education

Department of
Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION

GRADE 12

TIME: 2½ HOURS

This question paper consists of 17 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. Make 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 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, for example, 1.1.11 D.

1.1.1 The part of the brain that is responsible for interpreting smell and taste.

A Medulla oblongata
B Hypothalamus
C Cerebellum
D Cerebrum

1.1.2 The site of fertilisation in the female reproductive system.

A Cervix
B Uterus
C Fallopian tube
D Vagina

1.1.3 Which ONE represents the pathway of an impulse?

A Receptor → sensory neuron → interneuron → motor neuron
B Effector → motor neuron → interneuron → sensory neuron
C Receptor → sensory neuron → motor neuron → interneuron
D Sensory neuron → motor neuron → interneuron → effector

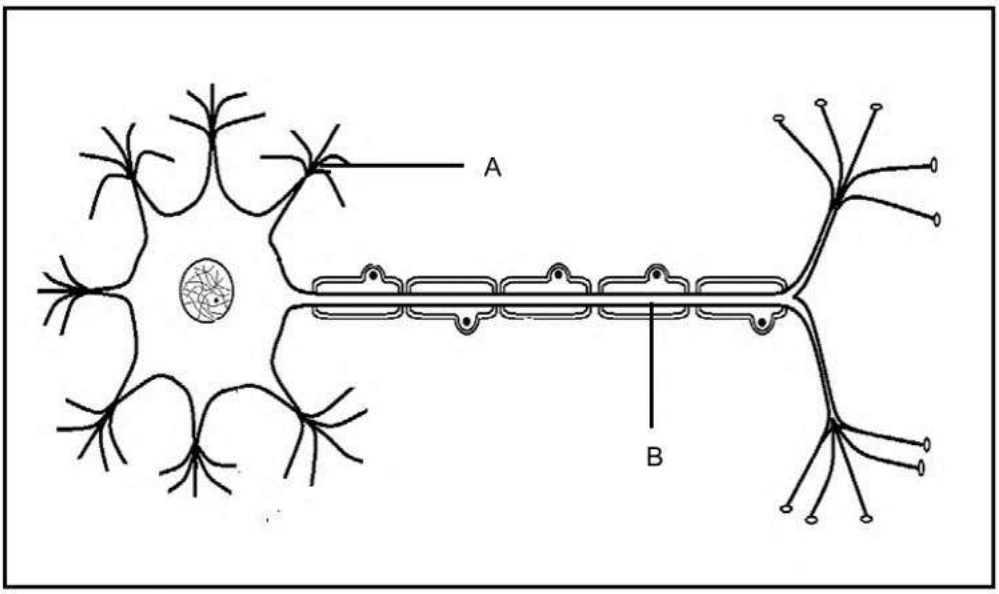
1.1.4 The list below gives the protective components of the central nervous system:

(i) Meninges
(ii) Cerebrospinal fluid
(iii) Cranium
(iv) Vertebral column

Which ONE of the following combinations applies to the protection of the brain?

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

QUESTIONS 1.1.5 AND 1.1.6 ARE BASED ON THE DIAGRAM OF A NEURON.



1.1.5 The diagram represents a …

A motor neuron.
B sensory neuron.
C interneuron.
D connector neuron.

1.1.6 The correct labels for both parts **A** and **B** are ...

	Part A	Part B
A	Dendrites	Axon
B	Axon	Dendrites
C	Dendrites	Myelin sheath
D	Cell body	Dendrites

1.1.7 High levels of progesterone in a female …

A stimulates the pituitary gland to secrete more FSH.
B stimulates the pituitary gland to secrete less FSH.
C inhibits the pituitary gland from secreting more oestrogen.
D stimulates the pituitary gland to secrete less oestrogen.

1.1.8 The pupil of the human eye is covered by the …

A cornea and retina.
B conjunctiva and sclera.
C conjunctiva and cornea.
D retina and sclera.

1.1.9 Which hormone is responsible for female secondary sexual characteristics?

A LH
B Oestrogen
C Progesterone
D Testosterone

1.1.10 Which ONE of the following is CORRECT regarding the events when fertilisation did not occur?

	Corpus luteum	Progesterone level	Menstruation
A	Degenerates	Increases	Occurs
B	Does not degenerate	Decreases	Does not occur
C	Degenerates	Decreases	Occurs
D	Does not degenerate	Increases	Does not occur

(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 disease is characterised by the degeneration of brain tissue leading to memory loss

1.2.2 The visual defect caused by an irregularly shaped cornea

1.2.3 A small device used to treat middle ear infections

1.2.4 The root that consists of sensory neurons in the spinal cord

1.2.5 Rapid, involuntary response to a stimulus

1.2.6 The type of development in birds where the young are not able to move independently and feed themselves after hatching

1.2.7 The hormone that stimulates the production of milk

1.2.8 The part of the brain that connects the left and right hemispheres of the cerebrum

1.2.9 The structural unit of the nervous system

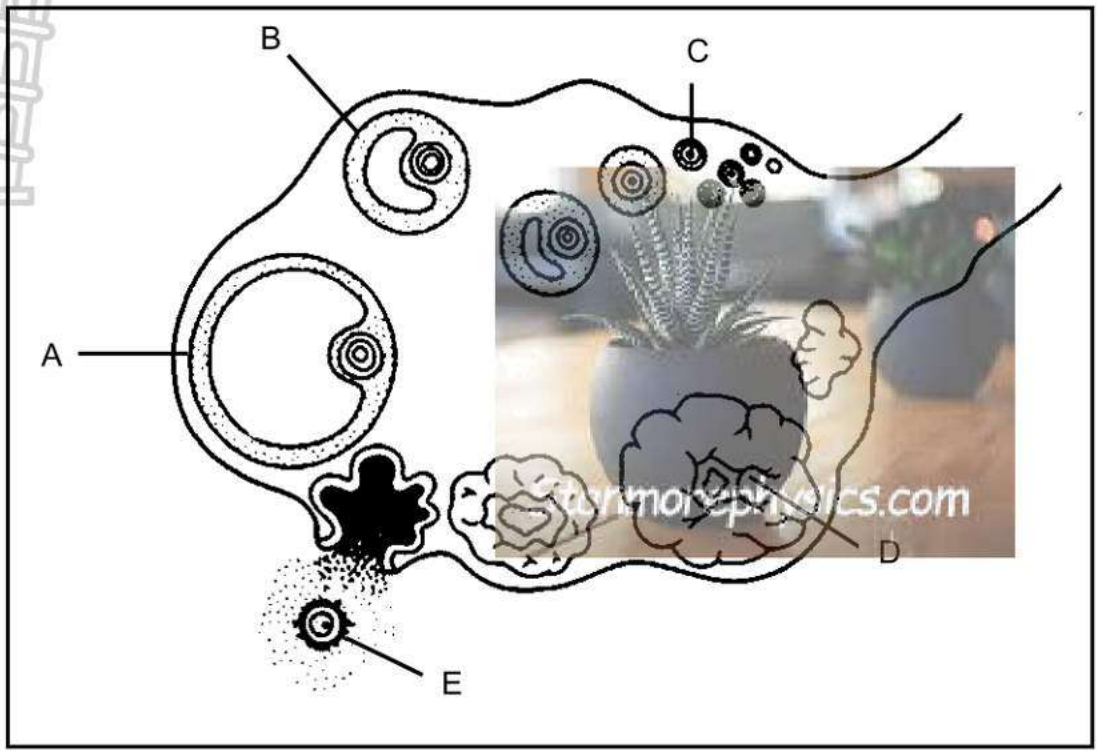
(9 x 1) **(9)**

1.3 Indicate whether each of the descriptions in COLUMN I applies 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	Affected by a specific hormone	A : Target organ Kidney B :
1.3.2	Responsible for refraction of light	A : Iris Vitreous humour B :
1.3.3	Prepares the body for action	A : Sympathetic nervous system Adrenalin B :

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

1.4 The diagram below illustrates part of the menstrual cycle in the female body.



1.4.1 Name this cycle of the human menstrual cycle. (1)

1.4.2 Identify:

(a) Structure **A** (1)

(b) Structure **D** (1)

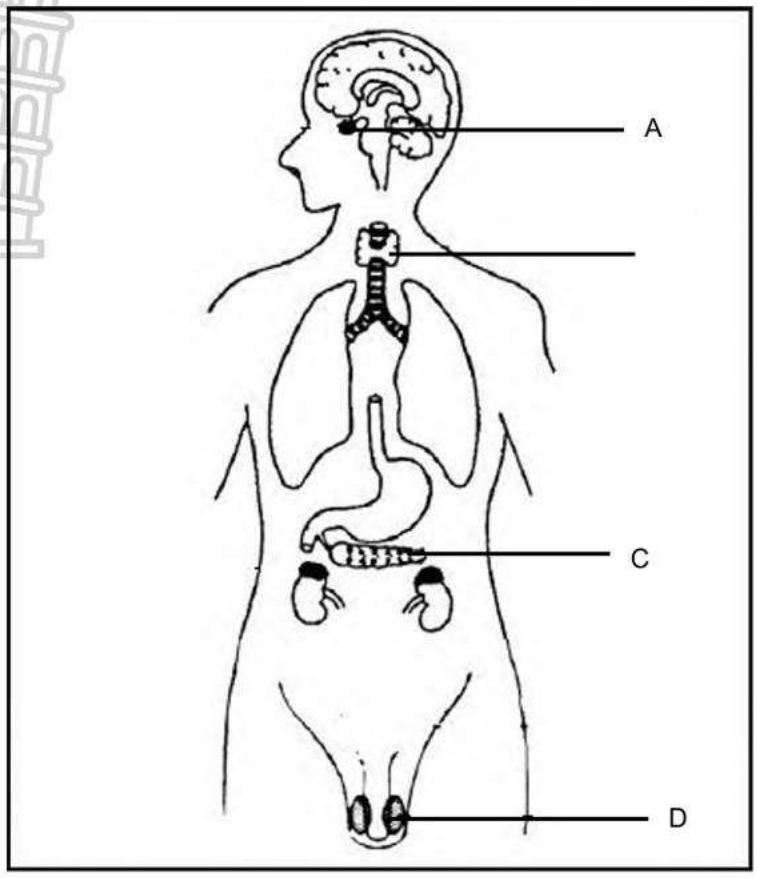
(c) The hormone responsible for the formation of **D** (1)

1.4.3 How many chromosomes are normally found in **E**? (1)

1.4.4 State the type of cell division that takes place to form **C**. (1)

1.4.5 Name the process of releasing cell **E**. (1)
(7)

1.5 The diagram below represents the human endocrine system.



1.5.1 Identify gland **A** (1)

1.5.2 Name a hormone secreted by the gland in QUESTION 1.5.1 that stimulates the growth of a person. (1)

1.5.3 Give the LETTER and the NAME of the gland that secretes a hormone responsible for:

(a Reducing glucose levels in the blood (2)

(b) Initiating puberty in males (2)

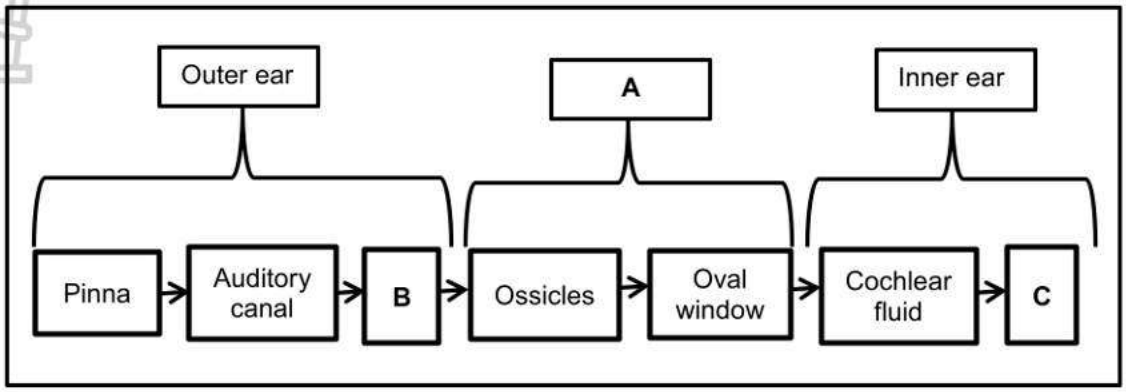
(c) Controlling the metabolic rate (2)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below shows the pathway of sound in the ear.



2.1.1 Identify:

(a) Part **A** of the ear (1)

(b) Membrane **B** (1)

(c) Receptor **C** (1)

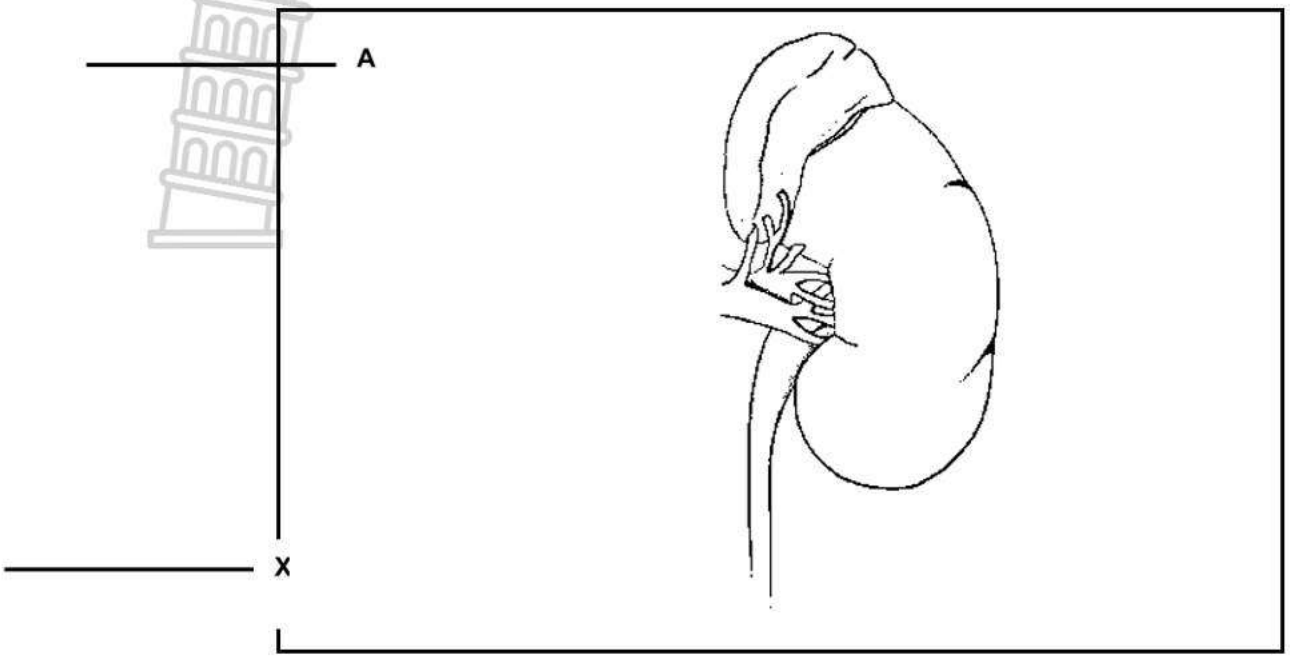
2.1.2 Explain how damage to part **C** could affect hearing. (2)

2.1.3 Describe how infection in **A** may lead to pain in the ear. (3)
(8)

2.2 A defender in a netball game prevented a goal from being scored when she jumped high to catch the ball. As she jumped there was a change in the direction and speed of her head.

Describe how she maintained balance as she jumped to catch the ball. **(6)**

2.3 The diagram shows a kidney, its blood supply and the ureter.



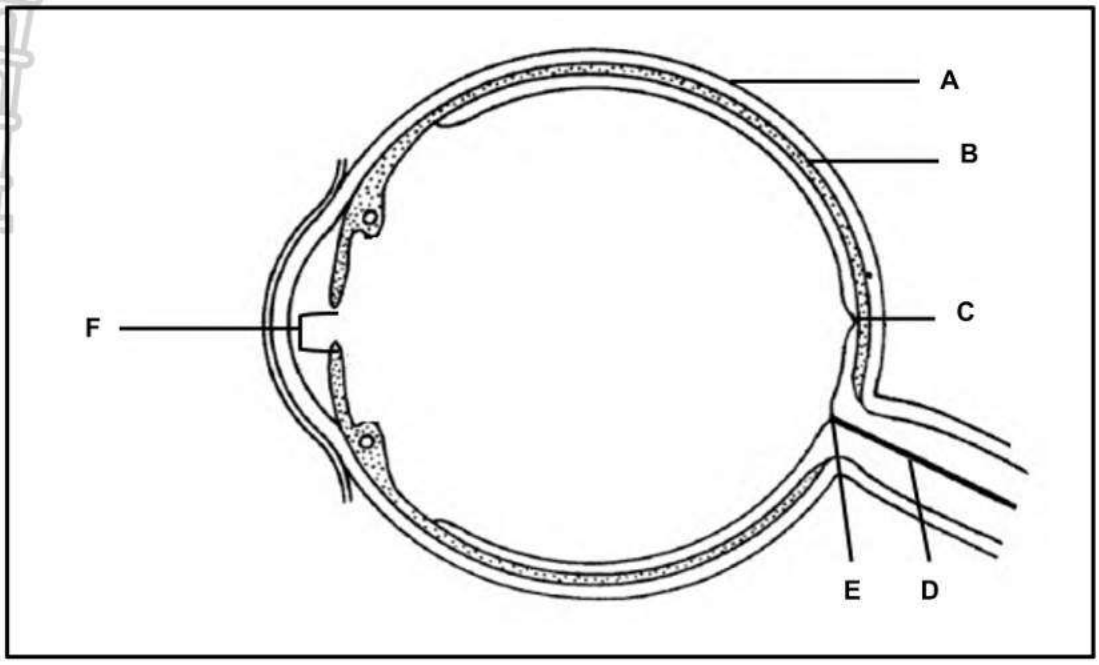
2.3.1 Identify:

(a) Gland **A** (1)

(b) The hormone secreted by gland **A**, controlling salt balance (1)

2.3.2 Explain what the homeostatic response was when urine is diluted in **X**. (5)
(7)

2.4 The diagram below represents the human eye.



2.4.1 Identify parts:

(a) **A** (1)

(b) **B** (1)

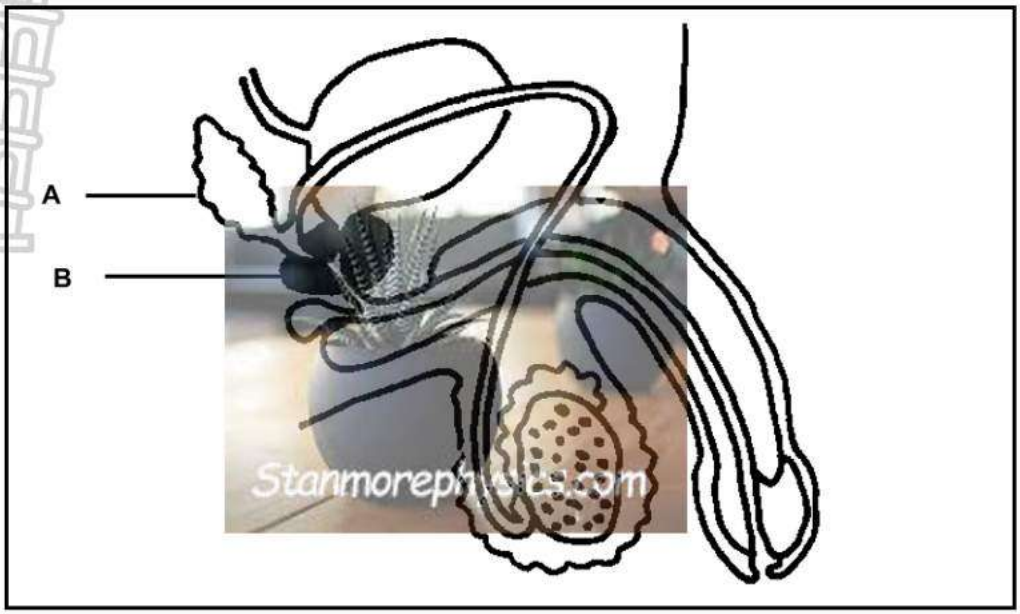
(c) **D** (1)

2.4.2 Describe ONE structural difference between parts **C** and **E**. (2)

2.4.3 Describe how part **F** adjust when a person enters a room with bright lights. (5)

2.4.4 Make a labelled drawing of the parts of the eye that are responsible for accommodation. (4)
(14)

2.5 The diagram below shows the parts of the male reproductive system.



2.5.1 Identify part **A** (1)

2.5.2 Prostate cancer affects men, and the risk increases as men get older, which may lead to surgical removal of part **B**.

Explain how the removal of part **B** may affect male fertility. (3)

2.5.3 Describe the process of spermatogenesis. (4)
(8)

2.6

Scientists at Harvard University investigated to determine which type of underwear leads to low sperm count. They asked 656 men to provide a semen sample and answer a questionnaire about what type of underwear they wore most often in the previous three months. In their results, they found that 75% of men who wore loose-fitting boxer shorts had a higher sperm count, while 25% of men who wore tight underwear had a lower sperm count.

2.6.1 Name the part of the male reproductive system where sperm cells are stored. (1)

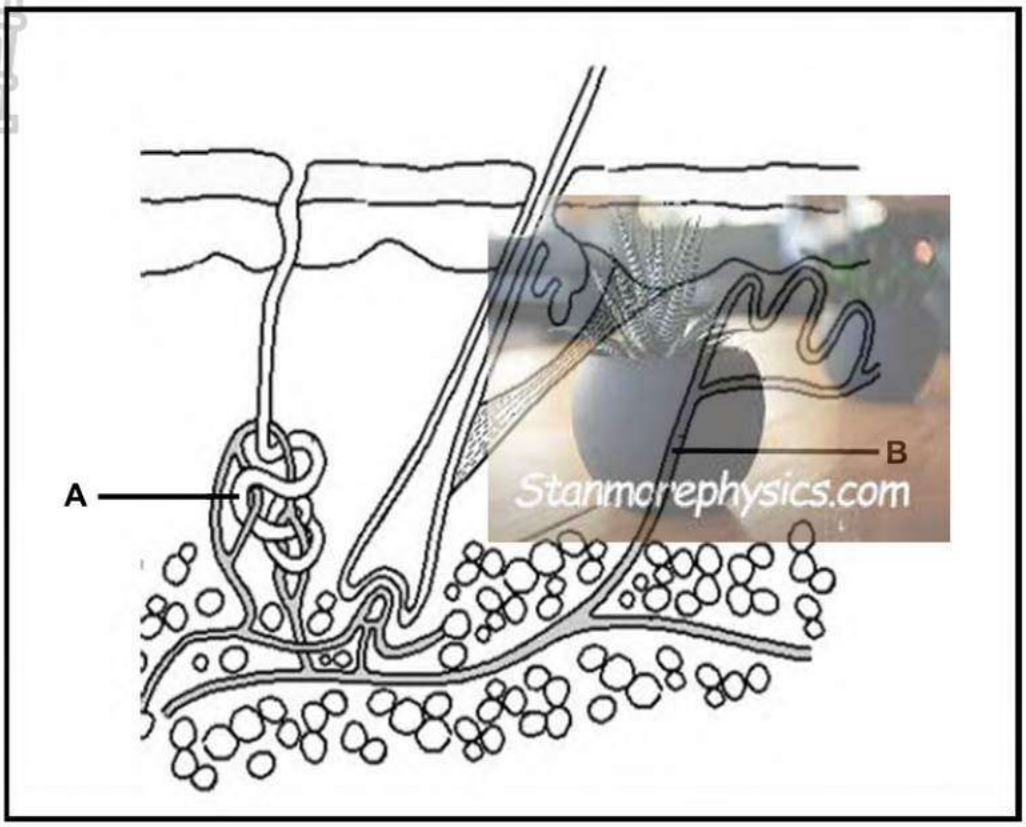
2.6.2 State ONE way in which the results of the investigation can be considered reliable. (1)

2.6.3 Explain why wearing loose-fitting underwear will increase male fertility. (3)

2.6.4 Except for movement, describe ONE way in which the sperm cell is structurally adapted to fertilise an ovum. (2)
(7)
[50]

QUESTION 3

3.1 The diagram below shows parts of a human organ involved in thermoregulation.



3.1.1 Identify the organ represented in the diagram. (1)

3.1.2 Give TWO reasons why part **A** is classified as an exocrine gland. (2)

3.1.3 Describe the role of parts **A** and **B** on a hot day. (5)
(8)

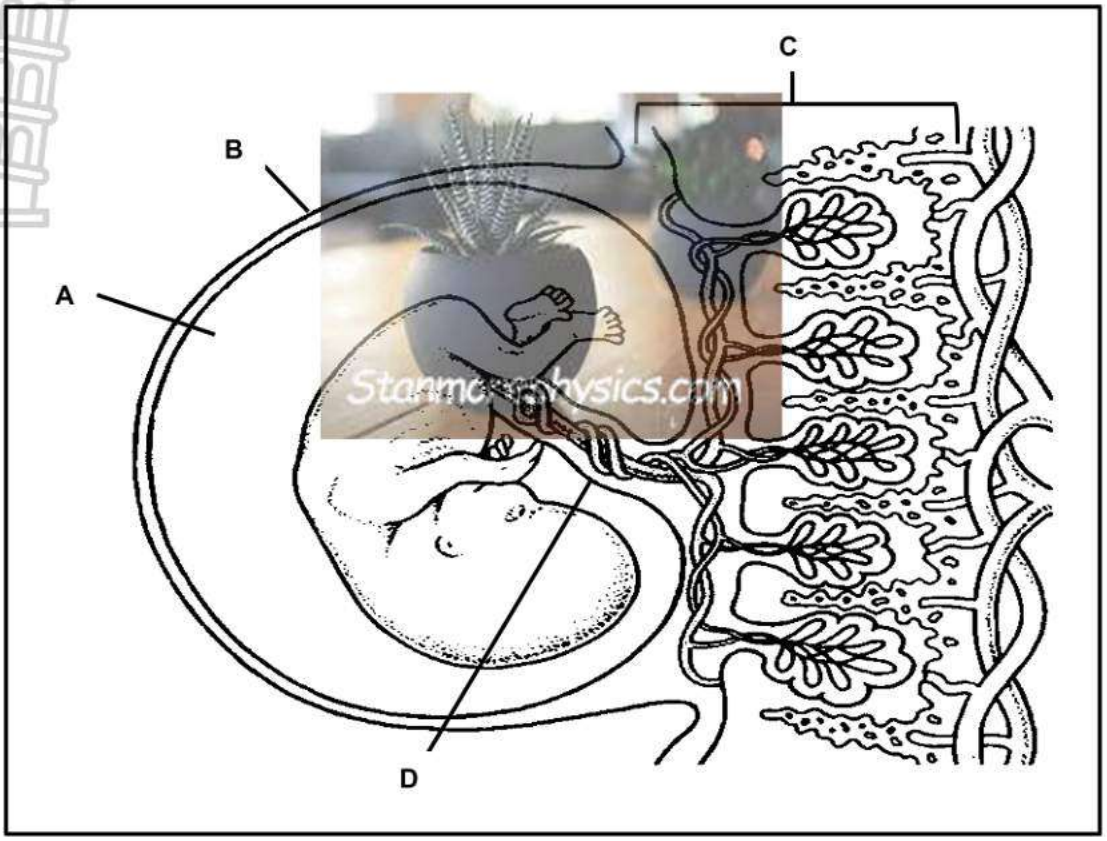
3.2 An investigation was conducted to determine the concentration of carbon dioxide in an individual's carotid artery at different intervals whilst on a treadmill. The results of the investigation are illustrated in the table below.

Duration (minutes)	Carbon dioxide concentration (mmol/ℓ)
0	23
15	24
30	25
45	25
60	23

3.2.1 What were the normal levels of carbon dioxide in the blood of the individual? (1)

3.2.2 Describe the homeostatic control of carbon dioxide in the blood after 45 minutes. (7)
(8)

3.3 The diagram below represents a developing foetus in the uterus.



3.3.1 Identify label **B**. (1)

3.3.2 Name TWO functions of **A**. (2)

3.3.3 Describe how structure **C** is formed. (3)

3.3.4 Explain the endocrine role of part **C** during gestation. (3)

3.3.5 Tabulate TWO differences between the composition of blood found in the blood vessels in part **D**. (5)
(14)

3.4 Read the extract below.

SHARK REPRODUCTION

In Hammerhead, Lemon and Mako sharks the embryo develops inside of the womb and will have a placenta and live birth. Each shark has an umbilical cord that is located between the pectoral fins. The Bamboo sharks and Epaulette sharks lay eggs in a deposit of water. Once the eggs are laid the female leaves without the eggs being protected. The female can lay 200 eggs. In Great white sharks, Nurse sharks and Thresher sharks the egg hatches inside of the womb and the shark has a live birth.

3.4.1 Name ONE ovoviviparous shark. (1)

3.4.2 Explain why Bamboo sharks and Epaulette sharks release large numbers of eggs. (3)

3.4.3 Describe the differences in nutrition of the embryos of the Lemon and Bamboo sharks. (3)
(7)

3.5 Scientists investigated to determine the effect of different concentrations of auxin on the cell elongation of coleoptiles (young stems). The following steps were followed:

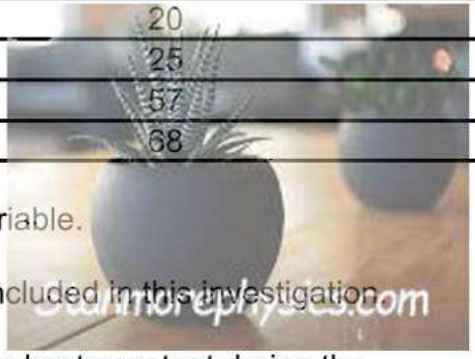
- Fifty (50) coleoptiles from the same species of bean plants were used.
- All the coleoptiles were the same length.
- The tips of the coleoptiles are removed. These coleoptiles were then placed into five groups.
- Each group was injected at the cut surface with a different concentration of auxin.

  - Group **B** was injected with 2 arbitrary units of auxins
  - Group **C** was injected with 4 arbitrary units of auxins
  - Group **D** was injected with 6 arbitrary units of auxins
  - Group **E** was injected with 8 arbitrary units of auxins

- Group **A** was included but was not injected with auxin.
- After four days the length of the coleoptiles in each group was measured and the average was calculated.

Table showing the results of the investigation.

Group	Average increase length of coleoptiles (mm)
A	0
B	20
C	25
D	57
E	68



3.5.1 Identify the independent variable. (1)

3.5.2 Explain why group **A** was included in this investigation. (2)

3.5.3 State TWO factors that were kept constant during the investigation. (2)

3.5.4 State ONE conclusion that can be drawn from the results. (2)

3.5.5 Draw a bar graph to represent the data in the table. (6)
(13)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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PREPARATORY EXAMINATION

GRADE 12

LIFE SCIENCES P1

These marking guidelines consist of 11 pages.

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 memo discussion meeting.

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

15. **If units are not given in measurements**
Candidates will lose marks. Memorandum 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 learner's 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 applies to all official languages.

19. **Changes to the marking guidelines**
No changes must be made to the memorandum. The provincial internal moderator must be consulted.

SECTION A

QUESTION 1

1.1	1.1.1	D✓✓		
	1.1.2	C✓✓		
	1.1.3	A✓✓		
	1.1.4	D✓✓		
	1.1.5	A✓✓		
	1.1.6	A✓✓		
	1.1.7	B✓✓		
	1.1.8	C✓✓		
	1.1.9	B✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Alzheimer✓		
	1.2.2	Astigmatism✓		
	1.2.3	Grommets✓		
	1.2.4	Dorsal✓ root		
	1.2.5	Reflex action✓		
	1.2.6	Altricial✓ development		
	1.2.7	Prolactin✓		
	1.2.8	Corpus callosum✓		
	1.2.9	Neuron✓	(9 x 1)	**(9)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	B only✓✓		
	1.3.3	Both A and B✓✓	(3 x 2)	**(6)**
1.4	1.4.1	Ovarian cycle✓		(1)
	1.4.2	(a) Graafian follicle✓		(1)
		(b) Corpus luteum✓		(1)
		(c) LH✓/ Luteinizing hormone		(1)
	1.4.3	23✓		(1)
	1.4.4	Mitosis✓		(1)
	1.4.5	Ovulation✓		(1) **(7)**

1.5.	1.5.1	Pituitary gland✓/ Hypophysis	(1)
	1.5.2	Growth✓ hormone/GH/ Somatotropin	(1)
	1.5.3	(a) C✓ – Pancreas✓/Islets of Langerhans	(2)
		(b) D✓ – Testes✓	(2)
		(c) B✓ – Thyroid gland✓	(2)
			(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) Middle ear✓ (1)

(b) Tympanic membrane✓/Tympanum (1)

(c) Organ of Corti✓ (1)

2.1.2 - Pressure wave will not be converted to an impulse ✓
- this will lead to hearing loss ✓/ impulse will not be transported to cerebrum. (2)

2.1.3 - Eustachian tube will be blocked✓/filled with mucus
- Pressure will not be equalised✓
- On either side of the tympanic membrane✓causing
- Pressure build-up in the middle ear✓ causing pain

(Any 3) (3)
(8)

2.2 - A change in the direction and speed of the body
- causes the movement of fluid✓ in
- which stimulates the cristae✓
- in the ampulla✓ / the semi-circular canals
- The pressure wave was converted into an impulse✓
- which was transported along the auditory nerve✓
- to the cerebellum✓ and interpreted✓
- which then sent impulses to the skeletal muscles✓ to restore balance and equilibrium (Any 6)

(6)

2.3 2.3.1 (a) Adrenal✓ gland (1)

(b) Aldosterone✓ (1)

2.3.2 - Water levels is the blood are above normal ✓
- The receptors in the hypothalamus are stimulated✓
- and sends impulses to the pituitary gland✓
- to stop secreting/to secrete less ADH✓
- No ADH/less ADH travels in the blood to the kidneys✓
- The renal tubules✓/distal convoluted tubules and collecting ducts
- become less permeable to water✓
- Less water is re-absorbed level in the blood✓
- The water levels in the blood decrease and return to normal ✓ (Any 5) (5)

(7)

2.4 2.4.1 (a) Sclera✓ (1)

(b) Choroid✓ (1)

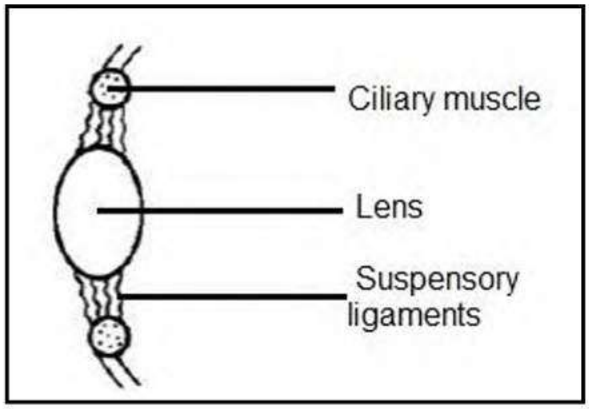
(c) Optic nerve✓ (1)

2.4.2
- Yellow spot/part C contains a high concentration of cones✓
- Blind spot/part E contains no photoreceptors✓/rods and cones (2)

2.4.3
- Part F/Pupil constricts✓/becomes smaller
- Circular muscles in the **iris** ✓ contract✓
- The radial muscles in the (iris)✓ will relax✓ (5)
-

(NB. They must indicate the muscle in the **iris**. If a learner did not mention iris no mark allocation. Be sensitive if a learner wrote. Circular mussel in the iris relax and radial muscle contract, then he did refer to iris. No need to mention iris in both bullets)

2.4.4 Parts of the eye responsible for accommodation



*** No mark allocation for ciliary body- mut be ciliary muscle**

Guidelines for assessing the drawing

Criteria	Elaboration	Mark
Heading	- Parts of eye accommodation	1
Correct diagram	- Only parts of accommodation drawn	1
Labels	- Any 1–2 correct label - All 3 correct labels	1 2

(4)
(14)

2.5 2.5.1 Seminal vesicle✓ (1)

2.5.2
- Alkaline fluid will not be secreted✓
- To neutralise the acid in the urethra✓ /vagina
- Sperm cells will denature✓/die/ form abnormal sperm cells
- Decrease in male fertility✓ (Any 3) (3)

2.5.3
- Under the influence of testosterone✓
- diploid cells in the seminiferous tubules in the testes✓
- undergo meiosis✓
- to produce haploid sperm cells✓ ((4)

(8)

2.6 2.6.1 Epididymis✓ (1)

2.6.2 656 men✓ participated in the investigation (1)

2.6.3
- Loose underwear allows the testes to be further away from the body✓
- The temperature of the testes is 2–3^0 C lower than the body temperature✓
- Allowing optimum sperm production✓ (3)

2.6.4.
- It has an acrosome✓
- which contains enzymes that penetrate the outer membrane of the ovum✓

(2)

(**Mark the first ONE only**) **(7)**

[50]

QUESTION 3

3.1 3.1.1 Skin✓ (1)

3.1.2
- The secretion/sweat is released externally✓
- via a duct✓

(2)

3.1.3
- (Receptors detect the high temperature) (In the paper- no marks allocation)
- B/Blood vessels in the skin dilate✓/vasodilation occurs
- **More** blood flows to the **skin surface**✓
- **More** heat is lost ✓
- A/sweat glands produce more sweat✓/become more active
- **More** evaporation✓ from skin surface
- **More heat** is lost from the skin✓

(Any 5) (5)
(8)

3.2.1 23 mmol/L✓ (1)

3.2 3.2.2
- Receptors in the carotid artery are stimulated✓ and
- impulses are sent to the medulla oblongata✓
- The medulla oblongata stimulates the heart✓
- to beat faster✓ causing
- more carbon dioxide to be sent to the lungs✓
- The breathing muscles✓/intercostal muscles and diaphragm
- contract more actively✓ and
- the rate and depth of breathing increases✓
- more carbon dioxide is exhaled✓ out of the body
- The carbon dioxide level in the blood decreases returns back to normal ✓

(Any 7) (7)
(8)

3.3.1 Chorion✓ (1)

3.3 3.3.2
- Shock absorber✓/ protect against mechanical injuries
- Temperature regulator✓
- Prevents dehydration✓
- Medium for the foetus to move✓ in

(Mark the first TWO only) (2)

3.3.3
- The chorion forms ✓
- Chorionic villi✓ and
- Attaches to the endometrium✓

(3)

3.3.4
- Secretes progesterone✓
- which further increases the thickness of the endometrium✓
- making it more (vascular and glandular)✓

(3)

3.3.5

Umbilical artery	Umbilical vein
- Carries deoxygenated blood✓ from the foetus to placenta	- Carries oxygenated blood✓ from the placenta to foetus
- Carries toxic substances from the foetus to placenta✓	- Carries nutrients from the placenta to the foetus✓

(5)

T✓1 mark + (4) **(14)**

3.4 3.4.1
- Great White shark✓
- Nurse shark✓
- Thresher shark✓

(Mark the first ONE only) (1)

3.4.2
- To increase the chances of fertilisation✓
- since it is external fertilisation ✓
- eggs/ ovum's may be lost✓/ predation✓/water currents (3)

3.4.3 - Lemon shark has a womb✓ and the embryo is fed by the placenta✓/ umbilical cord

- while the Bamboo shark embryos are fed by the yolk✓ in the egg✓ (3)

(Any 3)

(7)

3.5 3.5.1 (Different) Concentration of auxin✓ (1)

3.5.2 It is a control group✓
To ensure that the results are caused by (different concentrations of) auxins✓ (2)

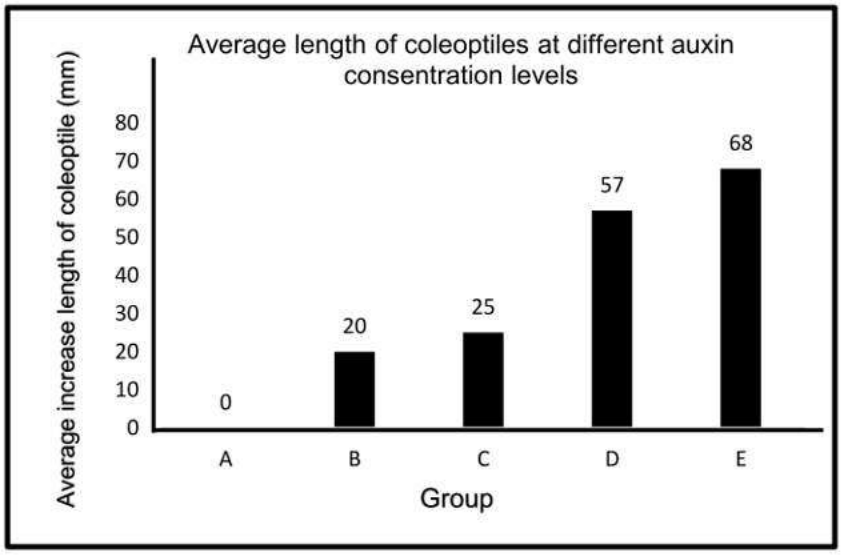
3.5.3 Same length of the coleoptiles✓
Same species of bean plants✓
Same time for growth (4 days)✓
All the tips of the coleoptiles were removed✓
Injections at the cur surface ✓
(Mark the first TWO only) (2)

3.5.4 When the concentration of auxin increases, the (average) length of coleoptiles increases✓✓

OR

When the concentration of auxin decreases, the (average) length of coleoptiles decreases✓✓

3.5.5



(2)

Criteria for marking graph:

Criteria	Mark allocation
Bar graph is drawn **(T)**	(1)
Caption of the graph includes both variables **(C)**	(1)
Correct labels on X-axis and Y-axis and with correct unit on Y-axis **(L)**	(1)
Correct scale for X-axis and Y-axis and bars with equal width with equal spaces for X-axis **(S)**	(1)
Plotting correctly done for: **(P)** 1–4 coleoptile lengths All 5 coleoptile lengths	 (1) (2)

(6)
(13)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150