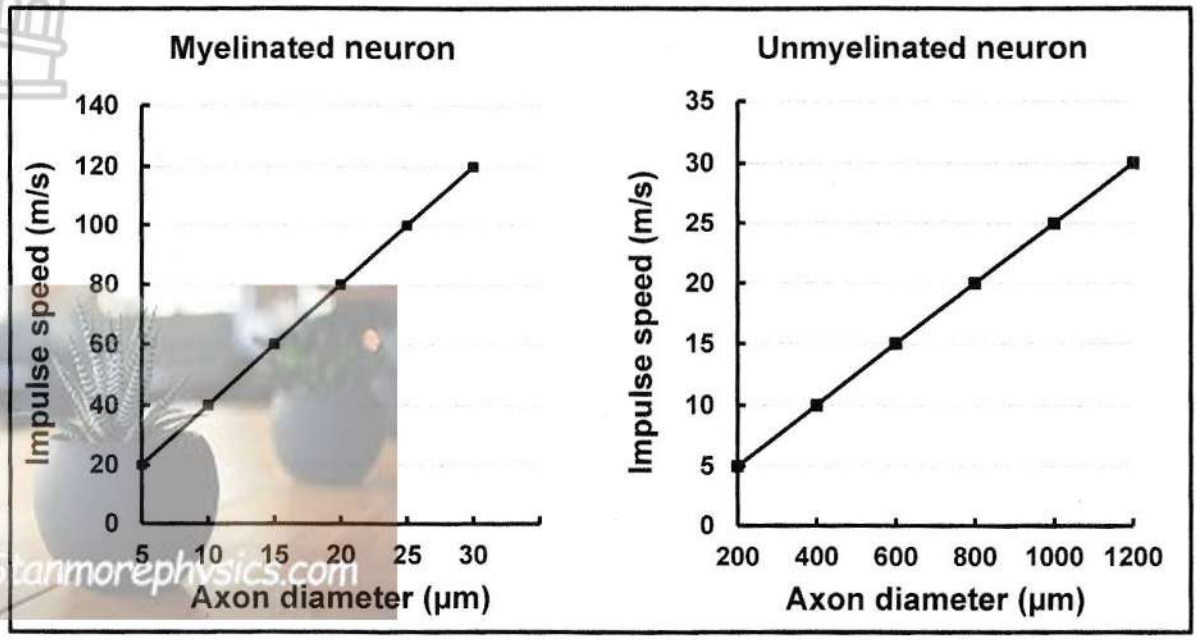
2.6 In the human body, the axons of myelinated neurons have much smaller diameters than the axons of unmyelinated neurons.

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



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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]

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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)

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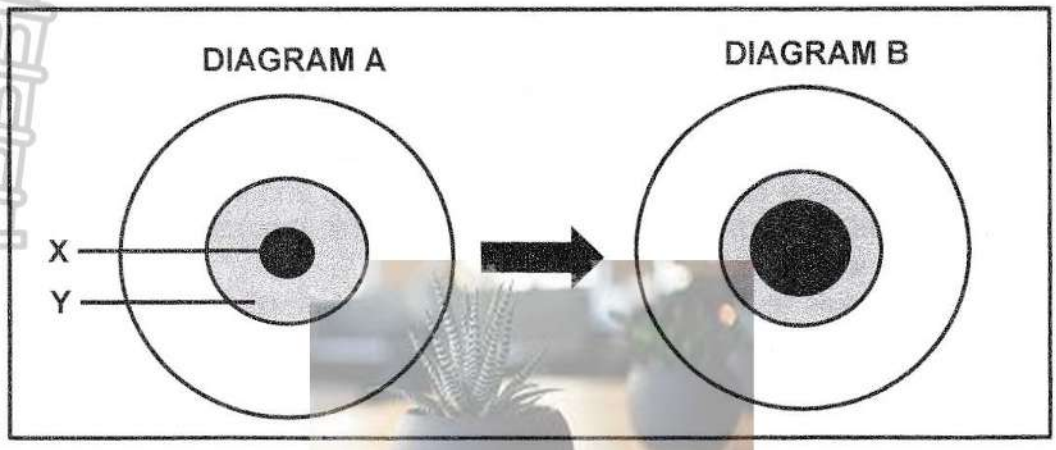
3.2 The diagrams below represent the pupillary mechanism in the human eye.



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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)

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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)

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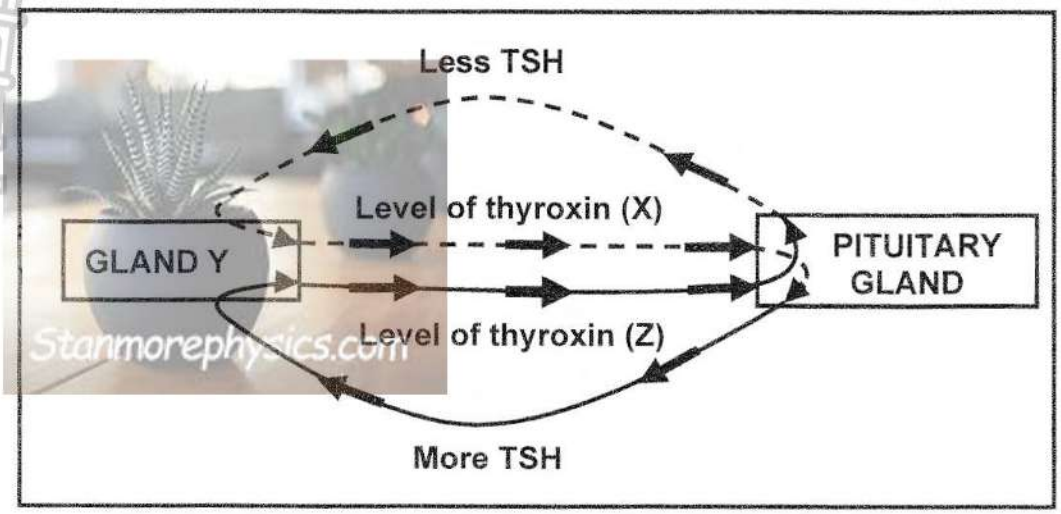
3.4 The flow diagram below shows the homeostatic control of thyroxin in the human body.



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)

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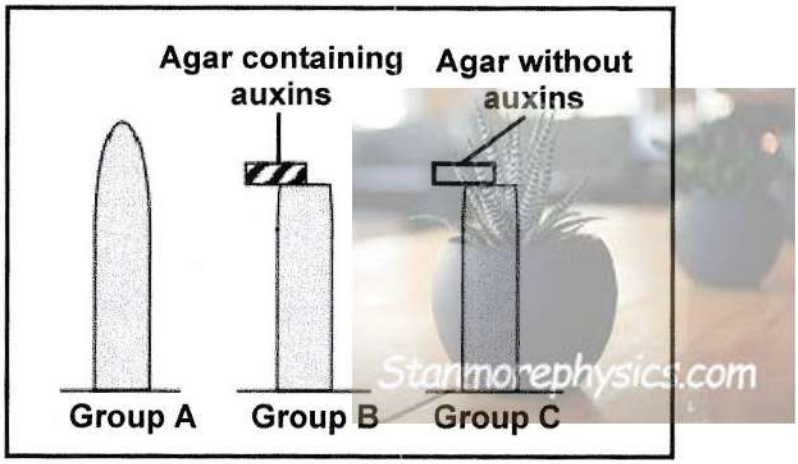
3.5 An investigation was conducted to determine the effect of auxins on plant tropism.

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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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

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LIFE SCIENCES P1

NOVEMBER 2024

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 9 pages.

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PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks are reached and put a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/ incorrect.

3. **If whole process is given when only a part of it is required**
   Read all and credit the relevant part.

4. **If comparisons are asked for but descriptions are given**
   Accept if the differences/similarities are clear.

5. **If tabulation is required but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of the answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable, accept the answer, provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the national standardisation meeting.

14. **If only the letter is asked for but only the name is given (and vice versa)**
    Do not credit.

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15. **If units are not given in measurements**
Candidates will lose marks. Marking guidelines will allocate marks for units separately.

16. **Be sensitive to the sense of an answer, which may be stated in a different way.**

17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.

18. **Code-switching of official languages (terms and concepts)**
A single word or two that appear(s) in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.

19. **Changes to the marking guidelines**
No changes must be made to the marking guidelines without consulting the provincial internal moderator who in turn will consult with the national internal moderator (and the Umalusi moderators where necessary).

20. **Official marking guidelines**
Only marking guidelines bearing the signatures of the national internal moderator and the Umalusi moderators and distributed by the National Department of Basic Education via the provinces must be used.

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SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	C✓✓		
	1.1.3	D✓✓		
	1.1.4	A✓✓		
	1.1.5	D✓✓		
	1.1.6	C✓✓		
	1.1.7	B✓✓		
	1.1.8	A✓✓		
	1.1.9	C✓✓		
	1.1.10	B✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Umbilical cord✓		
	1.2.2	Autonomic✓ nervous system		
	1.2.3	Cristae✓		
	1.2.4	Stirrup✓/stapes		
	1.2.5	Geotropism✓/gravitropism		
	1.2.6	Cochlea✓		
	1.2.7	Gibberellins✓		
	1.2.8	Acrosome✓	(8 x 1)	**(8)**
1.3	1.3.1	A only✓✓		
	1.3.2	B only✓✓		
	1.3.3	A only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) C✓ - Urethra✓ **OR** D✓ - Penis✓		(2)
		(b) B✓ - Epididymis✓		(2)
		(c) E✓ - Testis✓		(2)
	1.4.2	(a) Prostate gland✓		(1)
		(b) Spermatogenesis✓		(1) **(8)**
1.5	1.5.1	A✓ F✓		(2)
	1.5.2	B✓ - Capillaries✓/blood vessel		
		C✓ - Sweat gland✓		(4)
	1.5.3	(a) ADH✓/Antidiuretic hormone		(1)
		(b) Kidney✓		(1) **(8)**

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

2.1 2.1.1 (a) Fallopian tube✓ (1)

(b) Ovary✓ (1)

2.1.2 (a)
- It has a rich blood supply✓/is vascular
- It is glandular✓
- It is thick✓

Any (2)

(Mark first TWO only)

(b)
- Sperm cells are present in the fallopian tube✓/proximity of the ovum
- Ovulation has taken place✓/an ovum has been released (2)

(Mark first TWO only)

2.1.3
- During oogenesis✓*
- diploid cells in the ovary undergo mitosis✓
- to form numerous follicles✓
- At the onset of puberty✓
- under the influence of FSH✓
- one cell inside a follicle (enlarges and) undergoes meiosis✓
- Of the four cells that are produced, only one survives to form a (mature), haploid ovum✓

Compulsory mark ✓* (1) + Any (5) (6)

2.1.4
- Part A/the fallopian tube is unable to provide the space✓
- and there is no endometrium✓/blood supply
- to provide nutrients✓/oxygen **OR** remove waste products
- in order for the embryo to develop✓

Any (3)

(15)

2.2 2.2.1 20✓ (1)

2.2.2 FSH✓ (1)

2.2.3
- The progesterone level is decreasing✓/goes from 5 to 0,8 ng/ml therefore
- FSH secretion /the pituitary gland is no longer inhibited✓ (2)

2.2.4 $\left[\frac{280 - 70}{70}\right]$✓ x 100✓

= 300✓% (3)

2.2.5 - It remains high✓/will increase (1)

2.2.6
- The corpus luteum does not disintegrate✓
- and continues to secrete progesterone✓

OR

- The placenta develops✓
- which secretes progesterone✓ (2)

(10)

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2.3 2.3.1 Sub-capsular✓ cataracts (1)

2.3.2
- Protein structures in the lens start to disintegrate and clump together✓
- The lens becomes opaque✓/milky and
- less/no light passes through✓ the lens
- onto the retina✓
- therefore less/no stimuli will be converted to impulses✓ (5)

(6)

2.4 2.4.1
- The eyeball is too short✓
- The image forms behind the retina✓
- causing blurred vision✓

OR

- The cornea is less convex✓
- Less refraction occurs✓/the image forms behind the retina
- causing blurred vision✓ (3)

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2.4.2
- The light rays will be refracted more✓ causing the image to fall
- on the retina✓ (2)

(5)

2.5 2.5.1 Motor✓neuron (1)

2.5.2
- The neuron has many dendrites✓/is multipolar
- The cell body is located at one end✓
- The axon is long and the dendrites are short✓ Any (1)

(Mark first ONE only)

2.5.3
- It transmits impulses✓
- from the central nervous system✓ /interneuron
- to the effector✓ (3)

2.5.4 C → A → B✓✓ (2)

2.5.5 Multiple sclerosis✓ (1)

(8)

2.6 2.6.1 (a) 5✓µm (1)

(b) 800✓µm (1)

2.6.2 (a) (The impulse speed) is faster in a myelinated neuron than in an unmyelinated neuron✓✓

OR

(The impulse speed) is slower in an unmyelinated neuron than in a myelinated neuron✓✓ (2)

(b) As the axon diameter increases, the impulse speed is faster ✓✓ (2)

(6)

[50]

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QUESTION 3

3.1 3.1.1 (a) They lay eggs✓ (1)
(Mark first ONE only)

(b) - The eggs are protected✓/incubated by the parents
- The young chicks are fed by the parents✓/display parental care Any (1)
(Mark first ONE only)

3.1.2 - It increases the chances of fertilisation✓/gametes are in close contact
- Gametes are protected from predation✓/desiccation/ environmental factors
- Water is not needed✓
- Fewer gametes are needed✓ Any (2)
(Mark first TWO only)

3.1.3 - Eyes are closed✓ when they hatch
- Bodies do not have (down) feathers✓
- Unable to move✓ directly after hatching
- Dependent on parents for food✓/protection Any (2)
(Mark first TWO only)

3.1.4 - The chicks are not fully developed when hatched✓ since
- the eggs have less yolk✓/ there is a high degree of parental care (2)
(8)

3.2 3.2.1 (a) Pupil✓ (1)

(b) Iris✓ (1)

3.2.2 - It is a rapid✓
- involuntary✓ response
- to light✓ (3)

3.2.3 - Radial✓ muscles
- Circular✓ muscles (2)
(Mark first TWO only)

3.2.4 - The pupil dilated✓/enlarged so that
- more light will enter the eye✓
- to improve vision✓
- in dim light✓ (4)
(11)

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3.3 3.3.1 To ensure that the change in blood glucose levels was due to insulin only✓✓ (2)

3.3.2
- It stimulates the absorption of glucose✓ from the blood into the cells✓
- It stimulates the liver✓/muscles to convert glucose to glycogen✓
- It causes increased cellular respiration✓ which utilises glucose✓ Any (2 x 2) (4)

(Mark first TWO only)

3.3.3 Group **Y**✓ (1)

3.3.4
- At **0 mins, the blood glucose** level for group **Y** was within the normal range✓/ the blood glucose level for group **X** was high
- At **90 minutes the blood glucose** level for group **Y** returned to normal✓/the blood glucose levels for group **X** remained high
- After the ingestion of glucose, **the insulin level** for group **Y** increased✓ /the insulin level for group **X** decreased (3)

(10)

3.4 3.4.1 (a) Negative feedback✓ mechanism (1)

(b) Thyroid✓ (1)

(c) Goitre✓ (1)

3.4.2
- It regulates the metabolic rate✓
- It affects the growth and functioning of the heart✓/nervous system/
- It influences bone development✓/muscle control Any (1)

(Mark first ONE only)

3.4.3
- The thyroxin level is low✓
- The pituitary gland is stimulated✓
- More TSH✓is secreted
- which stimulates gland Y✓/the thyroid gland
- to secrete more thyroxin✓ Any (4)

3.4.4
- A lower metabolic rate✓
- causes decreased usage of nutrients✓ and
- excess nutrients/fat will be stored in the body✓ Any (2)

(10)

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3.5	3.5.1	(a)	(Presence of) auxins✓		(1)
		(b)	- Species✓ - Light✓ - Duration in the dark✓ **(Mark first TWO only)**	Any	(2)
	3.5.2	(a)	The plant/stem grows (straight) upwards✓		(1)
		(b)	- No upward growth will occur✓ - Lateral branches will develop✓	Any	(1)
	3.5.3		Four plants in each group✓✓		(2)
	3.5.4		- The auxins diffuse into the left side of the stem✓ - The higher concentration of auxins✓ on the left side - results in more cell elongation✓/growth of cells on the left side - There is less growth on the right-hand side✓and the stem will bend to the right-hand side		(4) **(11)** **[50]**

TOTAL SECTION B: 100
GRAND TOTAL: 150

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