KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

PREPARATORY EXAMINATION

SEPTEMBER 2022

MARKS: 150

TIME: $2^1/_2$ hours

N.B. This question paper consists of 18 pages including this page.

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 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 correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in your ANSWER BOOK, for example 1.1.11 D.

1.1.1 Which ONE of the following is the microscopic gap between two consecutive neurons?

A axon.
B dendrite.
C synapse.
D cell body.

1.1.2 The part of the brain that is activated/responds when an athlete is dehydrated is the …

A cerebellum.
B cerebrum.
C corpus callosum.
D hypothalamus.

1.1.3 Which ONE of the following stores nitrogenous wastes produced by the embryo?

A Amnion
B Allantois
C Chorion
D Yolk sac

1.1.4 The following are functions of different hormones:

(i) Regulates the blood sugar level
(ii) Regulates water levels in the blood
(iii) Stimulates growth of long bones
(iv) Stimulates milk production
(v) Regulates salt concentration

Which ONE of the following combinations is the correct function of ADH and prolactin respectively?

A (ii) and (i)
B (iii) and (iv)
C (ii) and (v)
D (ii) and (iv)

1.1.5 An investigation was conducted to determine the effect of alcohol on the reaction time of a person.

The reaction time was measured by the time it took to catch a ruler.

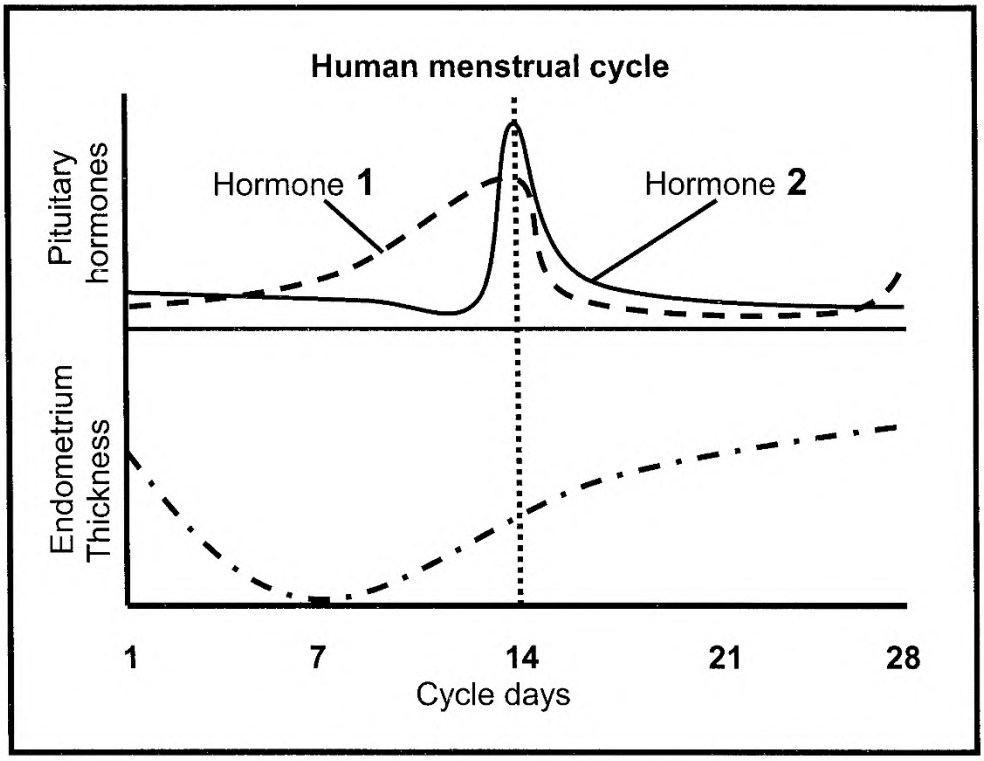
The procedure was as follows:

- The person's reaction time was first measured in a room with bright light.
- The person was then given 200 mℓ of alcohol to drink.
- After 15 minutes the reaction time of the person was measured for the second time whilst in a room with dim light.
- Ten measurements were recorded every 15 minutes in dim light and an average was calculated.

How was the validity of the investigation decreased?

A The person's reaction time was measured in the absence of alcohol the first time.
B Reaction time was measured by the time it took to catch a ruler.
C Reaction time was measured in different light conditions.
D Only ten measurements were recorded.

QUESTIONS 1.1.6 AND 1.1.7 ARE BASED ON THE FOLLOWING GRAPH AND TABLE



The table below shows follicle size from day 14 to day 28.

Cycle days	Follicle diameter (cm)
14	2
18	5
22	3
26	2
28	0,5

1.1.6 Which ONE of the following is the correct combination of result and conclusion?

	Result	Conclusion
A	Hormone 1 increased towards day 28	Fertilisation occurred
B	Hormone 1 decreased towards day 28	Fertilisation did not occur
C	Follicle diameter decreased towards day 28	Fertilisation occurred
D	Follicle diameter decreased after day 18	Fertilisation did not occur

1.1.7 Which ONE of the following represents the correct hormone number, name and function?

	Hormone	Name	Function
A	**1**	LH	Stimulates menstruation
B	**2**	FSH	Thickens endometrium
C	**1**	Progesterone	Stimulates follicle development
D	**2**	LH	Stimulates ovulation

QUESTIONS 1.1.8 AND 1.1.9 ARE BASED ON THE FOLLOWING DATA ON THE AGES OF PREGNANT WOMEN, AND THE CHANCES OF THEM HAVING MISCARRIAGES.

AGES OF WOMEN	PREGNANCIES PER MONTH (%)	CHANCES OF MISCARRIAGE (%)
22	25	10
28	24	11
34	18	15
40	6	24
46	2	53

1.1.8 Which ONE of the following is the correct relationship between the ages of women and the chances of miscarriage?

A The age of the women has no effect on the chances of miscarriage
B The older a woman gets,the greater the chances of miscarriage
C The older the woman gets the lower the chance of having a miscarriage
D Younger women have a greater chance of miscarriage

1.1.9 In a particular month during the investigation 25 500 women fell pregnant. How many in this particular month, would be aged 28 according to the data in the table above?

A 6120
B 4590
C 2805
D 6375

1.1.10 Which ONE of the following is the correct function of a vagina?

A Transports urine to the outside
B A place where ovulation occurs
C Acts as a birth canal
D Produces progesterone

(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 number (1.2.1 to 1.2.10) in the ANSWER BOOK.

1.2.1 The membranes that protect the brain and spinal cord

1.2.2 Fibres that transmit impulses towards the cell body in a neuron

1.2.3 A structure in the ear that equalises air pressure on either side of the tympanic membrane

1.2.4 A disease caused by damage to the myelin sheath of neurons

1.2.5 The growth response in plants in response to gravity

1.2.6 The plant growth where auxins produced at the tip of the stem inhibit growth of the branches closer to the tip of the stem

1.2.7 The eye defect characterised by the uneven curvature of the cornea

1.2.8 The white outer layer that protects the human eye

1.2.9 The type of development in birds where offspring's are able to move soon after hatching

1.2.10 The fusion of an ovum and a sperm cell outside the body of a female

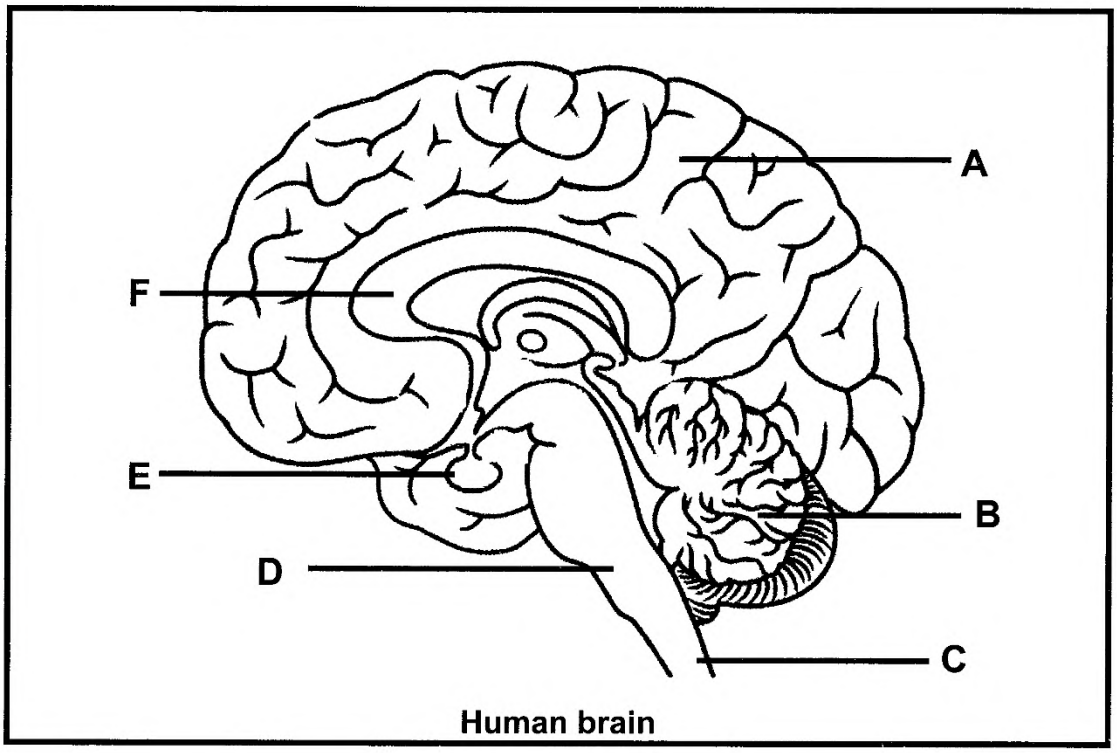
(10 × 1) **(10)**

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 number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	Increases the chances of fusion of sperm and ova	A: External fertilisation B: Internal fertilisation
1.3.2	Increases heart rate	A: Sympathetic nerves B: Parasympathetic nerves
1.3.3	Live offspring are born	A: Vivipary B: Ovovivipary

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

1.4 The diagram below shows a human brain.



Human brain

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

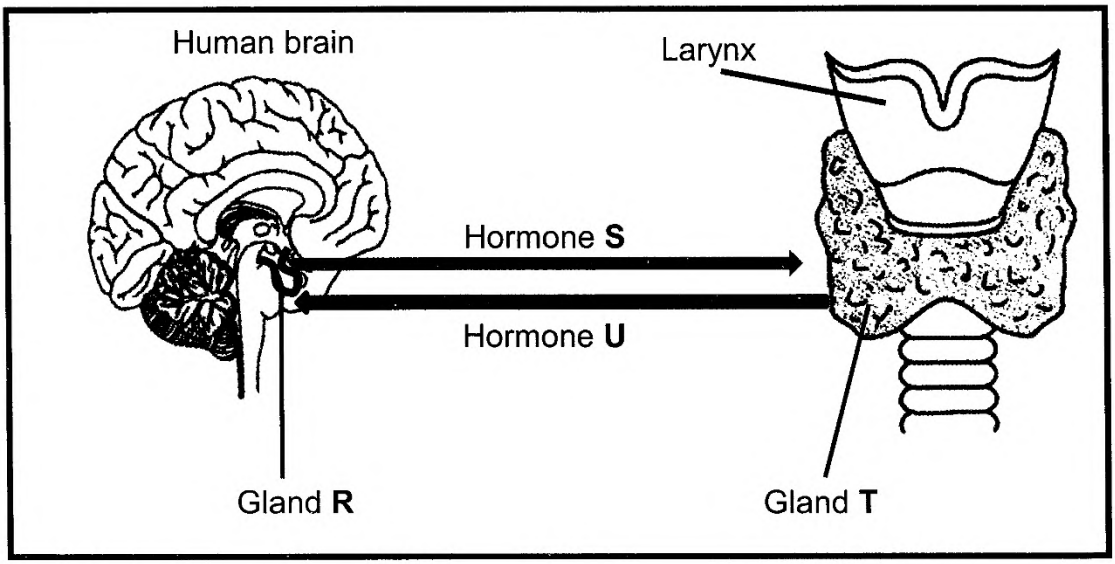
(a) Has its hemispheres connected by the corpus callosum (2)

(b) Is responsible for regulating the heartbeat (2)

(c) Co-ordinates voluntary actions (2)

(d) Has white matter on the outside (2)
(8)

1.5 The diagram below shows a relationship between two endocrine glands.



1.5.1 Identify glands:

(a) **R** (1)

(b) **T** (1)

1.5.2 Identify hormones:

(a) **S** (1)

(b) **U** (1)

1.5.3 State which hormone (**U** or **S**), controls metabolic rate. (1)

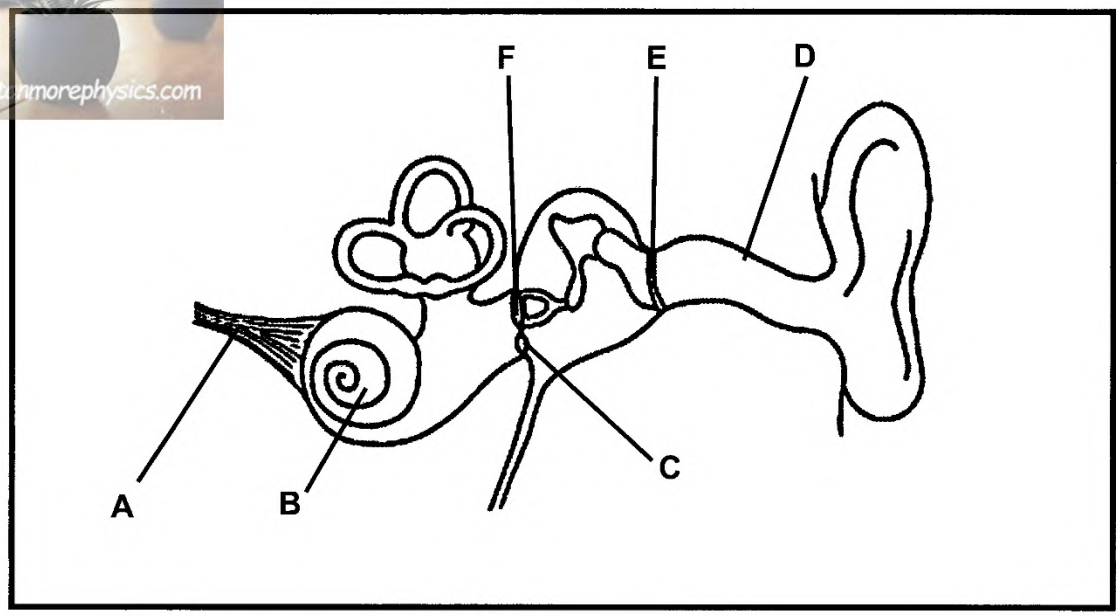
1.5.4 State the gland (**R** or **T**) that enlarges due to the lack of iodine in the diet? (1)
(6)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The following diagram shows the human ear.



2.1.1 Identify the parts labelled:

(a) **B** (1)

(b) **D** (1)

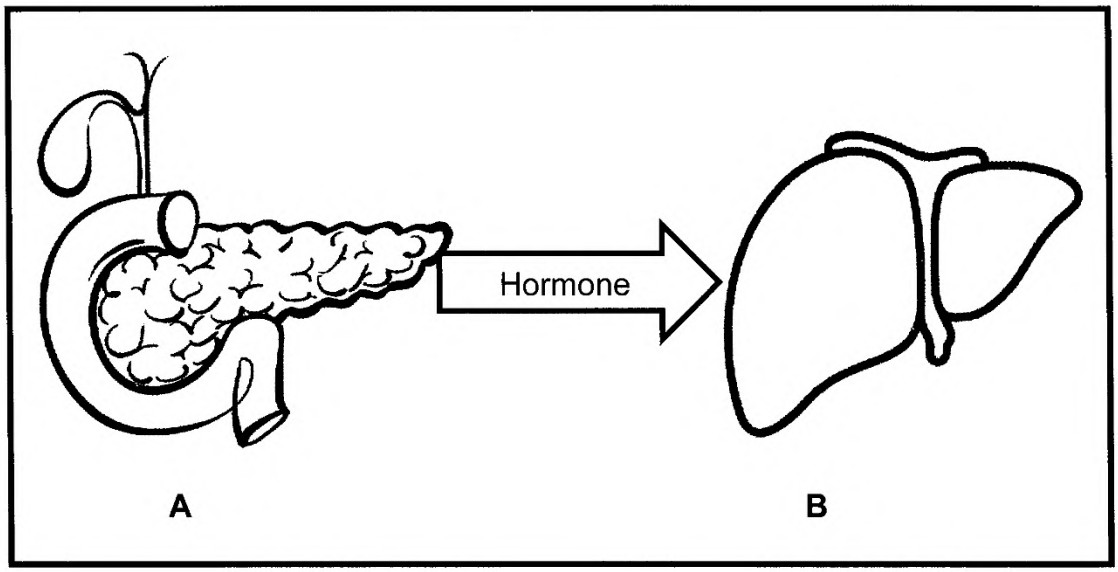
2.1.2 Write down the LETTER of the part that absorbs excess pressure from the inner ear. (1)

2.1.3 Explain the consequence if part **A** was damaged (2)

2.1.4 Explain how middle ear infection could affect hearing. (3)
(8)

2.2 Describe the role of the semi-circular canals in maintaining balance. (6)

2.3 The diagram below represents a homeostatic interaction that occurs in the human body.



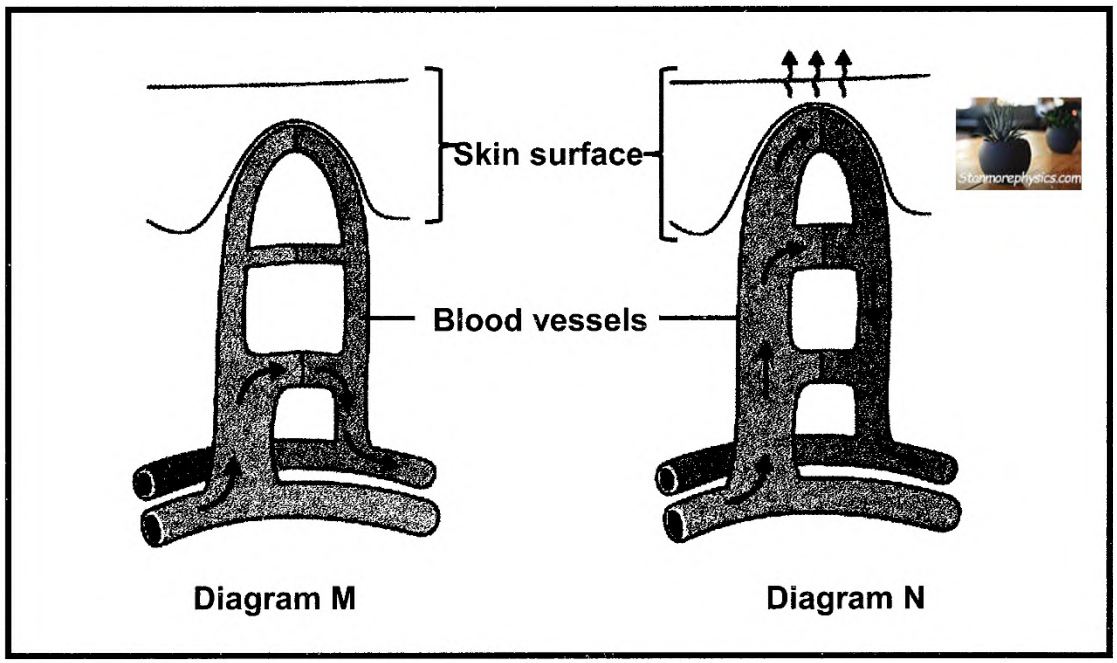
2.3.1 Identify organ **B**. (1)

2.3.2 Explain why the function of gland **A** shown here is an endocrine function. (2)

2.3.3 Name the hormone that is secreted by the pancreas when glucose levels are high? (1)

2.3.4 Describe the interaction between gland **A** and organ **B** when blood glucose levels are low. (3)
(7)

2.4 The diagram below shows the blood vessels of the skin at different environmental temperatures. The arrows in the blood vessels indicate the direction of blood flow.



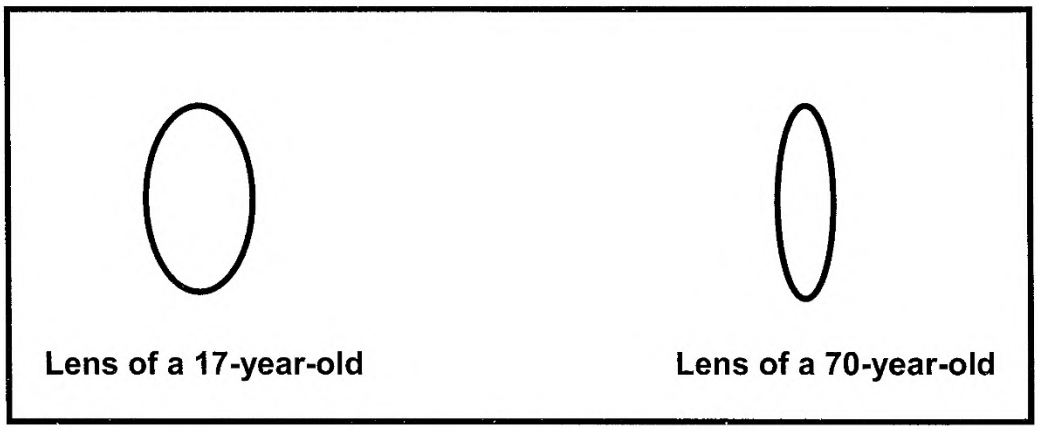
2.4.1 Which diagram (**M** or **N**) represents the blood vessel at low environmental temperature? (1)

2.4.2 Explain your answer to QUESTION 2.4.1 using evidence from the diagram. (3)

2.4.3 Describe the role of the sweat glands on a hot day. (3)
(7)

2.5 The lens of the human eye changes shape to ensure that a clear image is formed.

The diagram below shows the lens of two people, a 70-year-old, and a 17-year-old. Each person is looking at a book that is placed 50cm away. The 17-year-old can see the writing clearly while the 70-year-old sees a blurred image.



2.5.1 Name the process that occurs when a lens changes its shape for a clear image to be formed. (1)

2.5.2 Describe the changes that occurs in the eye lens of the 17-year-old when looking at the book. (5)

2.5.3 Name ONE part of the eye, besides the lens, that is involved in the refraction of light. (1)

2.5.4 Explain why the 70-year-old sees a blurred image. (3)

2.5.5 Name the visual defect caused when the lens becomes cloudy. (1)
(11)

2.6 Read the following extract.

New blood test may detect Alzheimer's disease (AD)

AD occurs due to the accumulation of a protein called *beta-amyloid* that clumps together to form "sticky" plaques on the brain. These plaques affect the transmission of impulses between brain cells and may result in the death of brain cells, leading to symptoms of AD. These symptoms include memory loss, mood changes, and difficulties with speech.

Scientists observed that *beta-amyloid* protein was able to travel from the brain into the blood. This then led to the discovery that analysis of blood samples could identify whether or not somebody was forming amyloid plaques on their brain.

2.6.1 According to the passage, what leads to the death of brain cells? (1)

2.6.2 List TWO symptoms of Alzheimer's disease mentioned in the passage. (2)

2.6.3 Explain how the success of this discovery will impact human lives. (3)
(6)

2.7 Describe how a simple reflex arc occurs. **(5)**
[50]

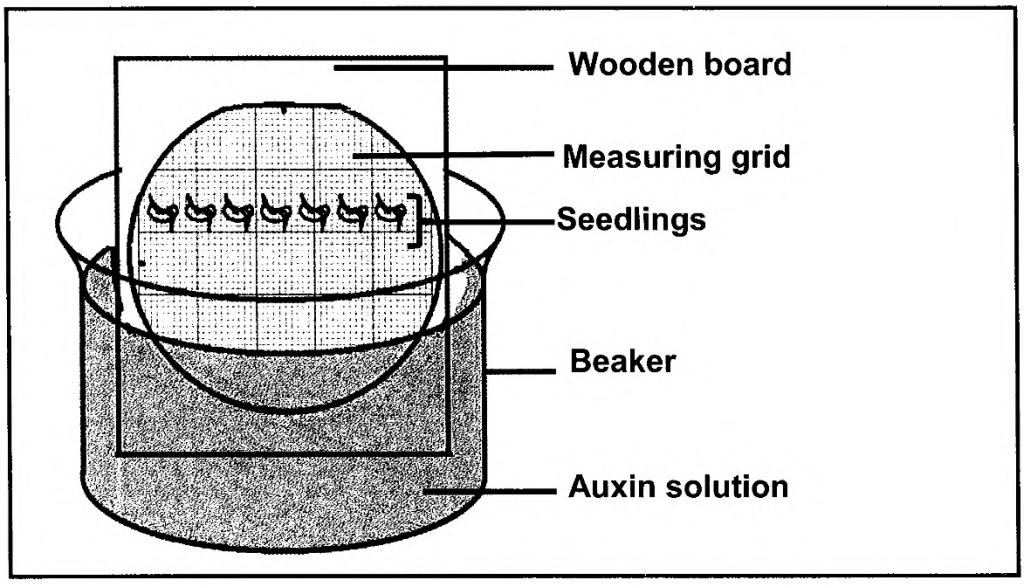
QUESTION 3

3.1 A group of Grade 12 learners investigated the influence of different concentrations of auxins on plumule growth. (A plumule is a young stem that grows from a seed).

The procedure was as follows:

- 35 bean seeds were germinated.
- The seedlings were then divided into five groups of seven seedlings each.
- A measurement grid was first placed on a wooden board.
- In each group seven seedlings were tied to the wooden board with cotton thread.
- Each wooden board with seedlings was placed in a beaker containing a different concentration of auxins.

The diagram below shows the set-up of a single beaker



- All five beakers were placed inside a dark cupboard for three days.
- After three days the increase in the length of each plumule (a young stem that grows from a seed) was measured.
- The average increase in length of the plumule in each beaker was calculated and recorded in the table below.

BEAKER NUMBER	AUXIN CONCENTRATION IN PARTS PER MILLION (ppm)	AVERAGE INCREASE IN PLUMULE LENGTH (mm)
1	0.1	1,5
2	1	3,2
3	10	4,8
4	50	2,3
5	100	0

3.1.1 Identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.1.2 State the purpose of the grid that was placed on a wooden board. (1)

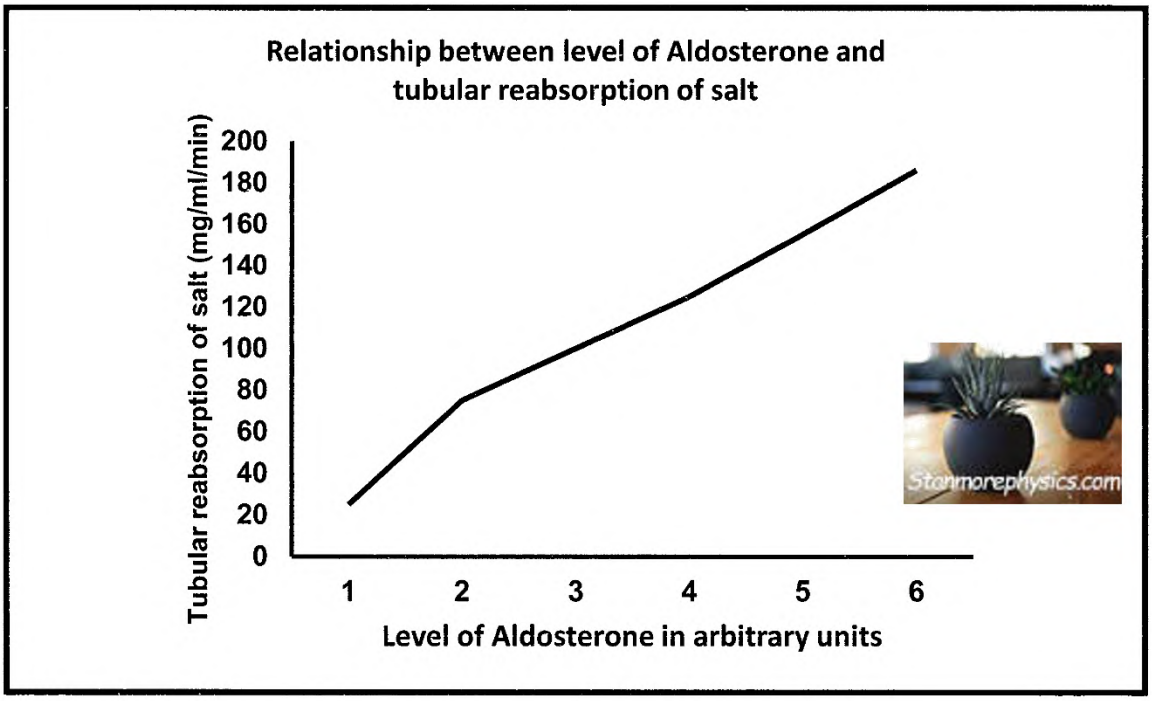
3.1.3 State ONE way in which the learners ensured the reliability of this investigation. (1)

3.1.4 State THREE factors, not stated in the procedure, that should be kept constant during this investigation. (3)

3.1.5 State the conclusion for this investigation. (3)

3.1.6 Name ONE other plant hormones that influence plant growth. (1)
(11)

3.2 The graph below shows the relationship between the levels of Aldosterone in the blood and tubular reabsorption of salt in the kidney.



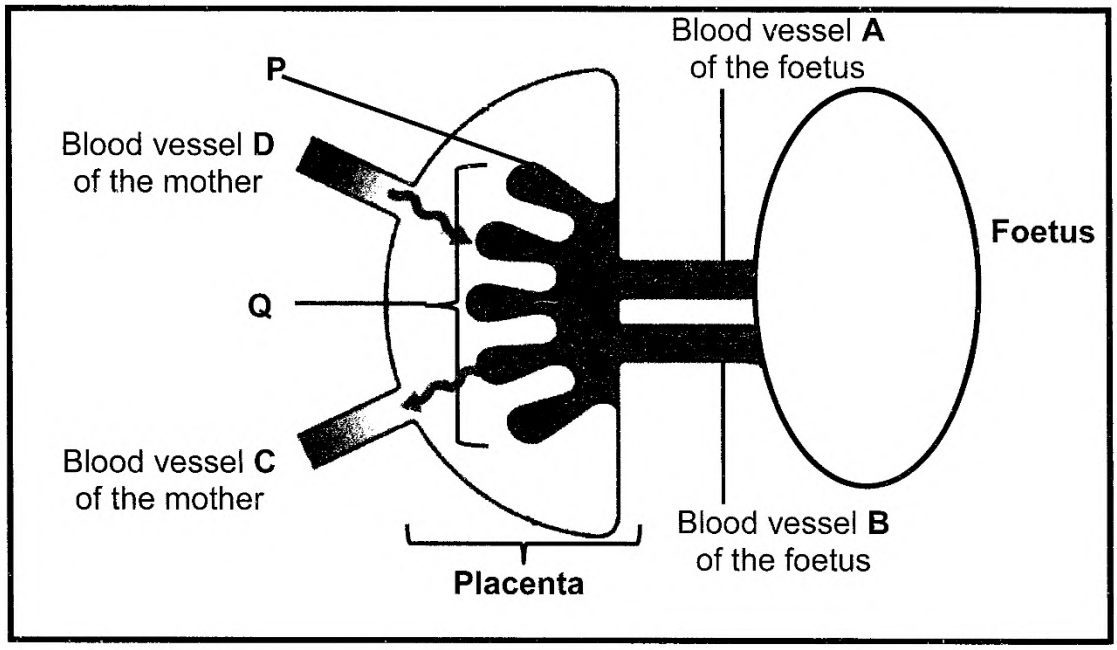
3.2.1 Name the gland that produces aldosterone. (1)

3.2.2 What was the rate of tubular reabsorption when the level of aldosterone was 6 arbitrary units? (1)

3.2.3 Explain why the trend in the graph indicates that the person had a very low salt content in the blood. (3)

3.2.4 Calculate the percentage increase in reabsorption between 2 and 5 arbitrary units of aldosterone. (3)
(8)

3.3 The diagram below represents the relationship between the blood system of the foetus and that of the mother. The arrows indicate the direction of blood flow in the blood vessels.



3.3.1 Identify:

(a) Structure **P** (1)

(b) The extra-embryonic membrane **Q** (1)

3.3.2 Give TWO functions of the placenta. (2)

3.3.3 Blood vessel **A** is a vein.

Tabulate TWO differences between the composition of blood found in blood vessel **A** and blood found in blood vessel **B**. (5)

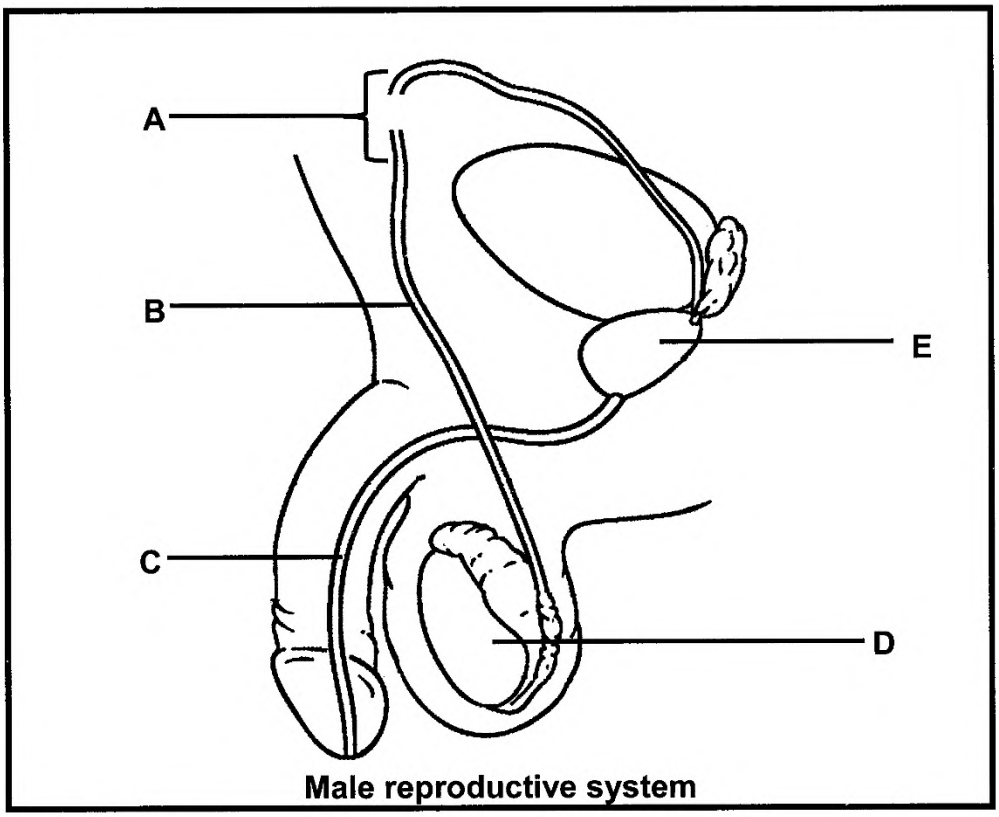
3.3.4 Explain ONE consequence for the foetus if blood vessel **B** becomes blocked preventing blood flow. (2)

3.3.5 If the blood of the mother and the blood of the foetus mix during pregnancy, it could lead to the death of the foetus.

Describe how this could cause death of the foetus. (2)
(13)

3.4 Describe the development of a fertilised human egg cell until implantation. **(4)**

3.5 The diagram below shows the male reproductive system.



Male reproductive system

3.5.1 Identify parts labelled:

(a) **B** (1)

(b) **C** (1)

(c) **E** (1)

3.5.2 Name and describe the type of gametogenesis that occurs in part **D**. (4)

3.5.3 Test results show that a man has a low sperm count.

Explain why a doctor would advise him against wearing tight underwear. (3)

3.5.4 A man had surgery and his part **A** was cut as shown in the diagram above.

Explain ONE reason why this man will:

(a) Not be able to reproduce (2)

(b) Still be capable of releasing semen from the body (2)

(14)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES P1

PREPARATORY EXAMINATION

MARKING GUIDELINE - SEPTEMBER 2022

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MARKS: 150

This marking guideline consists of 8 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is 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.

SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	D✓✓		
	1.1.3	B✓✓		
	1.1.4	D✓✓		
	1.1.5	C✓✓		
	1.1.6	B/ D ✓✓		
	1.1.7	D✓✓		
	1.1.8	B✓✓		
	1.1.9	A✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**

1.2	1.2.1	Meninges✓		
	1.2.2	Dendrites✓		
	1.2.3	Eustachian tube✓		
	1.2.4	Multiple Sclerosis✓		
	1.2.5	Geotropism✓		
	1.2.6	Apical dominance✓		
	1.2.7	Astigmatism✓		
	1.2.8	Sclera✓		
	1.2.9	Precocial✓		
	1.2.10	External fertilisation✓	(10×1)	**(10)**

1.3	1.3.1	B only✓✓	(2)
	1.3.2	A only✓✓	(2)
	1.3.3	A only ✓✓	(2)
			(6)

1.4	1.4.1	(a) A✓ – Cerebrum✓	(2)
		(b) D✓ – Medulla oblongata✓	(2)
		(c) B✓ – Cerebellum✓	(2)
		(d) C✓ – Spinal cord✓	(2)
			(8)

1.5	1.5.1	(a) Pituitary gland✓/hypophysis	(1)
		(b) Thyroid✓ gland	(1)
	1.5.2	(a) TSH✓/Thyroid stimulating hormone	(1)
		(b) Thyroxin✓	(1)
	1.5.3	U✓	(1)
	1.5.4	T✓	(1)
			(6)

50

SECTION B

QUESTION 2

2.1 2.1.1 (a) Cochlea✓ (1)

(b) Auditory canal✓ (1)

2.1.2 C✓ (1)

2.1.3
- Impulses would not be sent to the brain✓/cerebrum/cerebellum
- therefore, no hearing would occur✓/balance will not be maintained. (2)

2.1.4
- Eustachian tube gets blocked✓
- By the fluid build up✓
- therefore, pressure builds up in the middle ear✓
- causing ossicles to stop vibrating / tymphanic membrane will not vibrate✓
- leading to impaired hearing✓ Any 3 (3)

(8)

2.2
- A change in direction and speed✓ of the head
- stimulates the cristae✓ in the ampullae
- which converts the stimulus into an impulse✓
- which is then sent to the cerebellum✓
- via the auditory nerve✓
- The cerebellum sends impulses to the skeletal muscles✓
- to restore balance✓ Any 6 **(6)**

2.3 2.3.1 Liver✓ (1)

2.3.2
- A hormone is secreted✓
- directly into the blood✓ (2)

2.3.3 Insulin✓ (1)

2.3.4
- Gland A/The pancreas/islets of Langerhans secrete glucagon✓
- which causes the liver✓/organ B
- to convert glycogen to glucose✓
- causing glucose levels in the blood to increase✓ Any3 (3)

(7)

2.4 2.4.1 M✓ (1)

2.4.2
- Blood vessels are constricted✓/vasoconstriction occurred
- Less blood flows to the skin surface✓
- Heat is retained / less or no heat is lost✓ (3)

2.4.3
- Sweat gland becomes more active✓
- More sweat is produced✓
- and transported to the surface of the skin✓ (3)

(7)

2.5	2.5.1	Accommodation✓		(1)
	2.5.2	- Ciliary muscles contract✓ - Suspensory ligaments slacken✓ - Lens becomes more biconvex✓/rounder/fatter - Refractive power increases✓ - Light is refracted more✓ - Clear image is formed on the retina✓	Any 5	(5)
	2.5.3	- Cornea ✓/ aqueous humor / vitreous humor **(MARK first ONE only)**		(1)
	2.5.4	- The lens is not able to bend as much✓/is less elastic - The lens does not become biconvex enough✓ - The light is not bent enough to form a clear image on the retina✓ **OR** - The refractive power of the lens is low✓/the lens cannot become more convex and - Light rays are not refracted✓/bend enough for a clear image - To be focused on the retina✓.		(3)
	2.5.5	Cataracts✓		(1) **(11)**
2.6	2.6.1	Sticky plaque✓		(1)
	2.6.2	- Memory loss✓ - Mood changes✓ - Difficulty in speech✓ **(Mark the FIRST TWO only)**	Any 2	(2)
	2.6.3	- Blood tests could give early detection✓ of the disease - And patients can start medication early✓ - Preventing development of symptoms✓ - Therefore, people can live full lives✓/AD free lives	Any 3	(3) **(6)**
2.7		- Receptors receive the stimulus✓ and - convert stimulus into an impulse✓ - Impulse travels via sensory neuron✓ - To the interneuron of the spinal cord✓/CNS - Which sends impulses via motor neuron✓ - To the effectors✓ - Which bring about a quick response to the stimulus✓	Any 5	**(5)** **[50]**

QUESTION 3

3.1 3.1.1 (a) Auxin concentration✓ (1)

(b) Plumule growth✓ (1)

3.1.2 For measurement of the plumule length✓ (1)

3.1.3 - They used seven seedlings in each group✓/35 seeds in total/a large sample
- They calculated the average✓ increase in plumule length
(MARK FIRST ONE ONLY) Any 1 (1)

3.1.4 - Same species of beans✓
- Seedlings of the same age✓
- Seedlings of the same size✓
- Same temperature✓
- The same investigator✓
- Identical apparatus (beakers/petri-dishes/graph paper/grid) ✓
- same volume of the solution✓ Any 3 (3)

(MARK FIRST THREE ONLY)

3.1.5 An increase in auxin concentration up to an optimum/10 ppm stimulates the growth rate of the plumule/stem. With further increase in auxin concentration there is an inhibition of plumule/stem growth ✓✓✓ (3)

3.1.6 Gibberellins✓
Abscisic acid✓ Any 1 (1)
(Mark FIRST ONE ONLY) **(11)**

3.2 3.2.1 Adrenal gland✓ (1)

3.2.2 185 mg/ml/min✓ Accept (183 ≤ values≤ 187) (1)

3.2.3 - Aldosterone is responsible for lowering salt content✓
- as the levels of aldosterone increases ✓
- the tubular reabsorption of salt will increase ✓ (3)

3.2.4 (150 – 75) ÷ 75 ✓ for the value at 5 au **accept (148 ≤ values≤ 152)**
= 75/75 × 100✓ for the value at 2 au **accept (73 ≤ values≤ 77)**
= 100%✓ (3)
(8)

3.3 3.3.1 (a) Chorionic villi✓ (1)

(b) Chorion✓ (1)

3.3.2 - It acts as a micro-filter✓/prevents harmful substances from reaching the foetus
- Produces antibodies✓
- It secretes progesterone✓/oestrogen during pregnancy/maintains the endometrium
- Immunity is transferred from the mother to the foetus✓ Any 2 (2)

(MARK FIRST TWO ONLY)

✓

3.3.3

BLOOD VESSEL A	BLOOD VESSEL B
High concentration of nutrients✓/example of nutrient	Low concentration of nutrients✓/example of nutrient
Low concentration of waste products✓/example of waste product	High concentration of waste products✓/example of waste product
High concentration of oxygen✓	Low concentration of oxygen✓
Low concentration of carbon dioxide✓	High concentration of carbon dioxide✓

(MARK FIRST TWO ONLY) TABLE 1 + (2×2) (5)

3.3.4 - Waste products/nitrogenous waste/CO_2 will accumulate✓ in the foetus' body
- causing the death✓/harm of the foetus. Any 1×2 (2)

(MARK FIRST ONE ONLY)

3.3.5 - Harmful substances✓/bacteria
- may pass from the mother's blood to the blood of the foetus✓

OR

- The blood types✓/other proteins of the mother and baby
- may not be compatible✓ (2)

(13)

3.4
- zygote is formed✓
- which divides by mitosis✓
- to form a mass ball of cells✓
- called morula✓
- which grows into a hollow ball of cells✓
- called blastula✓/blastocyst. Any 4 **(4)**

3.5 3.5.1 (a) vas deferens✓/sperm duct (1)

(b) Urethra✓ (1)

(c) Prostate gland✓ (1)

3.5.2
- Spermatogenesis✓*
- Under the influence of testosterone✓
- diploid cells✓/germinal epithelium
- in the seminiferous tubules ✓ of the testis
- undergo meiosis✓
- to form (haploid) sperm✓ *1 compulsory + Any 3 (4)

3.5.3 - Tight underwear will pull the testes close to the body✓
- The temperature of the testes will be too high✓/higher pressure on the testes
- and sperm will not mature✓/sperm production is negatively affected. Any (3)

3.5.4 (a) - There will be no sperm in the semen✓
- therefore, no fertilisation can take place✓ (2)

(b) - The fluid part of the semen will still be produced✓
- by the accessory glands✓/seminal vesicles/prostate gland/ Cowper's glands (2)
(14)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150