basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2015

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

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SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 A light stimulus is converted into a nerve impulse in the ...

A iris.
B retina.
C optic nerve.
D choroid.

1.1.2 Which plant hormone promotes seed dormancy?

A Gibberellin
B Auxin
C Abscisic acid
D Growth hormone

1.1.3 The type of reproduction in which young develop from the eggs that are kept in the mother's body but do not receive nutrition from the mother:

A Vivipary
B Ovipary
C Ovovivipary
D Altricial

1.1.4 Which part of the human brain controls balance and equilibrium?

A Cerebrum
B Cerebellum
C Medulla oblongata
D Corpus callosum

1.1.5 DNA replication occurs during ...

A anaphase I.
B interphase.
C prophase I.
D prophase II.

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1.1.6 Which of the following CORRECTLY represents the events involved in the secretion and action of ADH (antidiuretic hormone)?

	WATER LEVEL IN BLOOD RELATIVE TO NORMAL	AMOUNT OF ADH PRODUCED RELATIVE TO NORMAL	AMOUNT OF WATER REABSORBED BY KIDNEYS
A	Increase	Increase	Decrease
B	Increase	Decrease	Increase
C	Decrease	Increase	Increase
D	Decrease	Decrease	Decrease

1.1.7 A worker spent about ten minutes in a walk-in freezer. Below are some of the changes that occurred in his body in response to the drop in external temperature.

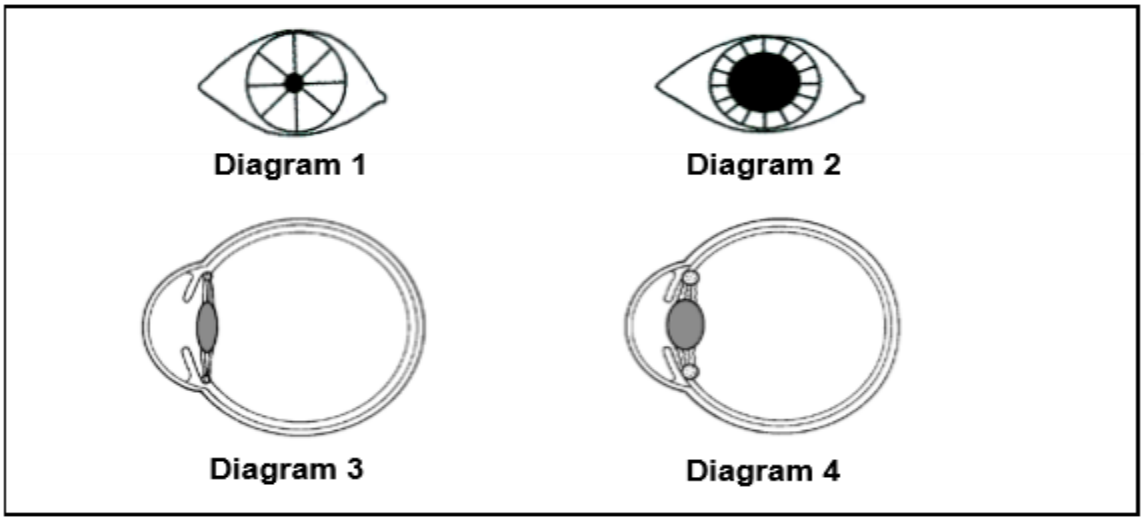
(i) Blood vessels in the skin constrict
(ii) Brain reacts
(iii) Skin temperature changes
(iv) Temperature receptors in the skin detect changes

Which ONE is the correct sequence in which the changes occurred?

A (ii) → (i) → (iii) → (iv)
B (iii) → (i) → (iv) → (ii)
C (iv) → (ii) → (i) → (iii)
D (iv) → (i) → (ii) → (iii)

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1.1.8 The diagrams below show the human eye under different conditions.



Which TWO diagrams above show the result when the ciliary muscles contract and the circular muscles of the iris relax?

A 1 and 3
B 3 and 2
C 1 and 4
D 4 and 2

1.1.9 A learner conducted an investigation to determine the percentage of people that are long-sighted.

The factor that is LEAST likely to affect such an investigation is the ...

A light intensity of the room in which the test was conducted.
B height of the people.
C age of the people in the sample.
D distance between the tool used to test the sight and the person being tested.

1.1.10 The data below represents the results of an investigation used to determine how the thickness of the lens changed as a pencil was moved away from the eye.

DISTANCE FROM EYE (cm)	THICKNESS OF LENS (mm)
10	4,0
20	3,6
30	3,2
50	2,9
100	2,6
150	2,6
200	2,6

[Adapted from *Complete Biology,* 2000]

The general conclusion that can be made from the data is that …

A as the distance from the eye increased up to 100 cm, the thickness of the lens increased, after which it remained constant.
B as the distance from the eye decreased, the thickness of the lens remained constant.
C as the distance from the eye increased up to 100 cm, the thickness of the lens decreased, after which it remained constant.
D the thickness of the lens increased with an increase in distance from the eye. (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 structure in the ear that equalises the pressure on either side of the eardrum

1.2.2 Measurement of the total amount of carbon dioxide emissions of an individual, a defined population or a company per year

1.2.3 The type of pollution caused when water is released into a river after being heated in power stations or industries

1.2.4 The watery fluid that supports the cornea and the front chamber of the eye

1.2.5 The hormone produced by the Graafian follicle

1.2.6 The hormone responsible for the formation of the corpus luteum

1.2.7 The receptors in the ear that detect changes in the direction and speed of any movement of the body

1.2.8 A hormone which stimulates the secretion of thyroxin

1.2.9 The type of fertilisation associated with viviparous reproduction

1.2.10 The series of changes that take place in the shape of the lens and the eyeball in response to the distance of an object from the eye

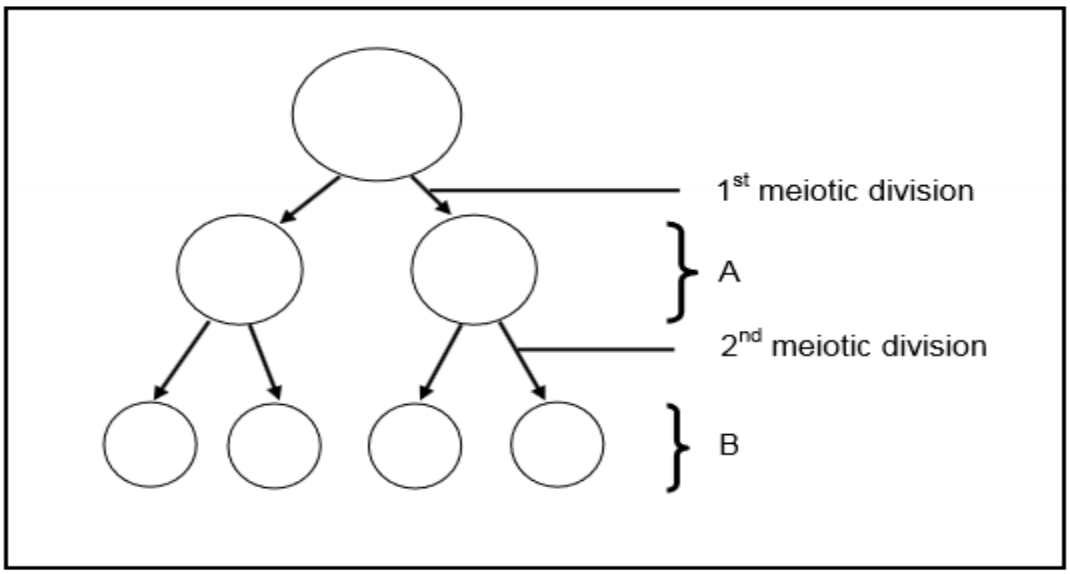
(10 x 1) **(10)**

1.3 Indicate whether each of the statements 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 1.3.6) in the ANSWER BOOK.

COLUMN I		COLUMN II
1.3.1	May cause a decrease in the pH of the blood	A: excess glucose B: excess carbon dioxide
1.3.2	The part of the brain that connects the two hemispheres	A: cerebellum B: corpus callosum
1.3.3	A brain disorder that results in memory loss	A: Alzheimer's disease B: multiple sclerosis
1.3.4	A structure in the nervous system that detects a stimulus	A: effector B: receptor
1.3.5	A hormone secreted by the pituitary gland/hypophysis	A: testosterone B: thyroxin
1.3.6	A type of development in birds in which the young are capable of moving around soon after hatching	A: precocial development B: Altricial development

(6 x 2) **(12)**

1.4 Study the diagram below, which shows a process occurring in a human male.



1.4.1 Name the process by which male gametes in humans are formed through meiosis. (1)

1.4.2 Name the organ in males where the process mentioned in QUESTION 1.4.1 takes place. (1)

1.4.3 How many chromosomes will be found in each cell at:

(a) A (1)

(b) B (1)

1.4.4 Name TWO processes occurring during the 1st meiotic division that contribute to the genetic variation of cells **A**. (2)

1.4.5 How many cells at **B** will carry the Y-chromosome? (1)

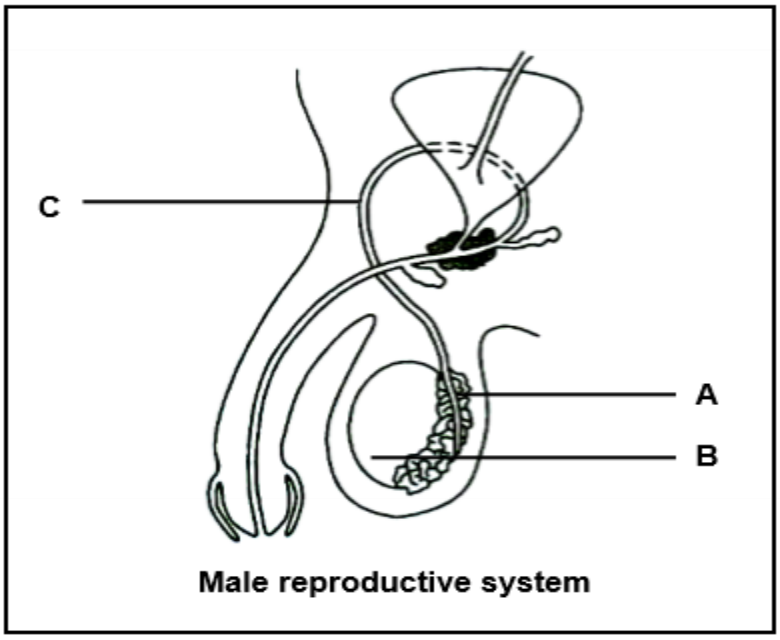
1.4.6 What are the mature cells at **B** called? (1)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Study the diagram below.



Male reproductive system

2.1.1 Give labels for each of the following:

(a) A (1)

(b) B (1)

(c) C (1)

2.1.2 State ONE function of part **A**. (1)

2.1.3 Explain the consequences for reproduction if part **C** is surgically cut. (3)

2.1.4 Explain why it would still be possible for an HIV positive man to infect another person during sexual intercourse after part **C** is surgically cut. (2)
(9)

2.2 Describe how the different parts of the ear and brain allow for hearing to occur. **(7)**

2.3 Study the diagram of a reflex arc below.

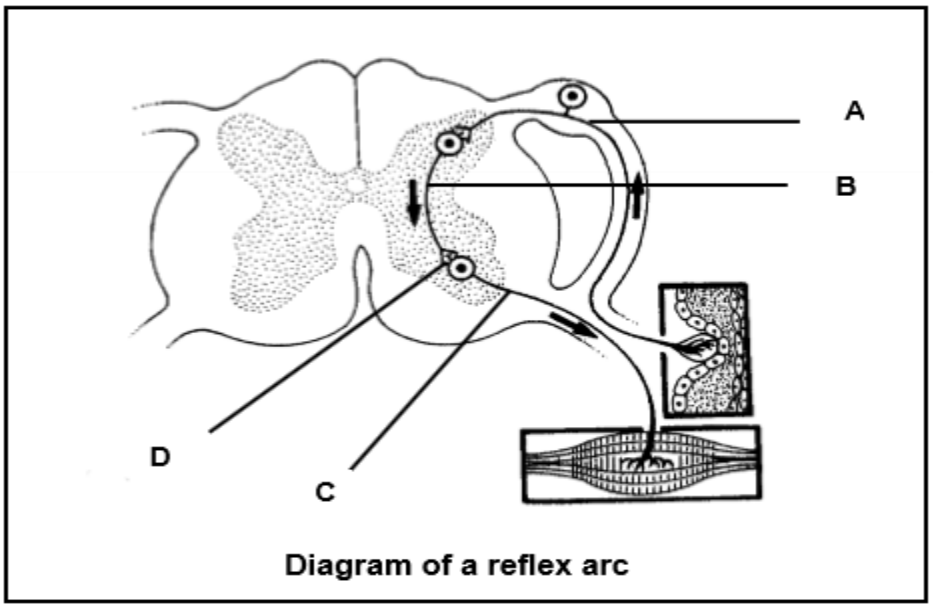


Diagram of a reflex arc

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

2.3.2 Label the following:

(a) The functional connection at **D** (1)

(b) Neuron **B** (1)

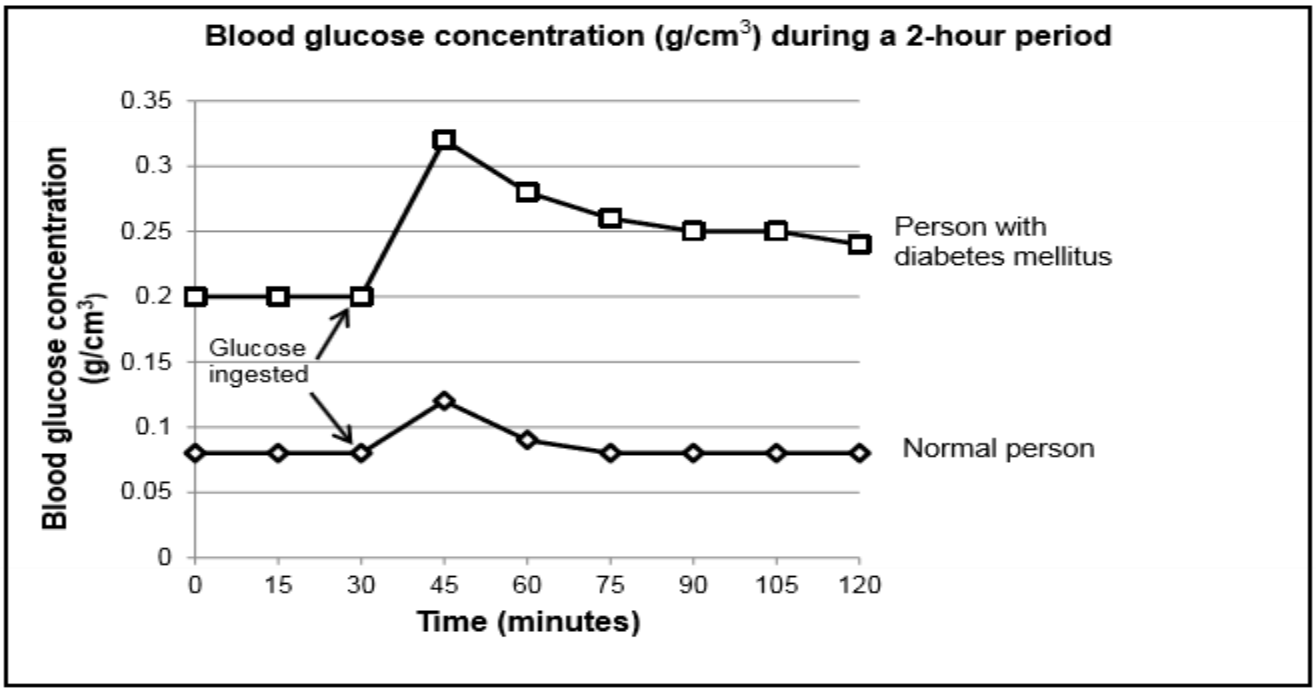
2.3.3 State the significance of the functional connection at **D**. (1)

2.3.4 Write down, in the correct order, the LETTERS ONLY of the neurons involved from the time a stimulus is received until a response takes place. (2)

2.3.5 Explain the consequences for a reflex action if neuron **C** is damaged. (2)

2.3.6 Draw a labelled diagram to represent the structure of neuron **A**. (5)
(14)

2.4 The graph below shows the blood glucose concentration in a normal person and in a person with diabetes mellitus. Both persons ingested 100 mℓ of glucose solution at 30 minutes.



[Adapted from *Cambridge Biology 2*, 2001]

2.4.1 What is the blood glucose concentration (g/cm^3) of the person with diabetes mellitus at 90 minutes? (1)

2.4.2 How many minutes after the ingestion of glucose did the glucose concentration reach its highest level in the normal person? (1)

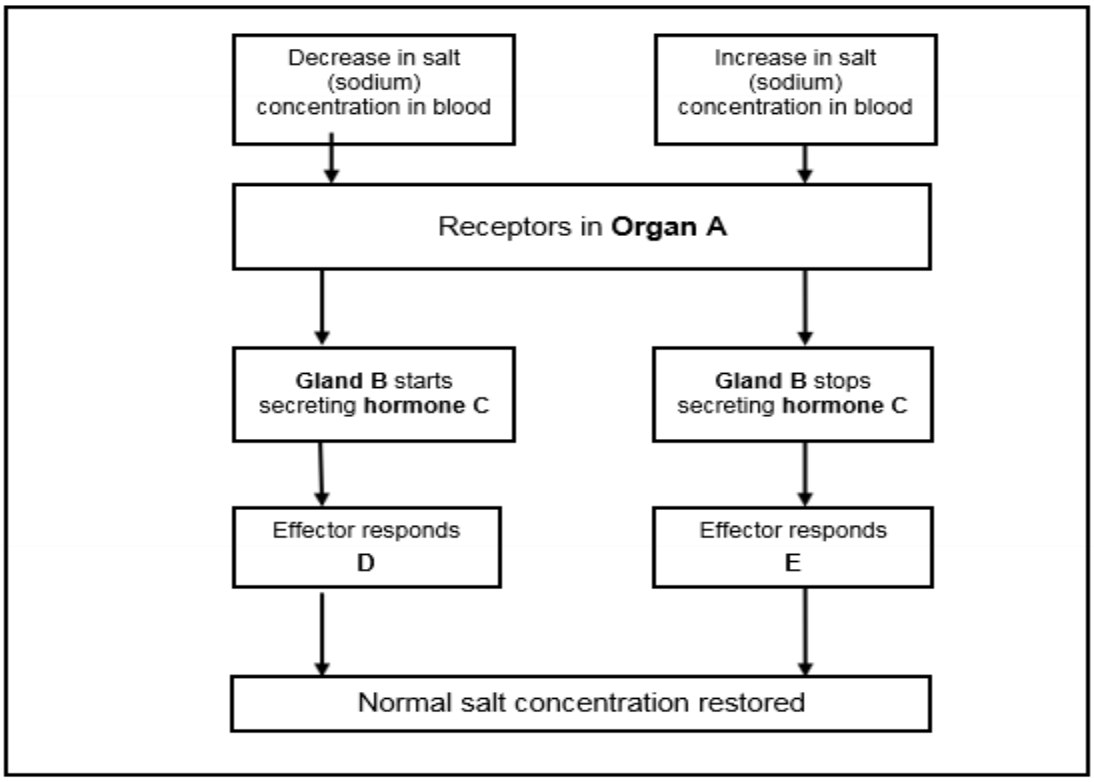
2.4.3 Describe TWO differences in the pattern of the blood glucose concentration for the person with diabetes mellitus and a normal person. (4)

2.4.4 Explain the reason for the differences mentioned in QUESTION 2.4.3. (2)

2.4.5 Name TWO hormones that have the opposite effect to that of insulin. (2)
(10)
[40]

QUESTION 3

3.1 Study the flow diagram below of a homeostatic mechanism used to regulate the concentration of salts in the human body.



3.1.1 Define *homeostasis*. (2)

3.1.2 Give the name of the following:

(a) Organ **A** (1)

(b) Gland **B** (1)

(c) Hormone **C** (1)

3.1.3 Describe the response by the effector at **D**. (2)
(7)

3.2 Read the passage below and answer the questions.

POPULAR DAM IS A BIOLOGICAL 'DESERT'

The Hartebeespoort Dam is situated in a residential area in North West. Unfortunately, it is rapidly becoming a biological 'desert' due to pollution by 2,7 million people living in the surrounding area, as well as the 720 megalitres of treated sewage water flowing into the dam. The inflow of treated sewage water increased the amount of phosphates present in the dam. This reduced the biodiversity of the dam resulting in only two plant species (water hyacinth and algae) and only three fish species (common carp, barbel and canary kurper) remaining in the dam, leading to an overpopulation of these species.

The Department of Water Affairs started a biological control programme to reduce the population of the remaining species so that other species could recolonise the dam. After a year the biodiversity of the dam increased.

[Adapted from *The Times*, 10 October 2013]

3.2.1 Based on the text above, explain what is meant by the term *biological 'desert'*. (1)

3.2.2 Explain why the increased phosphate levels caused a decrease in biodiversity. (3)

3.2.3 Explain how the reduction in biodiversity can affect the ecological balance in the dam. (4)

3.2.4 What is meant by *biological control*? (2)
(10)

3.3 The table below shows the global carbon dioxide emissions from fossil fuel combustion and some industrial processes in 2008.

COUNTRY	CARBON DIOXIDE EMISSIONS (%)
China	23
European Union	13
USA	19
India and Russian Federation	12
Other	33

[Adapted from www.environmentalprotectionagency.gov/climatechange]

3.3.1 Draw a pie chart to represent the data in the table. (6)

3.3.2 Explain the impact of the increased carbon dioxide emissions on the environment. (3)

3.3.3 Each country has been given a mandate to reduce its carbon dioxide emissions to reach a certain target. This is reviewed annually by the Conference of the Parties (COP), a United Nations organisation comprising 195 countries that meets to assess progress in dealing with climate change.

Explain TWO reasons why some countries are against reducing the carbon dioxide emissions by their industries. (4)
(13)

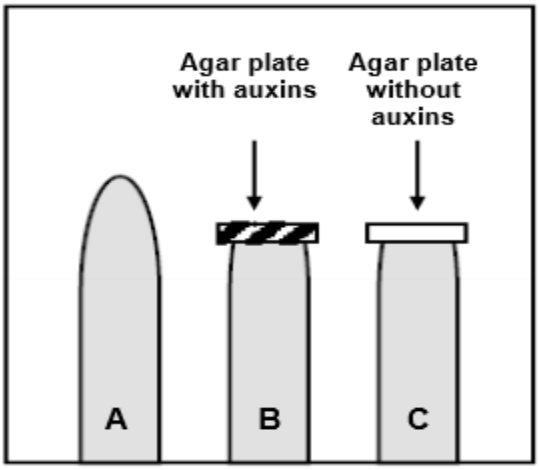
3.4 Thobeka investigated the effect of auxins on the growth of three plant shoots (**A**, **B** and **C**). The plant shoots were treated as follows:

- Shoot **A** – Not treated in any way
- Shoot **B** – Tip removed and agar plate with auxins placed on top
- Shoot **C** – Tip removed and agar plate without auxins placed on top

All shoots were exposed to the same light conditions.

NOTE: Agar is a jelly-like substance that allows auxins to diffuse through it.

The diagram below illustrates the set-up at the beginning of the investigation.



3.4.1 Identify the independent variable in this investigation. (1)

3.4.2 State TWO factors that must be kept constant in this investigation. (2)

3.4.3 Explain the results observed in:

(a) Shoot **B** after a few days (3)

(b) Shoot **C** after a few days (2)

3.4.4 Suggest TWO ways in which Thobeka could have improved the reliability of her investigation. (2)
(10)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

The unicellular zygote undergoes many developmental changes until it becomes a multicellular foetus, nourished and protected by the mother.

Describe the changes that allow the zygote to eventually develop into a foetus and how this foetus is nourished and protected during the period of pregnancy.

Content: **(17)**
Synthesis: **(3)**

NOTE: NO marks will be awarded for answers in the form of flow charts, diagrams or tables.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2015

MEMORANDUM

MARKS: 150

This memorandum consists of 11 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	C✓✓		
	1.1.3	C✓✓		
	1.1.4	B✓✓		
	1.1.5	B✓✓		
	1.1.6	C✓✓		
	1.1.7	C✓✓		
	1.1.8	D✓✓		
	1.1.9	B✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Eustachian tube✓		
	1.2.2	Carbon footprint✓		
	1.2.3	Thermal✓pollution		
	1.2.4	Aqueous humour✓		
	1.2.5	Oestrogen✓		
	1.2.6	Luteinising hormone✓/LH		
	1.2.7	Cristae✓		
	1.2.8	TSH✓/Thyroid-stimulating hormone		
	1.2.9	Internal✓ fertilisation		
	1.2.10	Accommodation✓	(10 x 1)	**(10)**
1.3	1.3.1	B only✓✓		
	1.3.2	B only✓✓		
	1.3.3	A only✓✓		
	1.3.4	B only✓✓		
	1.3.5	None ✓✓		
	1.3.6	A only✓✓	(6 x 2)	**(12)**
1.4	1.4.1	Spermatogenesis✓		(1)
	1.4.2	Testis✓		(1)
	1.4.3	(a) 23✓		(1)
		(b) 23✓		(1)
	1.4.4	- Crossing over✓ - Random assortment of chromosomes✓ **(Mark first TWO only)**	(any order)	(2)
	1.4.5	2✓		(1)
	1.4.6	Sperm cells✓/spermatozoa/male gametes		(1) **(8)**

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

2.1 2.1.1 (a) Epididymis✓ (1)
(b) Testis✓ (1)
(c) Vas deferens✓/sperm duct (1)

2.1.2 Stores sperm cells✓ (1)
(Mark first ONE only)

2.1.3 Sperm cells will not pass to urethra✓
to fertilise the egg✓
and hence he will not be able to have children✓ (3)

2.1.4 The HI virus may still be passed on✓during sexual intercourse
through the secretions of the accessory glands✓ (2)
(9)

2.2
- Sound waves are directed by the pinna✓
- through the auditory canal✓
- to the tympanic membrane✓/ eardrum
- causing it to vibrate✓
- The vibrations of the tympanic membrane are transferred to the ossicles✓ in the middle ear
- which eventually causes the oval window to vibrate✓
- This sets up pressure waves in the perilymph✓
- Pressure waves are then transferred to the endolymph✓ in the cochlea
- This stimulates the Organ of Corti✓
- in the cochlea✓
- to convert this stimulus into a nerve impulse✓
- ***which is then transported along the auditory nerve**✓
- ***to the cerebrum**✓
- ***where the sound is interpreted**✓

Any 4+3* (compulsory marks) **(7)**

2.3 2.3.1 A reflex action is a rapid✓, automatic response✓ to a stimulus. (2)

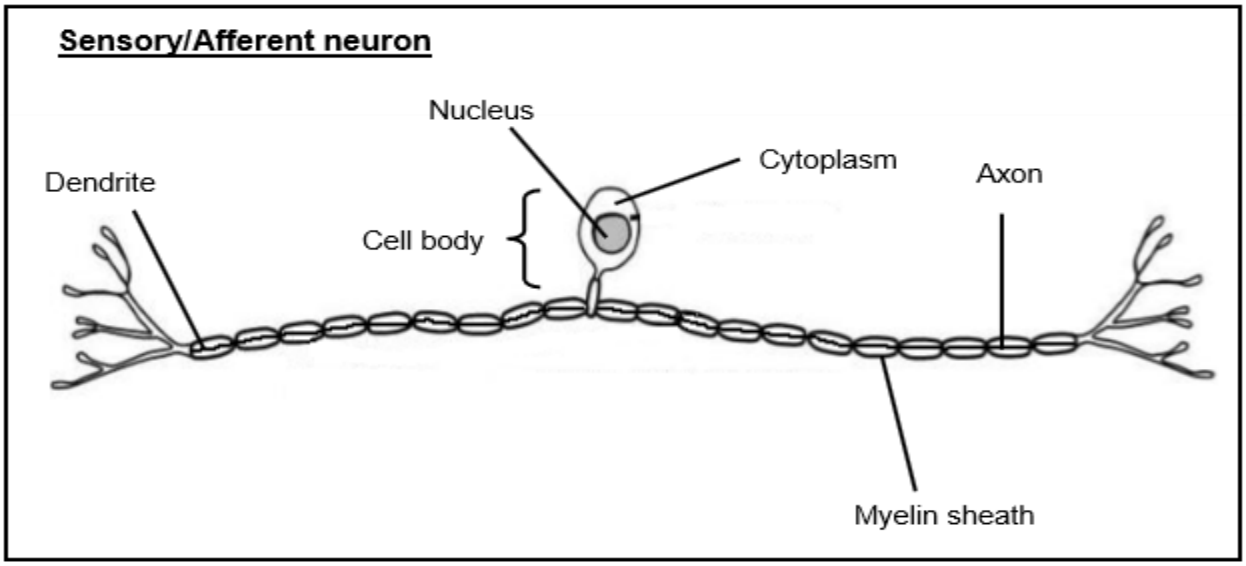
2.3.2 (a) Synapse✓ (1)
(b) Inter-neuron✓/connector neuron (1)

2.3.3 It ensures that the impulse moves in one direction only✓
It prevents continuous stimulation of the neurons✓
It ensures that the impulse is transmitted from the sensory neuron to the motor neuron✓ Any (1)

2.3.4 A ✓→ B ✓→ C (2)

2.3.5 - The person will be able to receive a stimulus✓
- but will not be able to respond to it✓ (2)

2.3.6



CRITERION	MARKS ALLOCATION
Caption	1 mark
Any 4 labels	4 marks

(5)
(14)

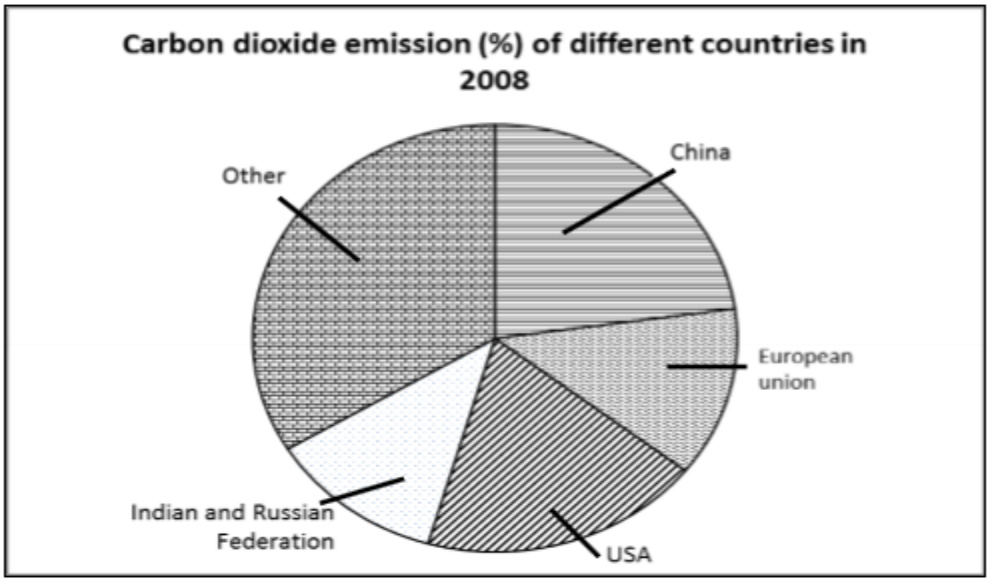
2.4	2.4.1	0.25✓ g/cm^3	(1)
	2.4.2	15✓ minutes	(1)
	2.4.3	- Blood glucose level of a person with diabetes mellitus is higher✓than that of a normal person at all times✓ - There is a greater increase in the blood glucose level of a person with diabetes mellitus after ingestion of glucose✓ compared to the normal person✓ - It takes longer for the blood glucose level to stabilise for the person with diabetes mellitus✓ compared to a normal person✓ Any (2x2) **(Mark first TWO only)**	(4)
	2.4.4	- Because the person with diabetes mellitus does not produce insulin✓/is insulin resistant - therefore blood glucose is not converted to glycogen✓	(2)
	2.4.5	- Glucagon✓ - Adrenalin✓ **(Mark first TWO only)**	(2) **(10)** **[40]**

QUESTION 3

3.1	3.1.1	The process by which the human body is able to maintain a constant✓internal environment✓		(2)
	3.1.2	(a) Kidney✓ (b) Adrenal✓ gland (c) Aldosterone✓		(1) (1) (1)
	3.1.3	- Walls of renal tubules✓ - become more permeable✓ - allowing for a greater re-absorption of sodium ions✓ - from the filtrate✓/into the blood capillaries	Any	(2) **(7)**
3.2	3.2.1	Low number of species✓/low biodiversity		(1)
	3.2.2	- Addition of phosphates caused eutrophication✓ - which led to an increase in algal growth✓ / algal bloom - which depleted the oxygen in the water✓ - thus reducing its ability to support ✓a variety of life-forms	Any	(3)
	3.2.3	- The length of food chains will be reduced✓/complexity of food webs will be reduced - resulting in organisms feeding on the remaining species having - excess food✓ - leading to their overpopulation✓ - while organisms depending on the species that were lost will - have less✓/no food available - leading to their death✓/migration	Any	(4)
	3.2.4	- The use of living organisms✓ - to control the numbers✓ of other organisms		(2) **(10)**

3.3 3.3.1

China:	$23/100 \times 360^0 = 82.8^0$
European Union:	$13/100 \times 360^0 = 46.8^0$
USA:	$19/100 \times 360^0 = 68.4^0$
India and Russian Federation:	$12/100 \times 360^0 = 43.2^0$
Other:	$33/100 \times 360^0 = 118.8^0$



Correct type of graph	1 mark
Caption	1 mark
Correct calculations	1: 1–4 calculations correct 2: All 5 calculations correct
Correct proportion and labelling sectors	1: 1–3 sectors correct 2: 4–5 sectors correct

NOTE: If the wrong type of graph is drawn: marks will be awarded for 'caption only' (6)

3.3.2
- Leads to the enhanced 'greenhouse effect' ✓
- and thus global warming✓
- Global warming influences the weather patterns✓
- which can destroy habitats✓
- leading to a decrease in biodiversity✓

Any (3)

3.3.3
- It will be expensive✓ to change to machinery that produce less CO_2✓
- Too expensive✓ to purchase or develop systems that remove excess CO_2 from outlet gases✓
- This will reduce profit✓ that will lead to job losses✓/ have negative effect on the country's economy

(Mark first TWO only) Any (2x2) (4)
(13)

3.4 3.4.1 Treatment✓ of plant shoot (1)

3.4.2
- Same type of plant✓
- Placed in the same environment✓
- Same amount of time✓
- Tip removed at the same length✓
- Same concentration of auxins✓
- Same type of agar✓

(Mark first TWO only) Any (2)

3.4.3 (a)
- Shoot B would show upward growth✓
- Auxins in the agar gel diffused downwards✓ into the shoot
- leading to cell elongation✓ (3)

(b)
- No growth in shoot C✓
- Shoot tip contains NO auxins✓ (2)

3.4.4
- Repeat the investigation✓
- Use more than 1 plant per investigation✓/increase sample size

(Mark first TWO only) Any (2)
(10)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

- The zygote divides by mitosis✓
- to form a ball of cells✓
- called the morula✓
- More mitotic divisions of the morula occurs to form a hollow ball of cells✓
- called a blastocyst✓

- The blastocyst attaches to the endometrial lining✓
- The outer wall of the blastocyst, called the chorion✓,
- develops projections called villi✓ which
- embeds/implants✓ into the uterine wall

- The cells of the embryo continues to divide✓
- and differentiate✓
- to form the different organs and limbs✓
- and is now called a foetus✓
- The foetus is enclosed in a sac called the amnion✓
- filled with amniotic fluid✓
- which protects the foetus against temperature fluctuations✓
- protects the foetus against dehydration✓
- and protects the foetus against mechanical injury✓/acts as a shock absorber

- The chorionic villi and the endometrium form the placenta✓
- where the blood of both the foetus and the mother✓
- run close to each other✓
- allowing for nutrients to diffuse✓ into the blood of the foetus
- The umbilical vein✓
- carries the absorbed nutrients from the mother to the foetus✓

Any (17)

Content: **(17)**
Synthesis: **(3)**

ASSESSING THE PRESENTATION OF THE ESSAY

RELEVANCE	LOGICAL SEQUENCE	COMPREHENSIVE
All information provided is relevant to the topic	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay
Only information relating to the development of the zygote to the foetus and its nutrition and protection is included (there is no irrelevant information)	Events that lead to the change from a zygote to a foetus are stated in the order in which they occur	ALL three aspects are included: 1. Development of zygote to foetus 2. Nutrition of the foetus 3. Protection of the foetus
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2016

MARKS: 150

TIME: 2½ hours

This question paper consists of 18 pages.

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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 to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 The microscopic space between two adjacent neurons is a/an …

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

1.1.2 The following is a list of functions performed by different organs in an organism:

(i) Protection
(ii) Gaseous exchange
(iii) Nutrition
(iv) Excretion

Which ONE of the following combinations refers to the functions performed by parts of an amniotic egg?

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

1.1.3 An investigation was done to determine the effect of alcohol on the reaction time of a person.

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 while he/she was in a room with dim light.
- Ten measurements were recorded each time and an average was calculated.

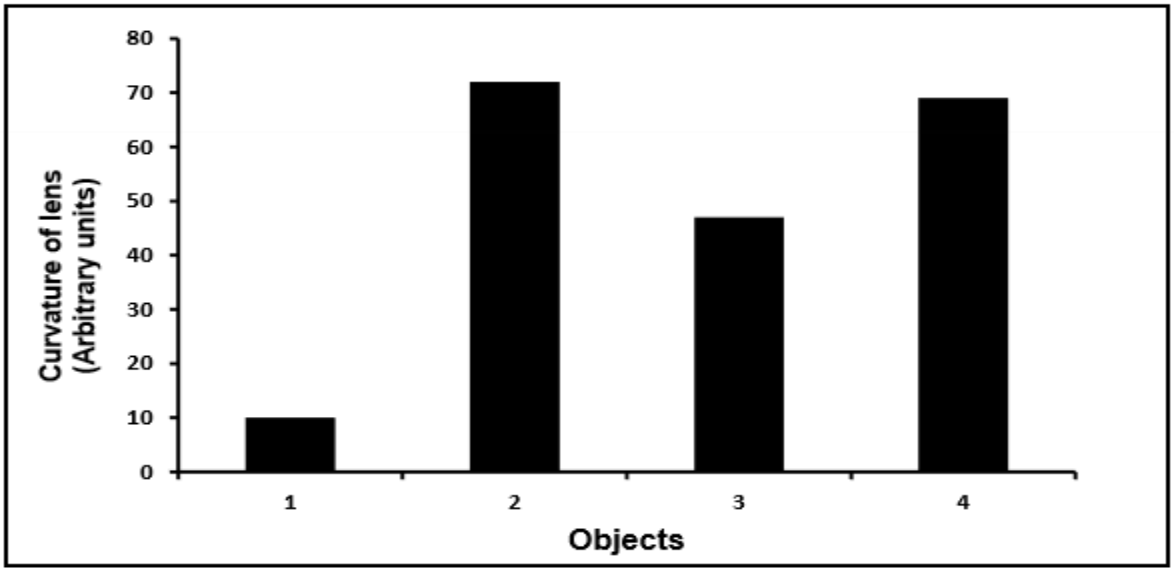
How was the validity of the investigation decreased?

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.

1.1.4 Which ONE of the following represents the CORRECT combination of a visual defect, its nature and the corrective measure?

	VISUAL DEFECT	NATURE OF DEFECT	CORRECTIVE MEASURE
A	Cataracts	Curvature of lens is uneven	Biconcave lenses
B	Short-sightedness	Lens cannot become less convex	Biconcave lenses
C	Astigmatism	Lens cannot become more convex	Surgery
D	Long-sightedness	Lens becomes cloudy and opaque	Biconvex lenses

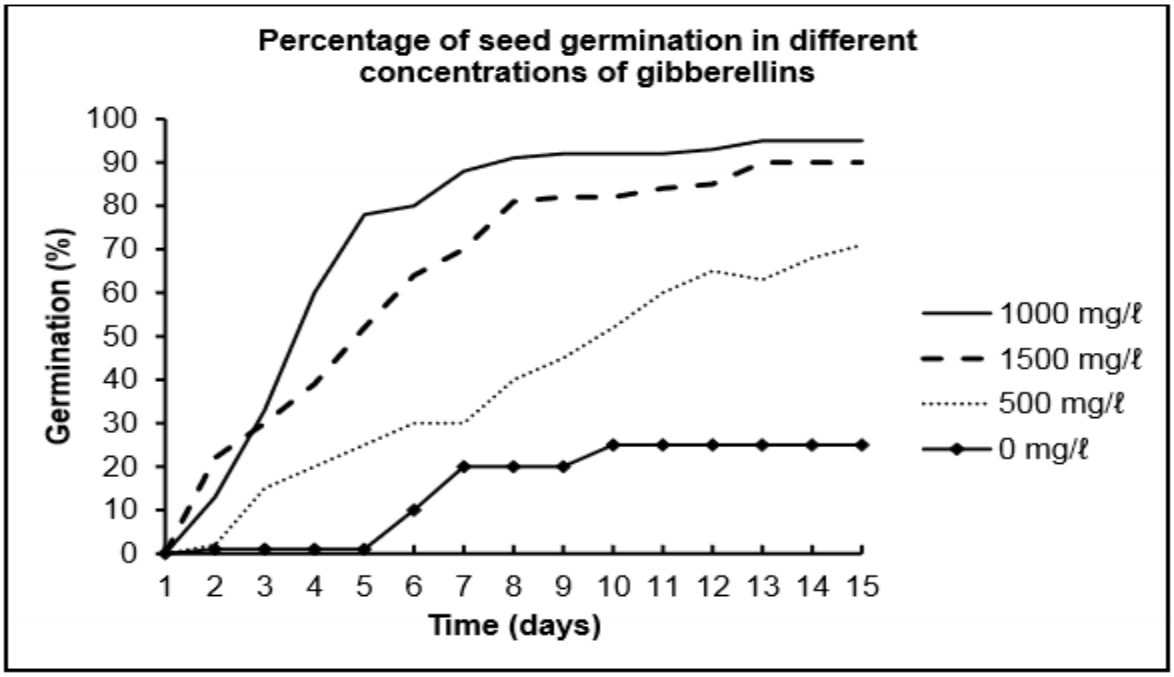
1.1.5 The graph below shows the curvature of the human lens when viewing objects at different distances.



Which ONE of the following objects is closest to the human eye?

A 1
B 2
C 3
D 4

1.1.6 The graph below shows the effect of different concentrations of gibberellins on the germination of seeds.



[Adapted from *HortScience* 44(3)]

One possible conclusion drawn from the results shown above, is that the …

A gibberellin concentration has no effect on the germination of the seeds.
B highest percentage of seed germination occurs at a gibberellin concentration of 1 500 mg/ℓ.
C highest percentage of seed germination occurs at a gibberellin concentration of 1 000 mg/ℓ.
D lowest percentage of seed germination occurs at a gibberellin concentration of 1000 mg/ℓ.

1.1.7 A gardener removes the apical buds from a rose bush in her garden regularly. As a result the rose bush will …

A produce more lateral branches.
B grow taller.
C remain the same size.
D produce fewer roses.

1.1.8 One of the dangers of landfills is the contamination of underground water sources. This is prevented by …

A covering the rubbish with a layer of soil.
B compacting the waste so that water cannot penetrate it.
C spraying water on the soil to keep dust levels down.
D lining the landfill with an impermeable barrier.

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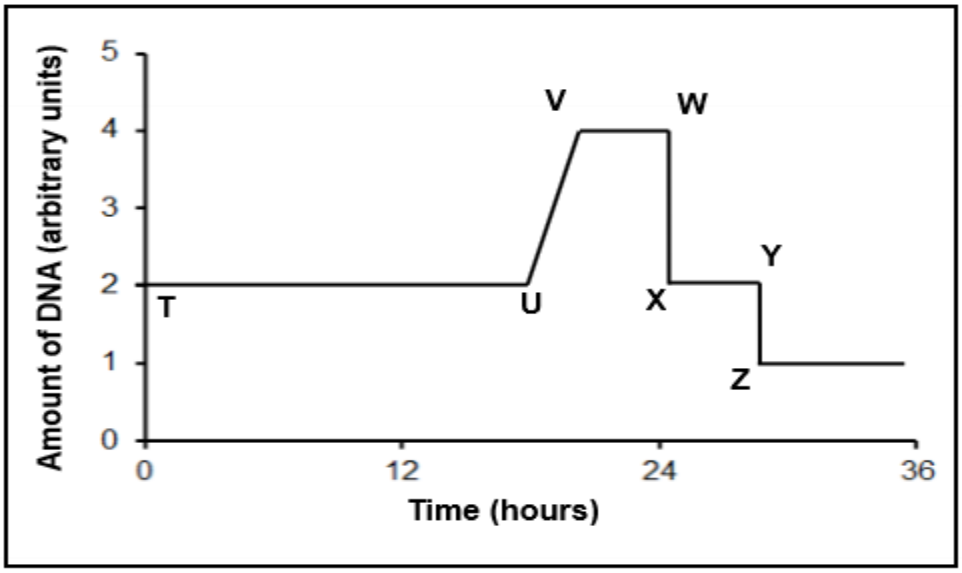
1.1.9 The following is a list of the factors affected by global warming:

(i) Veld fires
(ii) Biodiversity
(iii) Drought
(iv) Floods

Which ONE of the following combinations increases as a result of global warming?

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

1.1.10 The graph below shows changes in the amount of DNA present in a cell over a period of 36 hours.



[Adapted from www.slideshare.net]

Which ONE of the following parts of the graph represents interphase?

A T to V
B W to X
C V to Y
D X to Z

(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 1.2.8) in the ANSWER BOOK.

1.2.1 A type of reproduction in humans where the foetus develops inside the uterus

1.2.2 Structures found only in animal cells that form the spindle during cell division

1.2.3 The movement of part of a plant in response to gravity

1.2.4 The amount of carbon dioxide produced by an individual per unit time as a result of his/her activities

1.2.5 The stage in humans when sexual maturity is reached in males and females

1.2.6 A change in the internal or external environment that will be detected by a receptor and converted into an impulse

1.2.7 Small tubes placed in the tympanic membrane to drain liquid from the middle ear

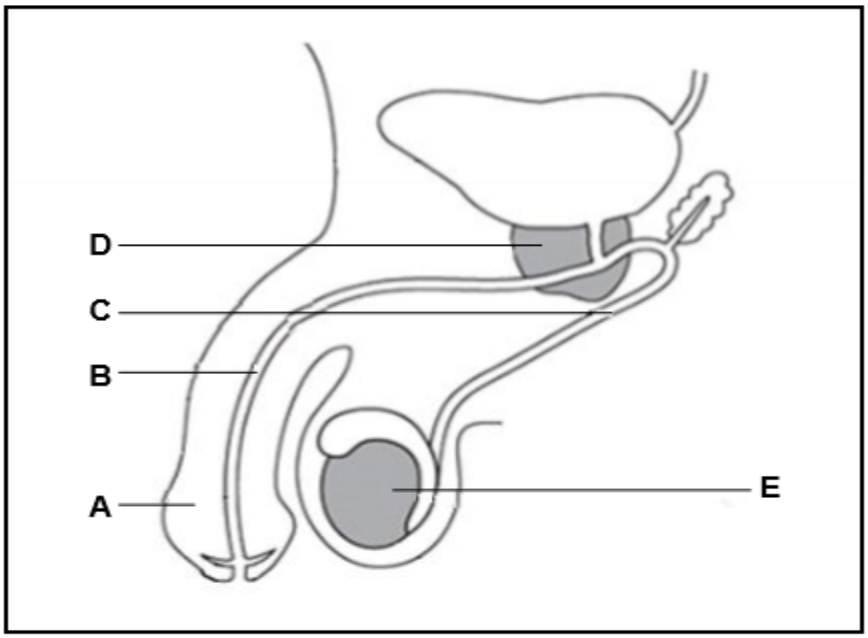
1.2.8 Part of the human ear that directs sound waves into the auditory canal (8 x 1) **(8)**

1.3 Indicate whether each of the statements 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 1.3.4) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	A type of development in birds in which offspring are poorly developed at birth and are thus unable to feed themselves	A: Precocial development B: Altricial development
1.3.2	Forms the placenta	A: Chorionic villi B: Endometrium
1.3.3	The state of the blood vessels in the skin of a human when the environmental temperature is high	A: Constricted B: Dilated
1.3.4	Having access to enough food of good quality at all times	A: Monoculture B: Eutrophication

(4 x 2) **(8)**

1.4 The diagram below represents a part of the male reproductive system.



1.4.1 Give the LETTER and the NAME of the part that:

(a) Is used in copulation (2)

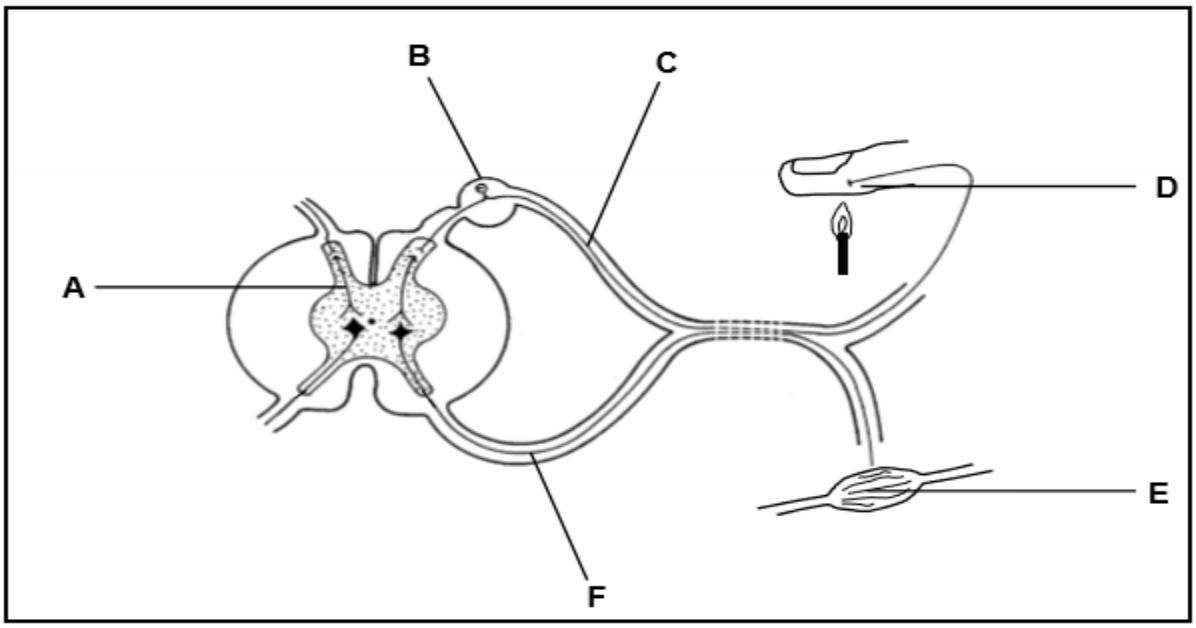
(b) Produces testosterone (2)

1.4.2 Give ONLY the LETTERS of the TWO parts in the diagram that:

(a) Contribute to the formation of semen (2)

(b) Provide a passage for the sperm cells (2)
(8)

1.5 The diagram below shows a reflex arc.



1.5.1 Give ONLY the LETTER of the part that represents the:

(a) Effector (1)

(b) Interneuron/Connector neuron (1)

(c) Sensory neuron (1)

1.5.2 Give the LETTER and NAME of the neuron in the diagram that is probably damaged if a person is able to detect the stimulus, but cannot respond. (2)

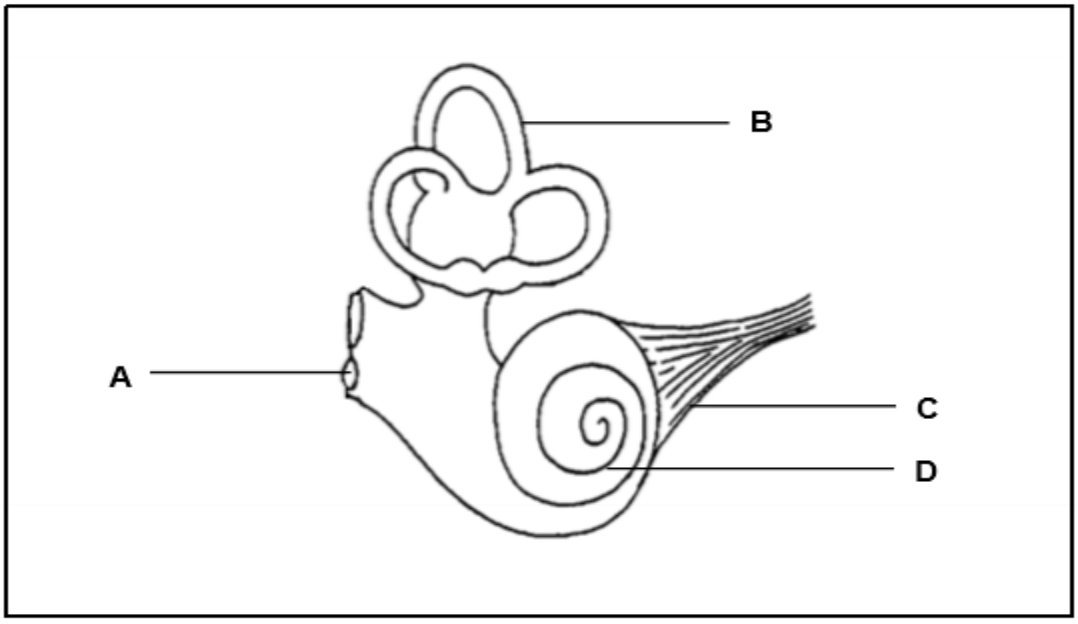
1.5.3 State if the nerve impulse travels from **D** to **E** or from **E** to **D**. (1)
(6)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a part of a human ear.



2.1.1 Identify part:

(a) **A** (1)

(b) **D** (1)

2.1.2 Name the receptors that are found in part **B.** (1)

2.1.3 Explain the consequence to the human body if:

(a) Part **C** is damaged (2)

(b) Part **A** becomes hardened (2)
(7)

2.2 Explain why people with middle-ear infections are usually advised not to travel by aeroplane. **(4)**

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2.3 An investigation was conducted to determine the relationship between the ages of women, the number of pregnancies per month and the chances of miscarriages.

The results of the investigation are shown in the table below.

AGES OF WOMEN	PREGNANCIES PER MONTH (%)	MISCARRIAGES (%)
22	25	10
28	24	11
34	18	15
40	6	24
46	2	50

[Adapted from http://www.children.gov.on.ca]

2.3.1 Draw a line graph to show the relationship between the ages of the women and the percentage of pregnancies per month. (6)

2.3.2 Describe the relationship that exists between the ages of women and the chances of them miscarrying. (2)

2.3.3 According to the data obtained, if there are 12 pregnant women who are 46 years old, how many of them are likely to miscarry? Show ALL working. (2)
(10)

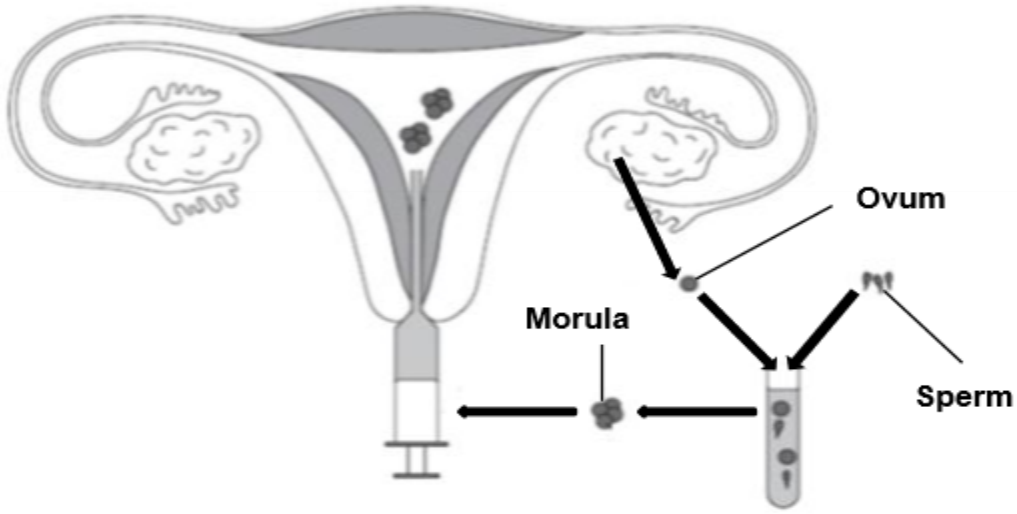
2.4 Read the extract below.

Anele found out that she had scar tissue blocking both her Fallopian tubes and therefore could not have a baby. She decided to try in vitro fertilisation (IVF).

The IVF procedure was performed as follows:

- Anele was given hormone supplements to stimulate the production of ova in the ovaries.
- The mature ova were then collected and placed in a test tube.
- Her partner was then asked to release his semen into a special container.
- The ova and the semen were then mixed in a test tube.
- The morulas that developed after a few days were then inserted into Anele's uterus.

The diagram below is a representation of how the procedure was done.



2.4.1 Explain why Anele's condition had prevented her from falling pregnant. (2)

2.4.2 Name ONE hormone that was:

(a) Given to Anele to ensure that ova were produced in the ovaries (1)

(b) Produced by the developing follicles in the ovaries, as the ova were maturing (1)

2.4.3 Describe the events that take place in the test tube after fertilisation, until a blastocyst is formed. (4)

2.4.4 Explain ONE possible consequence for the developing embryo if the corpus luteum disintegrates immediately after implantation. (3)
(11)

2.5 The diagrams below show two phases of meiosis in an animal cell.

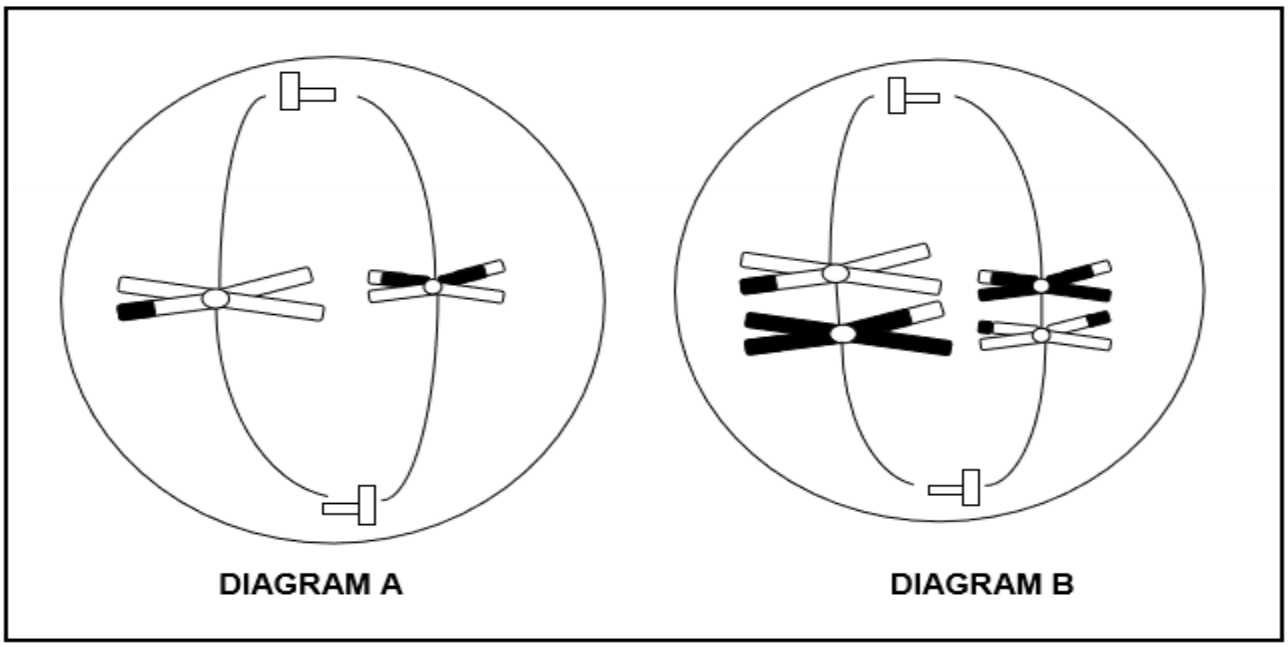


DIAGRAM A **DIAGRAM B**

2.5.1 Identify the phase represented by **DIAGRAM B.** (1)

2.5.2 Explain why the homologous chromosomes in **DIAGRAM B** have a mixture of genetic material from each chromosome. (2)

2.5.3 Name the phase that will follow the one represented by **DIAGRAM A**. (1)

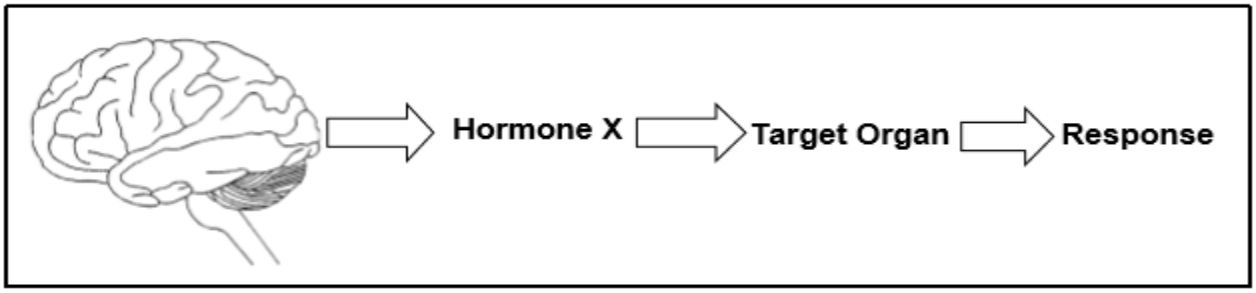
2.5.4 Describe the events that take place in the phase mentioned in QUESTION 2.5.3. (3)

2.5.5 Name ONE place in a human male where meiosis takes place. (1)
(8)
[40]

QUESTION 3

3.1 The diagram below represents one part of the negative feedback response that occurs when a person is dehydrated.

The decrease in blood volume, as a result of the excessive loss of water, is detected by the brain.



3.1.1 Identify the:

(a) Hormone **X** (1)

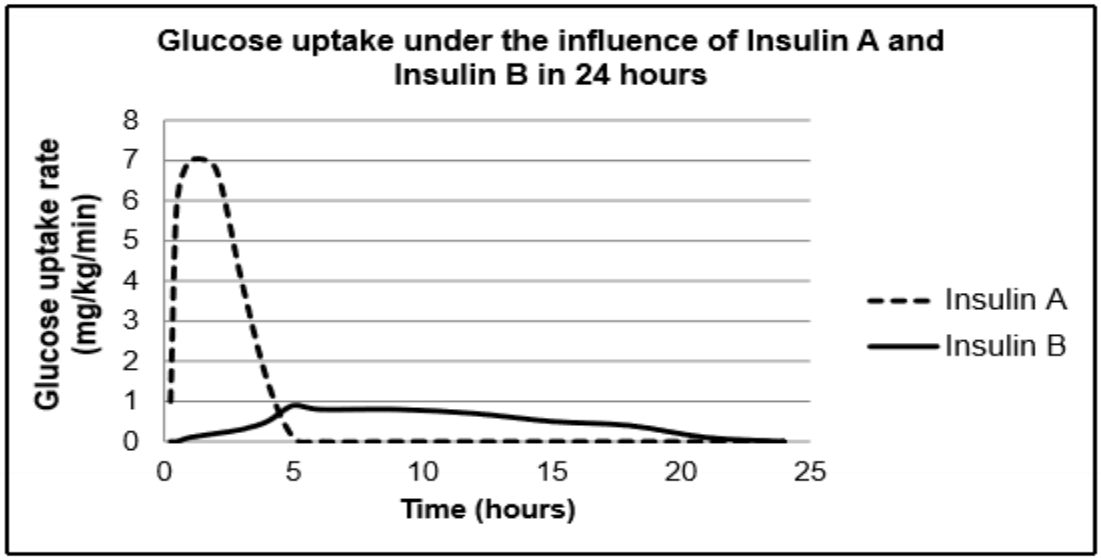
(b) Endocrine gland that secretes hormone **X** (1)

(c) Target organ (1)

3.1.2 Describe the negative feedback response that occurs when a person is dehydrated, after it has been detected by the brain. (4)
(7)

3.2 Some people with type I diabetes cannot produce insulin and therefore need to inject themselves regularly (insulin-dependent).

An investigation was done to determine the action of two types of insulin (**A** and **B**). The glucose uptake rate of cells, when using each type of insulin, was measured over time.



[Adapted from www.webmed.com]

3.2.1 Name the human organ that produces insulin. (1)

3.2.2 Using the information in the graph, state TWO differences in the functioning of insulin **A** and **B**. (4)
(5)

3.3 An investigation was done to determine the effect of different amounts of thyroxin on body weight in rats.

The procedure was as follows:

- 45 healthy female rats of the same species were used.
- They were divided into three groups of 15 each (Groups A, B and C).
- Their average body weight was determined and recorded.
- Group A was injected daily with methimozole which inhibits the production of thyroxin in rats.
- Group B was injected daily with DL-thyroxin which stimulates the production of more thyroxin than under normal conditions in rats.
- Group C was given no treatment.
- All three groups were exposed to the conditions above for 2 months.
- The average body weights of all the groups were determined weekly.

3.3.1 In the investigation identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.3.2 State THREE factors that were kept constant during the investigation. (3)

3.3.3 Which group of rats (**A**, **B** or **C**) would be expected to gain the most weight? (1)

3.3.4 Explain your answer to QUESTION 3.3.3. (3)

3.3.5 In which group of rats (**A**, **B** or **C**) would the levels of TSH in the blood be low? (1)

3.3.6 Explain your answer to QUESTION 3.3.5. (2)
(12)

3.4 Read the extract below.

WATER CRISIS IN SOUTH AFRICA

The impact of the water scarcity will be one of South Africa's biggest problems soon. Recently a province had to switch off the water supply because the dams were 'so close on the edge'. It is stated that people are using more water than what's available; the demand is more than the supply.

About 37% of the clean, drinkable water is being lost through poor infrastructure (leaking pipes, dripping taps) and wastage. About 60% is used for irrigation.

Industries and mines also contribute to the water crisis by polluting our water bodies. They generate harmful waste which is sometimes dumped into water bodies, creating acid mine drainage. The impact of climate change also adds to the water crisis.

There is a suggestion that South Africa needs to work with neighbouring countries to come up with solutions. An example is to grow the agricultural products in neighbouring countries with a higher rainfall, and then South Africa imports these products.

[Adapted from mg.co.za/article and www.news24.com]

3.4.1 Refer to the extract and state TWO causes of the water crisis facing South Africa. (2)

3.4.2 State how importing agricultural products from neighbouring countries would reduce South Africa's water crisis. (1)

3.4.3 Explain how switching off the water supply would affect the industries that depend on water. (2)

3.4.4 The South African government could possibly solve the water crisis by increasing the cost of water.

Suggest TWO ways in which this solution could help to reduce the water crisis. (2)
(7)

3.5 Invasive alien plants can cause environmental problems in an area.

3.5.1 Explain the impact of invasive alien plants on:

(a) Food security (3)

(b) Water availability (2)

3.5.2 Explain ONE DISADVANTAGE of controlling invasive alien plants using the following methods:

(a) Biological method (2)

(b) Mechanical method (2)
(9)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Plants and animals are both able to sense and respond to light.

Explain how plant stems respond to unilateral light and describe the path taken by light through the human eye until it is converted into an impulse.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2016

MEMORANDUM

MARKS: 150

This memorandum consists of 10 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	D✓✓		
	1.1.3	C✓✓		
	1.1.4	B✓✓		
	1.1.5	B✓✓		
	1.1.6	C✓✓		
	1.1.7	A✓✓		
	1.1.8	D✓✓		
	1.1.9	B✓✓		
	1.1.10	A✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Vivipary✓/Viviparous		
	1.2.2	Centrioles✓/Centrosome		
	1.2.3	Geotropism✓/Gravitropism		
	1.2.4	Carbon footprint✓		
	1.2.5	Puberty✓		
	1.2.6	Stimulus✓		
	1.2.7	Grommets✓		
	1.2.8	Pinna✓	(8 x 1)	**(8)**
1.3	1.3.1	B only✓✓		
	1.3.2	Both A and B✓✓		
	1.3.3	B only✓✓		
	1.3.4	None✓✓	(4 x 2)	**(8)**
1.4	1.4.1	(a) A✓ - penis✓		(2)
		(b) E✓ - testes✓		(2)
	1.4.2	(a) D✓ and E✓ **(Mark first TWO only)**		(2)
		(b) B✓ and C✓ **(Mark first TWO only)**		(2) **(8)**
1.5	1.5.1	(a) E✓		(1)
		(b) A✓		(1)
		(c) C✓		(1)
	1.5.2	F✓ - motor neuron✓		(2)
	1.5.3	D to E✓		(1) **(6)**

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 (a) Round window✓ (1)

(b) Cochlea✓ (1)

2.1.2 Cristae✓ (1)

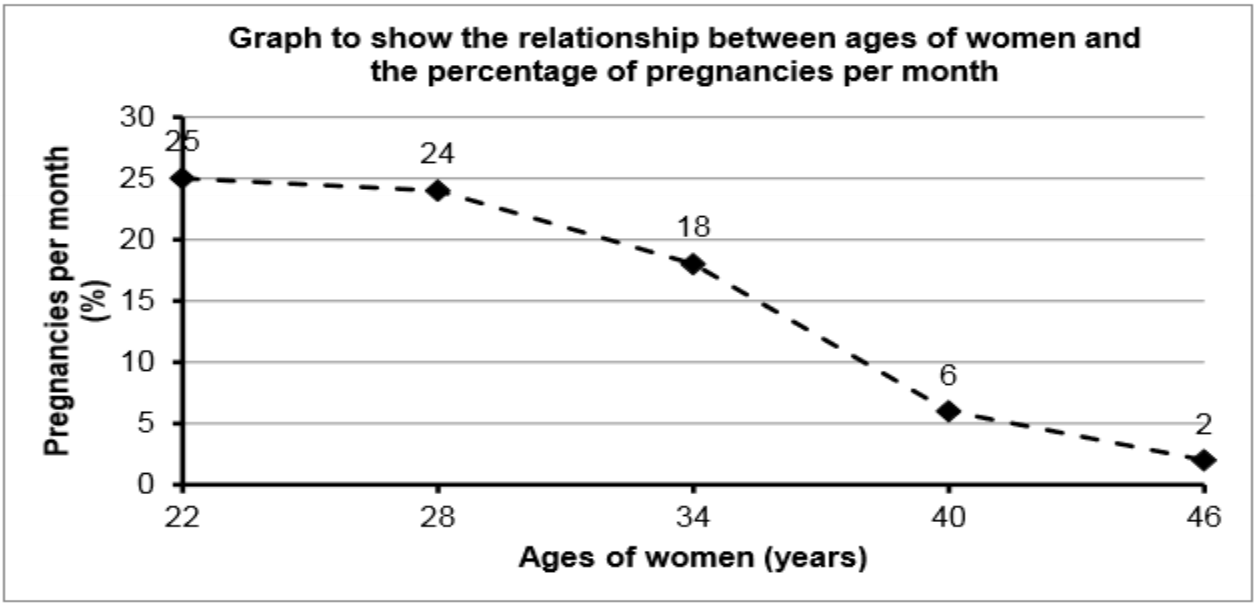
2.1.3 (a)
- Impulses from the cochlea cannot be transmitted to the brain✓
- and therefore hearing will not occur✓ (2)

2.1.4 (b)
- Part A will not be able to vibrate✓
- The round window will not absorb the sound waves✓ from the cochlea
- and hearing will be affected✓ (Any 2) (2)

(7)

2.2
- Mucus in the middle ear✓
- will lead to the blockage of the Eustachian tube✓
- which will not be able to equalise the pressure✓ in the middle ear
- resulting in pressure on the tympanic membrane✓
- that may cause the tympanic membrane to burst✓
- leading to hearing loss✓ (Any 4) **(4)**

2.3 2.3.1



Mark allocation of the graph

Criteria	Mark Allocation
Correct type of graph drawn for the pregnancies per month only	1
Title of graph including the two variables (Age of women and pregnancies per month)	1
Correct label and unit for X-axis and Y-axis	1
Correct scale for X-axis and Y-axis	1
Drawing of the graph	0: No points plotted correctly 1: 1 to 4 points plotted correctly 2: All 5 points plotted correctly

NOTE:
If axes are transposed: marks will be lost only for labelling of X-axis and Y-axis

(6)

2.3.2 The older the women, the higher the chances of having miscarriages✓✓

OR

The younger the women, the lower the chances of having miscarriages✓✓ (2)

2.3.3 50% x 12✓ = 6✓

OR

$\frac{50}{100}$ x 12✓ = 6✓

(2)
(10)

2.4.1	2.4.1	- As a result of the blocked Fallopian tube✓ - the sperm cannot reach the ovum✓ - therefore fertilisation cannot take place✓	(Any 2)	(2)
	2.4.2	(a) FSH✓/follicle stimulating hormone **(Mark first ONE only)**		(1)
		(b) Oestrogen✓ **(Mark first ONE only)**		(1)
	2.4.3	- A zygote✓ is formed - which divides by mitosis✓ - forming a ball of cells✓ - called the morula✓ - which further divides to form a hollow ball of cells✓	(Any 4)	(4)
	2.4.4	- Progesterone levels would fall✓ - The endometrium would no longer be maintained✓ - A miscarriage would occur✓		(3) **(11)**
2.5	2.5.1	Metaphase I✓		(1)
	2.5.2	- Crossing over has taken place✓ - and genetic material was exchanged ✓		(2)
	2.5.3	Anaphase II✓		(1)
	2.5.4	- The spindle fibres contract✓ - The centromeres split✓ - and pull the daughter chromosomes✓/chromatids - to the opposite poles of the cells✓ - Cytokinesis begins✓	(Any 3)	(3)
	2.5.5	Testes✓/seminiferous tubules **(Mark first ONE only)**		(1) **(8)** **[40]**

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QUESTION 3

3.1 3.1.1 (a) ADH✓/antidiuretic hormone (1)

(b) Hypothalamus✓/Pituitary gland (1)

(c) Kidneys✓ (1)

3.1.2
- An increase in ADH causes the walls of the kidney tubules✓
- to become more permeable✓ to water
- More water is reabsorbed✓
- and the blood volume increases✓
- Less urine is produced✓
- and the urine is more concentrated✓ (Any 4) (4)

(7)

3.2 3.2.1 Pancreas✓ (1)

3.2.2

Insulin A	Insulin B
Glucose uptake peaks at a higher level✓/around 7 mg/kg/min	Glucose uptake peaks at lower level✓/around 1 mg/kg/min
All glucose uptake occurs in a short period of time✓/the first 5 hours	Glucose uptake is gradual✓/ sustained over a period of 24 hours
The initial uptake of glucose rises rapidly to a maximum within the first few hours✓	The initial uptake of glucose rises slowly to the maximum over 5 hours✓

TABULATION IS NOT REQUIRED (Any 2 x 2) (4)
(Mark first TWO only) **(5)**

3.3 3.3.1 (a) Amount of thyroxin✓ (1)

(b) Body weight✓ (1)

3.3.2
- Same number of rats in each group✓
- All rats were of the same species✓
- All groups were investigated for the same period of time✓
- All rats were the same gender✓
- All groups were weighed after the same interval✓ (Any 3) (3)

(Mark first THREE only)

3.3.3 Group A✓ (1)

3.3.4
- Low thyroxin levels✓
- will lead to low metabolic rate✓
- Therefore the energy from the diet is used very slowly✓
- and more organic compounds are stored✓ (Any 3) (3)

3.3.5 Group B✓ (1)

3.3.6
- These rats have high levels of thyroxin in their blood✓
- therefore pituitary gland will not be stimulated✓to secrete TSH (2)

(12)

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3.4	3.4.1	- Poor infrastructure✓ - Climate change✓ - Wastage✓ - Pollution of water sources✓ **(Mark first TWO only)**	(Any 2)	(2)
	3.4.2	- The need of water for irrigation will be reduced✓		(1)
	3.4.3	- Decreased production✓ - will lead to loss of profit✓		(2)
	3.4.4	- More revenue for fixing poor infrastructure✓/building dams - Less water wastage✓by individuals and companies **(Mark first TWO only)**		(2) **(7)**
3.5	3.5.1	(a) - Invasive alien plants reduce food security✓ - since they grow rapidly and invade land✓ - that could be used to grow crops✓		(3)
		(b) - Invasive alien plants reduce water availability✓ - since they use more water✓		(2)
	3.5.2	(a) - The new organism may become a pest itself✓/it may feed on indigenous plants instead of the targeted alien plant - since no natural enemy for it was brought into the area✓		(2)
		(b) - Some parts that are left behind✓ - can regrow✓/will cost more money to remove them again		(2) **(9)** **[40]**
			TOTAL SECTION B:	**80**

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SECTION C

QUESTION 4

Plant stems response to unilateral light
- Plant stems response to light is positively phototropic✓
- Auxins✓
- produced in the tip of the stem✓
- move away from unilateral light✓
- so that there is a high concentration of auxins on the darker side✓
- which stimulates growth✓/cell division/cell elongation
- The low concentration of auxins on the side exposed to light✓
- inhibits growth✓
- This uneven growth✓
- causes the stem to bend towards the light✓ Max 7

How humans receive and interpret light stimuli
- Light enters the eye ✓
- through the cornea✓
- which refracts the light✓
- It then passes through the aqueous humour✓
- and the pupil✓
- The size of the pupil is adjusted by the iris✓
- to regulate the amount of light that enters the eye✓
- The light then passes through the lens✓
- which also refracts the light✓
- It then passes through the vitreous humour✓
- and reaches the retina✓
- which has the photoreceptors✓/rods and cones which convert the light stimulus into a nerve impulse

Max 10 (10)
Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to plant stems' response to unilateral light and how humans receive and interpret light stimuli. No irrelevant information.	All the information regarding how plant stems respond to unilateral light and how humans receive and interpret light stimuli are arranged in a logical manner.	At least the following points should be included: - Plant response to unilateral light (**4/7**) - How humans receive and interpret light stimuli (**7/10**)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2017

MARKS: 150

TIME: 2½ hours

This question paper consists of 18 pages.

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SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Write down the question number (1.1.1–1.1.10), choose the answer and make a cross (X) over the letter (A–D) of your choice in the ANSWER BOOK.

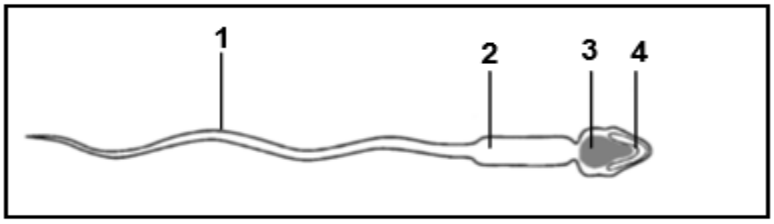
EXAMPLE:

1.1.11	A	B	C	~~D~~

1.1.1 After sperm cells have been produced in humans, they are stored in the … until maturation.

A penis
B urethra
C epididymis
D seminal vesicles

1.1.2 Which ONE of the following parts in the diagram of a sperm cell contains a haploid number of chromosomes?



A 1
B 2
C 3
D 4

1.1.3 Which ONE of the following plant hormones is responsible for the germination of seeds?

A Growth hormone
B Abscisic acid
C Gibberellin
D Auxin

1.1.4 The phase in meiosis in which individual centromeres split is called …

A anaphase I.
B anaphase II.
C metaphase I.
D metaphase II.

1.1.5 When Jane plays in the snow, her body maintains a constant core temperature by ...

A vasodilation and sweating.
B vasoconstriction and shivering.
C sweating and shivering.
D vasoconstriction and vasodilation.

1.1.6 Which ONE of the following hormones prepares the human body to react to emergency situations?

A Insulin
B Aldosterone
C Adrenalin
D Growth hormone

QUESTIONS 1.1.7 AND 1.1.8 REFER TO THE INVESTIGATION BELOW.

An investigation was carried out to determine the fertility levels of healthy males in different age groups.

The procedure followed was as follows:

- 50 healthy males in each of the following age groups were asked to participate: 20–29, 30–39, 40–49, 50–59 and 60–69.
- Semen was collected from each of the males.

The number of active sperm cells present in the semen was counted for each man in each age group and averages were calculated.

1.1.7 Which ONE of the following is the dependent variable in the investigation?

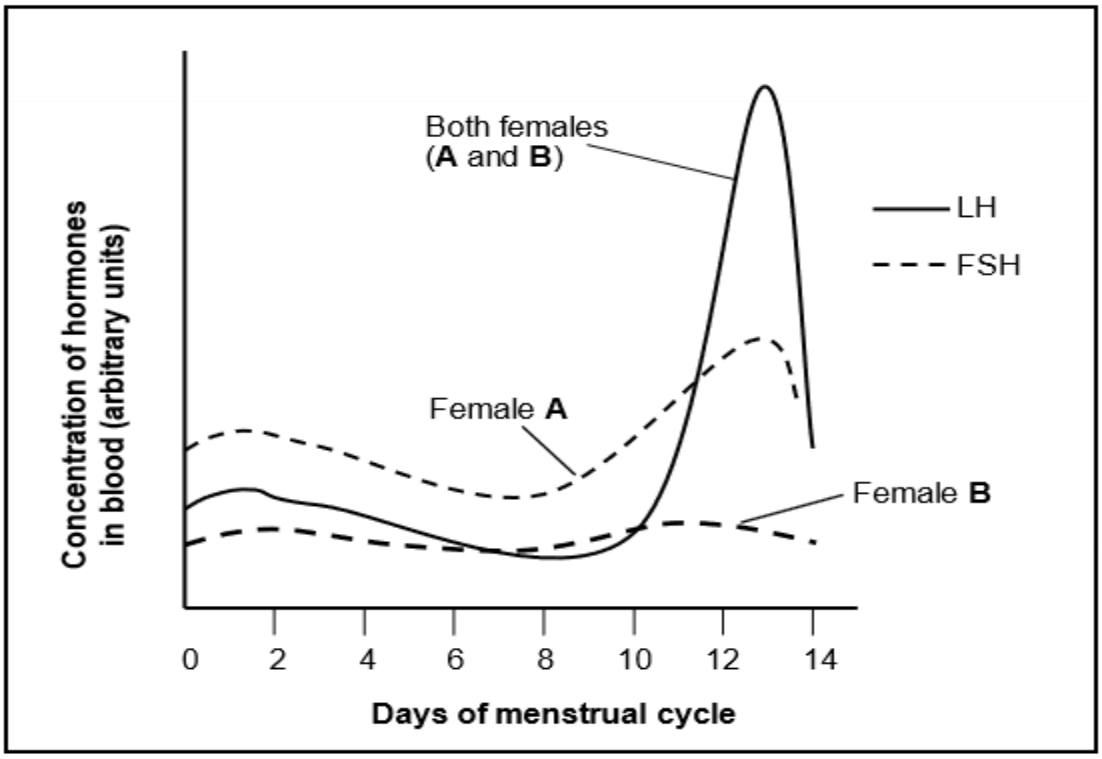
A Fitness levels of the males
B Age groups of the males
C Number of active sperm cells
D Amount of semen

1.1.8 Which ONE of the following variables was kept constant during this investigation?

A Number of participants in each age group
B Fertility levels of males in each age group
C Number of active sperm cells
D Age groups of the males

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QUESTIONS 1.1.9 AND 1.1.10 REFER TO THE GRAPH BELOW. THE GRAPH SHOWS THE CHANGES IN THE CONCENTRATION OF FEMALE HORMONES (LH AND FSH) IN TWO FEMALES DURING THE FIRST TWO WEEKS OF THE MENSTRUAL CYCLE.



1.1.9 Which female will NOT ovulate on day 14?

A Female **A**, because the FSH levels are high
B Female **A**, because the LH levels are too high on day 13
C Female **B**, because LH inhibits the development of a follicle
D Female **B**, because a follicle did not develop in the ovary

1.1.10 Which ONE of the following statements is CORRECT regarding female **A**?

A FSH increases on day 14 because the Graafian follicle is secreting progesterone.
B FSH increases after day 9 as the pituitary gland/hypophysis is secreting progesterone.
C FSH decreases after day 4 to ensure that implantation occurs.
D FSH increases in the first two days to stimulate the development of a follicle. (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 1.2.8) in the ANSWER BOOK.

1.2.1 The diploid cell formed by the process of fertilisation

1.2.2 A fluid that protects the human embryo against injuries and large-scale temperature changes

1.2.3 A disorder of the nervous system that is characterised by the breakdown of the myelin sheath of neurons

1.2.4 A hormone produced by the pituitary gland/hypophysis that stimulates milk production in human females

1.2.5 Having access to enough food on a daily basis to ensure healthy living

1.2.6 A blood vessel in the umbilical cord that transports nutrients to the foetus

1.2.7 A part of the neuron that conducts impulses towards the cell body

1.2.8 A disease that results from the body's inability to produce insulin

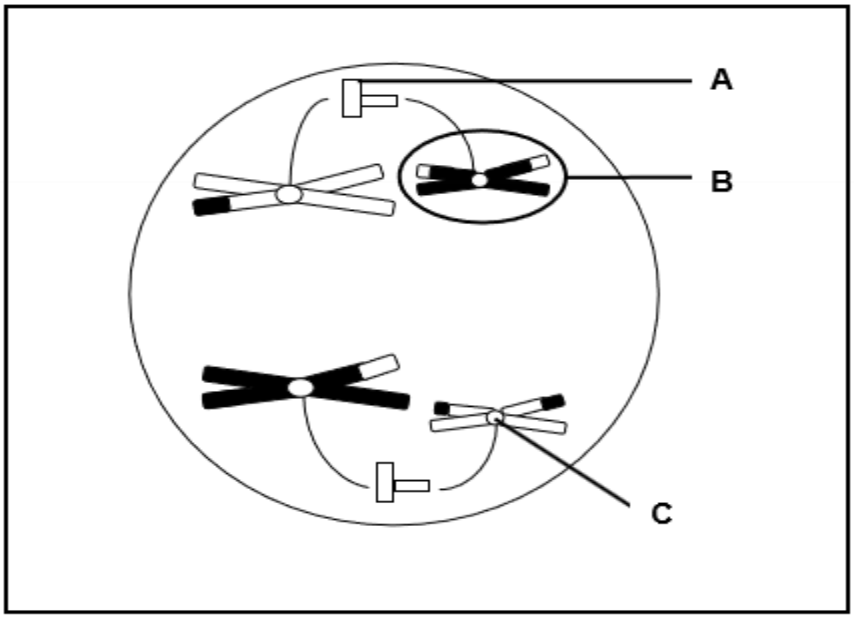
(8 x 1) **(8)**

1.3 Indicate whether each of the statements 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	The hormone that is in excess in a person that grows abnormally tall	A: ADH B: Thyroxin
1.3.2	The part of the autonomic nervous system that controls involuntary actions	A: Sympathetic B: Parasympathetic
1.3.3	A hormone that controls the salt content in a human body	A: Adrenalin B: Aldosterone

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

1.4 The diagram below shows a phase of meiosis in an animal cell.



1.4.1 Identify:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

1.4.2 Which phase of meiosis is illustrated in the diagram above? (1)

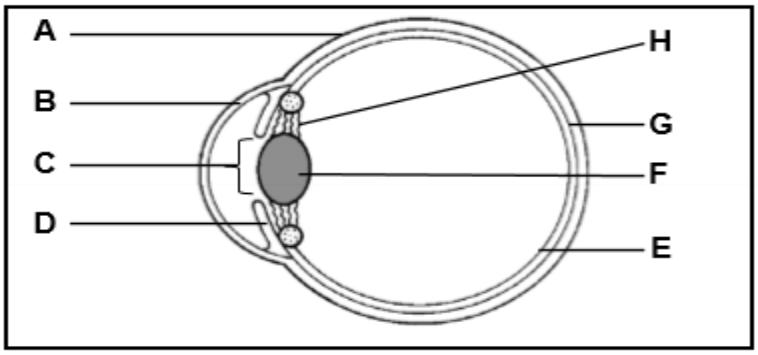
1.4.3 Name the phase that follows the one represented in the diagram above. (1)

1.4.4 How many chromosomes were there in the cell above before the process of meiosis began? (1)

1.4.5 What is the specific name given to meiosis when it takes place in a human female? (1)
(7)

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1.5 The diagram below represents a section through a human eye.



1.5.1 Identify:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

1.5.2 Give the LETTER and NAME of the part that:

(a) Regulates the amount of light entering the eye (2)

(b) Contains a dark pigment that absorbs excess light in the eye (2)

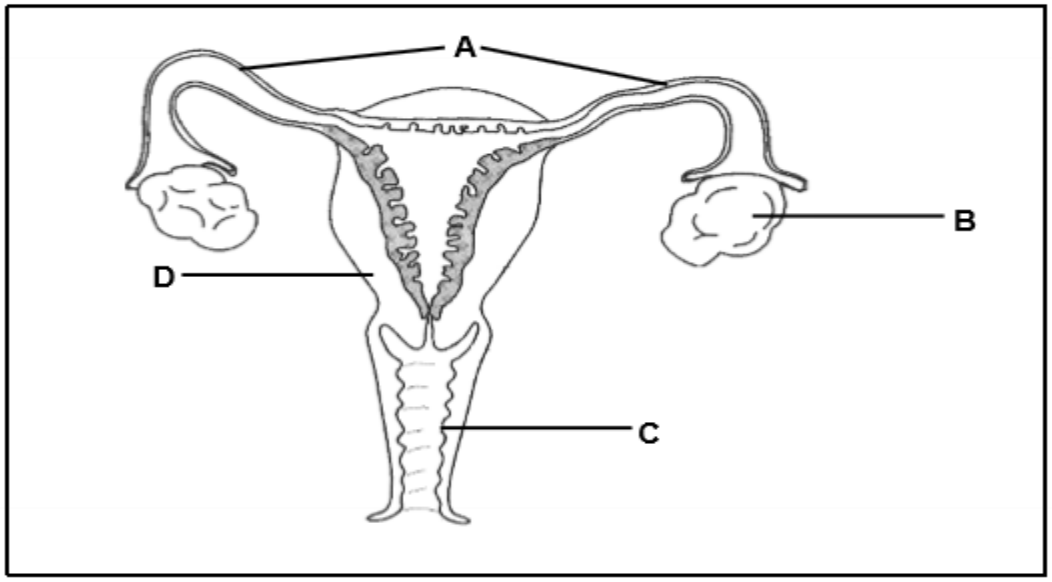
(c) Contains receptors sensitive to light (2)
(9)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents the human female reproductive system.



2.1.1 Identify part **C**. (1)

2.1.2 State ONE function of part **D**. (1)

2.1.3 Name the hormone secreted by part **B** during the first week of the menstrual cycle. (1)

2.1.4 State how the hormone named in QUESTION 2.1.3 influences part **D**. (1)

2.1.5 During tubal ligation, part **A** is surgically cut or tied.

Explain how this procedure prevents pregnancy. (3)
(7)

2.2 An investigation was carried out to determine the effects of smoking during pregnancy on the baby's birth weight. Babies born weighing 2 499 g or less have a low birth weight.

The table below compares the percentage of babies with a low birth weight born to mothers who smoked with mothers who did not smoke in a certain city in 2009.

BIRTH WEIGHT (GRAMS)	PERCENTAGE OF TOTAL BIRTHS (%) IN 2009	
	MOTHERS WHO SMOKED	MOTHERS WHO DID NOT SMOKE
<1 000	0,7	0,2
1 000–1 499	0,9	0,3
1 500–1 999	2,2	1,1
2 000–2 499	7,1	3,2

[Adapted from www.ainw.gov.au]

2.2.1 Draw a histogram to represent the percentage of births in each weight group born to mothers who smoked. (6)

2.2.2 Why were babies that weighed more than 2 500 g at birth not included in the investigation? (1)

2.2.3 State a general conclusion for the investigation based on the data in the table. (2)

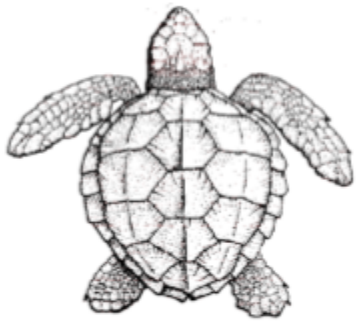
2.2.4 Describe how chemicals from cigarette smoke are able to reach the baby's blood from the mother's blood. (2)
(11)

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2.3 Read the extract below.

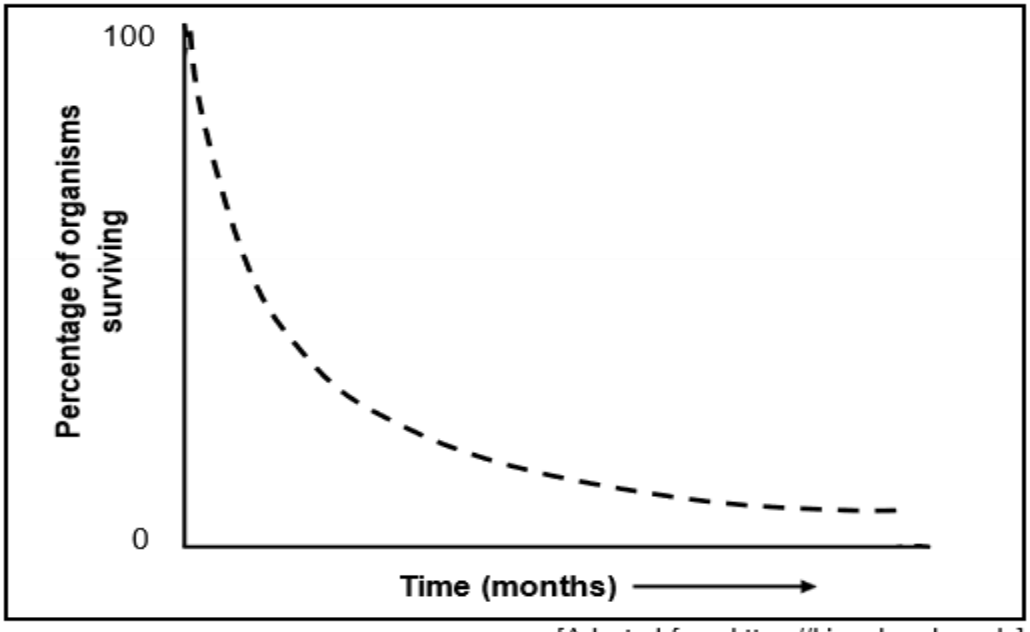
In a species of sea turtles (shown below), the females leave the water to lay their eggs in a nest on the beach. The female makes the nest by digging a hole with her hind legs. A female is known to lay about 100 or more eggs. After the eggs have been laid, the female covers the nest with sand to hide it from predators and leaves the eggs to incubate on their own.

It takes about two months for the hatchlings to emerge from the nest. The hatchlings must try to make it to the sea safely. Only about 10% of the hatchlings usually make it to the sea safely and survive to reproduce.



A sea turtle

The graph below shows the percentage of survivors in a sea turtle population over a period of time.



[Adapted from https://bioweb.uwlax.edu]

2.3.1 Write down whether the type of reproduction in sea turtles is **oviparous**, **viviparous** or **ovoviviparous**. (1)

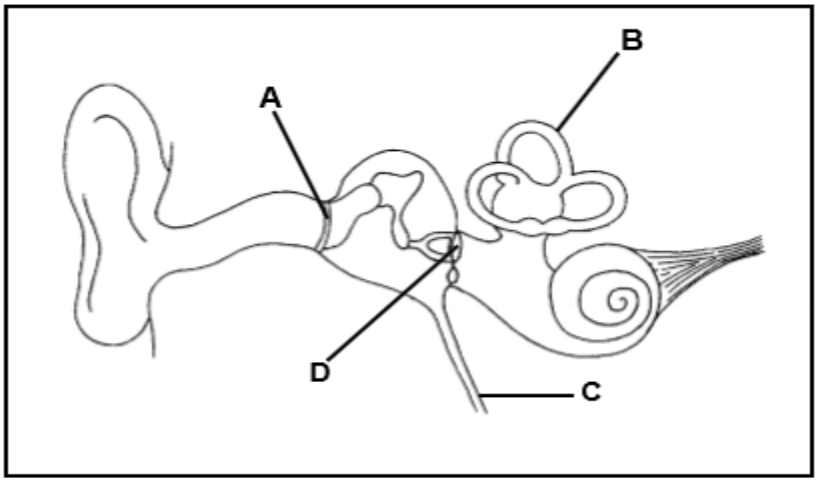
2.3.2 Give a reason for your answer to QUESTION 2.3.1. (1)

2.3.3 The shape of the graph would differ if there were parental care.

(a) Describe how the shape of the graph would differ if there were parental care. (1)

(b) Explain your answer to QUESTION 2.3.3(a). (2)
(5)

2.4 The diagram below represents parts of the human ear.



2.4.1 Identify parts:

(a) **B** (1)

(b) **C** (1)

(c) **D** (1)

2.4.2 Explain how parts **A** and **D** together are adapted to amplify sound. (3)

2.4.3 State ONE advantage of the middle ear being filled with air. (1)
(7)

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2.5 Read the extract below.

A LINK BETWEEN CONCUSSION AND BRAIN DAMAGE

In 2002 a former American football player was found dead in his truck. The doctor who handled the autopsy discovered that the football player had severe brain damage and that his death was caused by repeated blows to the head or repeated concussions. He called this disorder chronic traumatic encephalopathy (CTE).

A more recent study was conducted which involved the brains of 165 people who played football at high school, college or professional level. The study found evidence of CTE in 131 of the brains.

[Adapted from www.wikipedia.org and www.theatlantic.com]

2.5.1 The part of the brain affected by CTE is the cerebrum.

State TWO possible symptoms of this disorder. (2)

2.5.2 State ONE way in which the brain is protected. (1)

2.5.3 Explain why CTE does not usually affect essential life processes such as breathing or heart rate. (2)
(5)

2.6 TSH and thyroxin are both secretions of endocrine glands, namely the pituitary gland/hypophysis and the thyroid gland respectively.

2.6.1 Where will you look for evidence to detect the levels of TSH and thyroxin in the human body? (1)

2.6.2 A high level of TSH is detected in the human body.

Explain TWO possible causes of high levels of TSH in the body. (4)
(5)
[40]

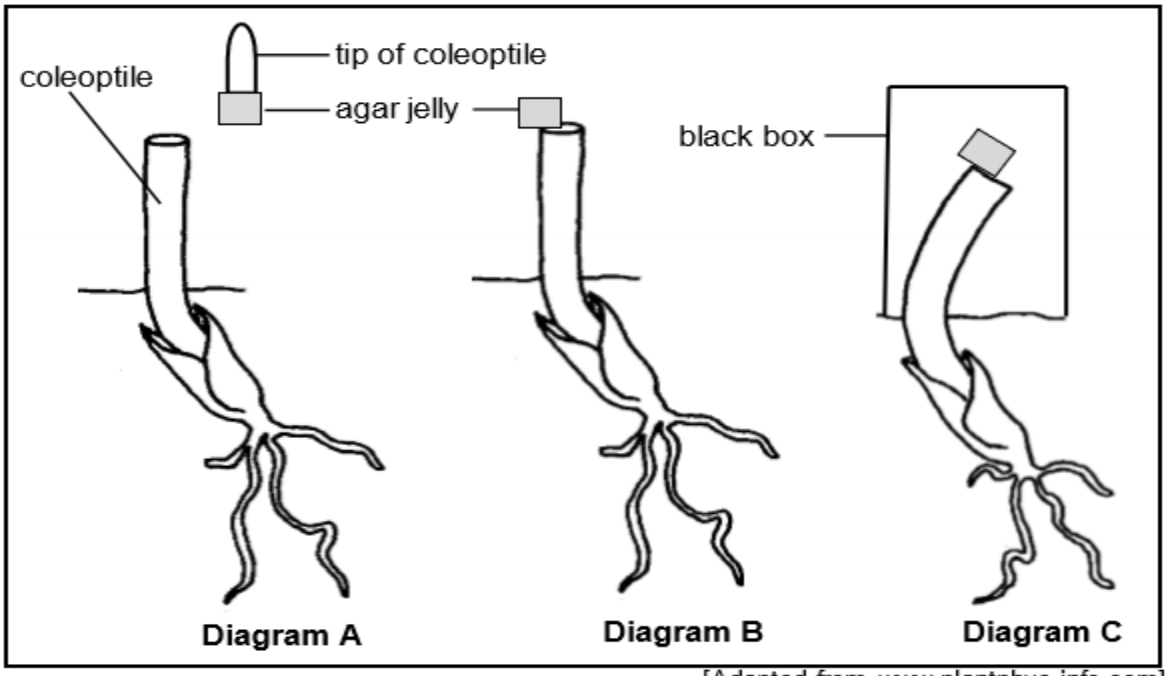
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QUESTION 3

3.1 An investigation was carried out to determine the effect of auxins on the growth of coleoptiles.

The procedure was as follows:

- The tip of one coleoptile (young shoot) was removed and placed on a block of agar jelly, as shown in diagram **A**.
- After two hours the agar jelly was placed on the cut surface of the original coleoptile, as shown in diagram **B**.
- The coleoptile was covered with a black box and allowed to grow for two days, as shown in diagram **C**.



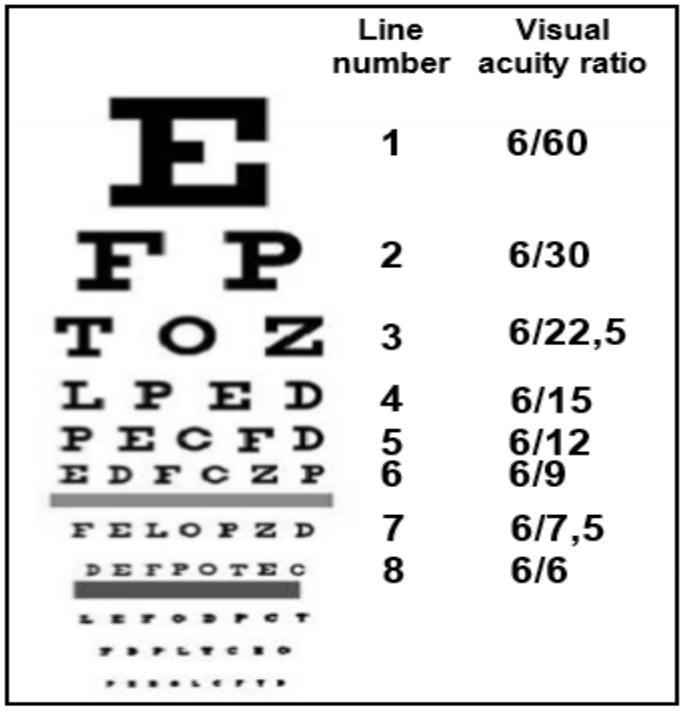
[Adapted from www.plantphys.info.com]

3.1.1 Explain why the tip of the coleoptile was placed on the agar jelly for two hours at the start of the investigation. (2)

3.1.2 Describe what occurred in diagram **C** to cause the coleoptile to bend even though no light was present. (4)

3.1.3 Describe a control for this investigation. (2)
(8)

3.2 The diagram below represents a typical Snellen chart that is used to estimate visual acuity (ability to see clearly). The extract explains how a Snellen chart is used.



A person, whose visual acuity is being tested, stands 6 m away from the chart. One eye is covered and he/she reads the letters of each row out loud, beginning at the top. The smallest row that can be read accurately indicates the visual acuity in that specific eye.

Visual acuity is expressed as a ratio and the line designated 6/6 is the smallest line that a person with normal acuity can read at a distance of 6 m.

When a person is having his/her visual acuity tested to obtain a driver's licence, special equipment is used that can present the letters in different patterns, arrangements and sizes.

[Adapted from www.wikipedia.org]

3.2.1 A person is only able to read accurately to the end of line 5 on the Snellen chart.

What is his/her visual acuity ratio? (1)

3.2.2 Explain ONE reason why the special equipment, which can present different patterns, arrangements and sizes of letters, is used when testing eyesight for a driver's licence. (2)

3.2.3 Some clinics have half-size charts that must be read at a distance of 3 m instead of 6 m.

Describe the process that occurs in the eye to ensure that the letters of the chart are in focus at 3 m. (4)
(7)

3.3 Read the extract below.

TONS OF FOOD THROWN AWAY EACH YEAR

In South Africa about 9 million tons of food per year is thrown away as waste, whilst around 13,8 million South Africans are food insecure. The drought that is currently affecting the country is expected to increase the number of food-insecure South Africans. This food wastage costs the economy of South Africa about R60 billion each year.

The table below shows food groups with their wastage costs.

Food group	Wastage costs (billion rands)
Fruit and vegetables	23
Meat	17
Seafood	8
Others	12

The highest volume of waste occurs when the food is transported, especially over long distances. Packaging and processing accounts for the second highest volume of waste.

[Adapted from *The New Age*, 1 February 2016]

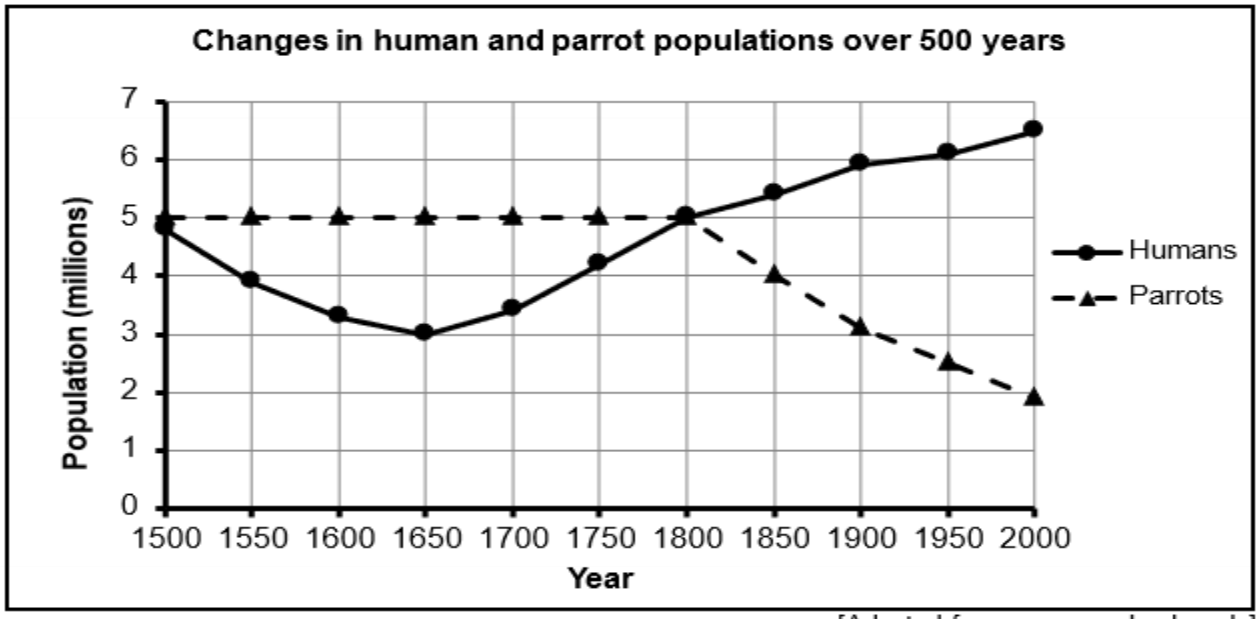
3.3.1 State TWO factors, according to the extract, that lead to the largest amount of food being wasted. (2)

3.3.2 Suggest TWO ways in which shopkeepers can reduce the amount of food going to waste. (2)

3.3.3 What percentage does seafood contribute to the total food wastage cost in South Africa? Show ALL your calculations. (2)

3.3.4 Explain TWO ways in which the drought is expected to increase the number of food-insecure South Africans. (4)
(10)

3.4 The graph below shows the changes in the human population and the population of parrots (a type of bird) in a certain country over a period of 500 years.



[Adapted from www.people.eku.edu]

3.4.1 When was the human population at 3 million? (1)

3.4.2 Describe the difference in the trends between the human population and the parrot population since 1800. (2)

3.4.3 Suggest TWO reasons for the trend described in QUESTION 3.4.2. (4)

3.4.4 If the current rate of decrease in the parrot population continues, explain how the organisms that feed mainly on the parrot population would be affected. (2)
(9)

3.5 Describe how the excessive use of fertilisers by farmers impacts on the quality of water. **(6)**
[40]

TOTAL SECTION B: 80

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SECTION C

QUESTION 4

Nontobeko had been walking in the desert, without water, for two days, when she suddenly heard a sound behind her. She turned her head and saw a snake coming towards her. She became scared and turned around to run away. As she was running, she tripped and fell.

Describe how her body regulated water content during the two days and describe how her balance would have been restored after she fell down.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2017

MARKING GUIDELINE

MARKS: 150

This memorandum consists of 10 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	C✓✓		
	1.1.3	C✓✓		
	1.1.4	B✓✓		
	1.1.5	B✓✓		
	1.1.6	C✓✓		
	1.1.7	C✓✓		
	1.1.8	A✓✓		
	1.1.9	D✓✓		
	1.1.10	D✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Zygote✓		
	1.2.2	Amniotic✓fluid		
	1.2.3	Multiple sclerosis✓		
	1.2.4	Prolactin✓		
	1.2.5	Food security✓		
	1.2.6	Umbilical vein✓/Vein		
	1.2.7	Dendrite✓		
	1.2.8	Diabetes✓	(8 x 1)	**(8)**
1.3	1.3.1	None✓✓		(2)
	1.3.2	Both A and B✓✓		(2)
	1.3.3	B only✓✓		(2)
			(3 x 2)	**(6)**
1.4	1.4.1	(a) Centriole✓ (b) Chromosome✓(do not accept homologous chromosome/ chromatid) (c) Centromere✓		(3)
	1.4.2	Anaphase I✓		(1)
	1.4.3	Telophase I✓		(1)
	1.4.4	4✓		(1)
	1.4.5	Oogenesis✓		(1) **(7)**
1.5	1.5.1	(a) Sclera✓ (b) Cornea✓ (c) Pupil✓		(1) (1) (1)
	1.5.2	(a) D✓ – Iris✓ (b) G✓ – Choroid✓ (c) E✓ – Retina✓		(2) (2) (2) **(9)**
			TOTAL SECTION A:	**50**

SECTION B

QUESTION 2

2.1 2.1.1 Vagina✓/vaginal canal (birth canal not accepted since it is not always a birth canal) (1)

2.1.2
- Protects the developing foetus✓
- Contracts to push the baby out during labour✓
- Allows for implantation of embryo✓
- Contracts to push out blood/lining during menstruation✓

(MARK FIRST ONE ONLY) Any (1)

2.1.3 Oestrogen✓ (1)

2.1.4 It causes the initial thickening of the endometrium✓/endometrium become more vascular and glandular (1)

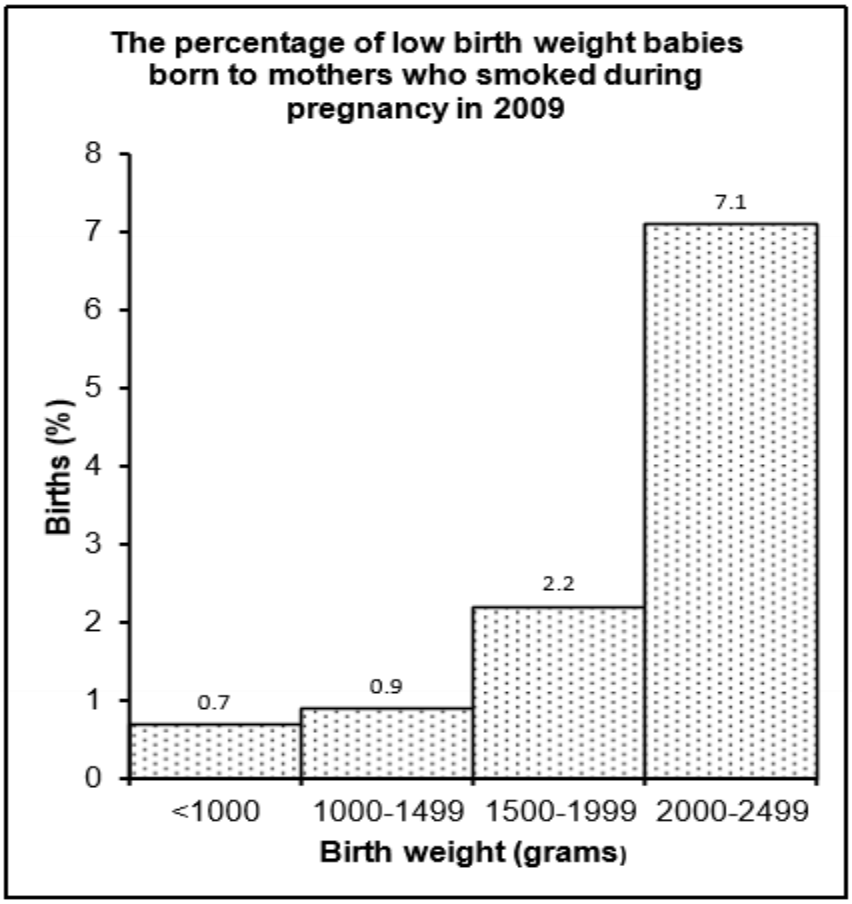
2.1.5
- Sperm✓
- cannot reach the ovum✓
- therefore fertilisation cannot take place✓

OR

- Ovum✓ cannot move into A/the Fallopian tube/oviduct
- cannot be reached by the sperm✓
- therefore fertilisation cannot take place✓ (3)

(7)

2.2 2.2.1



Mark allocation of the graph

Criteria	Mark Allocation
Histogram drawn (bars must be touching)	1
Title of graph (has both variables)	1
Correct label and unit for X-axis and Y-axis	1
Correct scale for Y-axis and X-axis and width of the bars	1
Drawing of the graph	1: 1 to 3 bars drawn correctly 2: All 4 bars drawn correctly

NOTE:
If the wrong type of graph is drawn: Marks will be lost for 'correct type of graph'
If axes are transposed: Marks will be lost only for labelling of X-axis and Y-axis

If learners draw both graphs on the same system of axes:
- Learners will lose the mark for the title
- If 8 bars are drawn, mark the first 4 bars only

If learners draw two graphs mark the first graph

(6)

2.2.2 Babies that weigh 2 500 g or more are considered to be of a normal/healthy birth weight✓ (1)

2.2.3 The total percentage of low birth weight babies born to mothers who smoked was higher than those born to mothers who did not smoke✓✓

OR

The total percentage of low birth weight babies born to mothers who did not smoke was lower than those born to mothers who smoked✓✓ (2)

2.2.4
- Chemicals dissolved in the mothers blood✓
- are able to move across the placenta✓/and through the umbilical cord into the babies blood
- by diffusion✓

Any (2)
(11)

2.3 2.3.1 Oviparous✓ (1)

2.3.2 Eggs are laid✓ in the nest (1)

2.3.3 (a) The graph will decrease more slowly✓at the beginning /not decrease as quickly at the beginning/more convex (1)

(b) The offspring are protected✓ by the parents for a longer period of time
Therefore more of them will survive✓ to become adults (2)
(5)

2.4 2.4.1 (a) Semi-circular canals✓ (1)
(b) Eustachian tube✓ (1)
(c) Oval window✓/fenestra ovalis (1)

2.4.2
- A/the tympanic membrane is larger✓/larger surface area
- than D/the oval window✓/smaller surface area
- Therefore the incoming sound waves are concentrated on to a smaller area✓
thus amplifying the sound (3)

2.4.3 Allows ossicles/tympanum to vibrate freely✓ (1)
(7)

2.5 2.5.1
- Loss of higher thought processes✓/memory/judgement/ problem solving/any example
- Loss of one or more of the senses✓/loss of smell/hearing/ any example
- Loss of voluntary actions✓/paralysis could occur

(MARK FIRST TWO ONLY) Any (2)

2.5.2
- The skull✓/cranium
- The meninges✓/name of ALL three i.e. pia mater, arachnoid and dura mater
- The cerebrospinal fluid✓

(MARK FIRST ONE ONLY) Any (1)

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	2.5.3	- CTE mainly affects the cerebrum✓ - Therefore the medulla oblongata✓ which controls breathing and heart rate - is generally not damaged✓	Any	(2) **(5)**
2.6	2.6.1	Blood✓		(1)
	2.6.2	- The pituitary gland/hypophysis is malfunctioning✓and secretes large amount of TSH✓ - Thyroid gland secretes less thyroxin✓and this will not have a negative feedback effect on the pituitary gland to secrete less TSH✓ **(MARK FIRST TWO ONLY)**	(2 x 2)	(4) **(5)** **[40]**

QUESTION 3

3.1	3.1.1	- To allow time for the auxins from the tip✓ - to diffuse into the agar jelly✓		(2)
	3.1.2	- Auxins from the agar jelly✓ - diffused into the shoot/coleoptile on one side/the left side only✓ - The cells on this side were stimulated to grow✓/elongate - The cells on the other side/right side did not receive auxins✓ - and grew more slowly✓ - This uneven growth✓ caused the stem to bend to the right	Any	(4)
	3.1.3	- Remove the agar jelly completely✓/use agar jelly/substance that does not contain auxins - and place a black box✓ around the tip of the coleoptile		(2) **(8)**
3.2	3.2.1	6/12✓/6:12		(1)
	3.2.2	- People cannot learn the pattern✓/arrangement/sizes and therefore cheat on the test✓		(2)
	3.2.3	- The ciliary muscles contract✓ - and tension on the suspensory ligaments is released✓/ suspensory ligaments slacken - The lens becomes more convex✓/bulges - and its refractive power increases✓ - so that a clear image is formed on the retina✓	Any	(4) **(7)**

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3.3	3.3.1	- **The transport of food over long distances**✓ - **The packaging and processing of food**✓ **(MARK FIRST TWO ONLY)**		(2)
	3.3.2	- Reduce prices✓ - Sell locally grown products✓ - Donate unsold food to charities✓ - Only buy quantities that they can sell✓ - Use large refrigerators✓/ storages **(MARK FIRST TWO ONLY)**	Any	(2)
	3.3.3	8/60 x 100✓ = 13,3✓/13,33/13 %		(2)
	3.3.4	- Crops will fail✓/farmers cannot plant crops therefore less food will be produced✓ - Decrease in supply of food✓/more food will have to be imported and this food will be more expensive✓ to purchase **(MARK FIRST TWO ONLY)**	(2 x 2)	(4) **(10)**
3.4	3.4.1	1650✓		(1)
	3.4.2	- There was an increase in the human population✓ and a decrease in the parrot population✓		(2)
	3.4.3	- Humans cut down the trees✓ which are the parrots habitat✓ - Humans probably killed the parrots✓ for food✓/sport/ as pests - Humans introduces diseases✓ that kill the parrots✓ - Humans introduce other species✓ which use resources that the parrots would normally use✓ **(MARK FIRST TWO ONLY)**	Any (2 x 2)	(4)
	3.4.4	- The organisms that feed on the parrots would probably migrate✓/die as they would no longer have any food✓ - They will have to find an alternative food source✓ and that will affect other food chains✓	Any (1 x 2)	(2) **(9)**
3.5		- Fertilisers are washed into water bodies when it rains✓/excessive irrigation - and cause eutrophication✓ - The excess nutrients✓ in the fertilisers - cause an algal bloom✓ - The algae block out the sunlight✓ - and the water plants cannot photosynthesise✓ - Less oxygen is released into the water✓ - plants die and bacteria cause decay✓ - This removes more oxygen from the water✓ - other organisms then also die✓ - due to the reduced water quality✓	Any	**(6)** **[40]**

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SECTION C

QUESTION 4

Regulating water

- The water levels in her body are low✓/she is dehydrated
- Osmoreceptors✓
- in the hypothalamus✓ are stimulated by the low water levels and send impulses
- to the pituitary gland✓/hypophysis
- which is stimulated to secrete more ADH✓
- ADH increases the permeability✓
- of the tubules✓/collecting ducts and distal convoluted tubules
- in the kidneys✓
- More water is reabsorbed✓
- and passed to the surrounding blood vessels✓
- Less urine is produced✓
- and the urine is more concentrated✓
- in order to conserve water✓
- Aldosterone✓ is secreted by the adrenal glands
- to ensure more Na^+ ions✓ are reabsorbed by the distal convoluted tubules
- The increase in Na^+ ions in the blood✓
- causes more water to be reabsorbed✓ into the blood capillaries Max 12

Balance is achieved in the following way:

- The maculae✓
- in the utriculus and sacculus✓ and
- the cristae✓
- in the semi-circular canals✓ are stimulated
- They generate impulses✓
- which is transmitted through the auditory nerve✓
- to the cerebellum✓where they are interpreted
- Impulses are transmitted via the motor neuron✓
- to skeletal muscles✓

Max 5
Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question.	Ideas arranged in a logical sequence.	Answered all aspects required by the essay.
All the information provided is relevant to regulating water and salts and maintaining balance. There is no irrelevant information.	All the information regarding regulating water and salts and maintaining balance is arranged in a logical manner.	At least the following marks should be obtained: -Regulating water (**8/12**) -Balance and equilibrium(**3/5**)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2018

MARKS: 150

TIME: 2½ hours

This question paper consists of 15 pages.

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SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 The part of the female reproductive system where fertilisation takes place is called the …

A vagina.
B ovary.
C Fallopian tube.
D cervix.

1.1.2 The vibrations on the tympanic membrane are transferred to the …

A ossicles and then the oval window.
B oval window and then the ossicles.
C ossicles and then the round window.
D cochlea and then the ossicles.

1.1.3 The nerve impulse in the axon of a sensory neuron is transmitted …

A towards the dendrite of the sensory neuron.
B towards the cell body of the sensory neuron.
C away from the effector organ.
D away from the cell body.

1.1.4 Which part of the ear converts pressure waves into nerve impulses?

A Auditory nerve
B Organ of Corti
C Eustachian tube
D Auditory canal

1.1.5 During periods when the temperature is low, …

A the thyroxin levels are expected to be low.
B sweating increases.
C the blood vessels to the skin dilate.
D the ADH levels are expected to be low.

1.1.6 The level of aldosterone will most likely increase after …

A consuming food with a high salt content.
B sweating excessively.
C consuming food with a high glucose content.
D the constriction of blood vessels to the skin.

1.1.7 A person can feel pain in his legs but cannot move his legs.

This is a result of damage to the …

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

1.1.8 Colour vision is difficult at night, because under dim light conditions …

A rods are not stimulated.
B the pupil dilates.
C cones are not stimulated.
D the lens cannot change shape.

1.1.9 The table below indicates the effect of drinking different amounts of alcohol on the reaction times of a group of people.

The reaction time was determined by using the catch distance on a ruler that was dropped from a certain height.

The longer the catch distance on the ruler, the longer the reaction time.

Units of alcohol (5% per volume)	0	1	2	3	4	5	6
Catch distance on the ruler (cm)	14	12	10	18	22	25	29

The conclusion that can be drawn from the investigation is that drinking alcohol …

A increases the reaction time.
B initially increases the reaction time, after which further intake of alcohol decreases the reaction time.
C does not have any effect on the reaction time.
D initially decreases the reaction time, after which further intake of alcohol increases the reaction time.

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1.1.10 The table below shows the speed at which impulses are transmitted through different types of nerve fibres, **A**, **B**, **C** and **D**.

NERVE FIBRE	DIAMETER *(µm)*	AVERAGE SPEED OF TRANSMISSION (m/s)
A	15	100
B	7	19
C	3	13
D	1	1

Which ONE of the following is the best interpretation of the information in the table above?

A Nerve fibre **A** is found in patients suffering from multiple sclerosis.
B The speed of transmission of impulses is not important for the survival of an individual.
C The greater the diameter of the nerve fibre, the greater the speed of transmission.
D Nerve fibre **D** is found in patients suffering from Alzheimer's disease. (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 1.2.8) in the ANSWER BOOK.

1.2.1 Growing the same species of crop on a farm year after year

1.2.2 The killing of pests by using their natural predators or parasites

1.2.3 A hollow ball of cells formed from the zygote

1.2.4 The hormone responsible for osmoregulation

1.2.5 The illegal killing or removal of organisms from their environments

1.2.6 The vesicle which contains enzymes found in the head of a sperm cell

1.2.7 The hormone that stimulates milk production for breastfeeding in humans

1.2.8 The part of the nervous system made up of cranial and spinal nerves (8 x 1) **(8)**

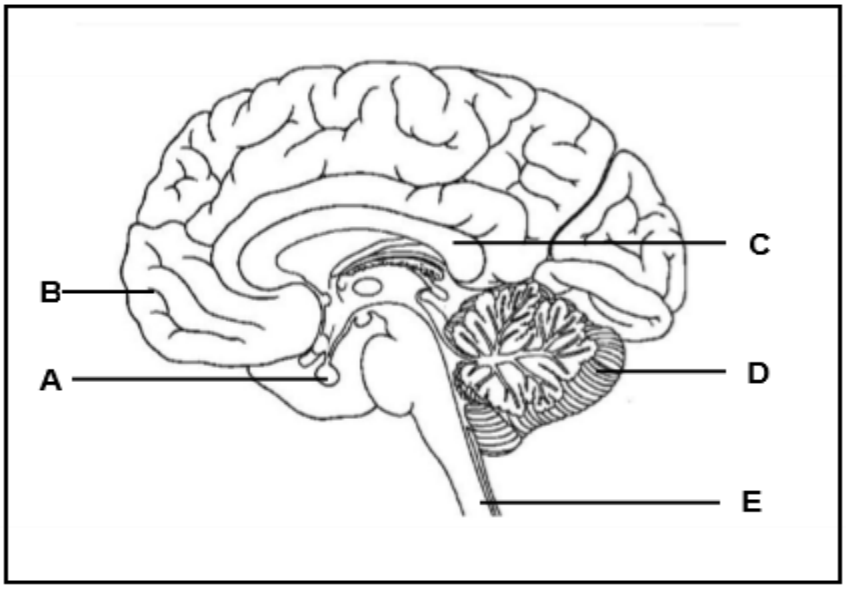
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1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	Reduces biodiversity	A: B:	Alien plant invasion Overgrazing by livestock
1.3.2	Sustainable use of medicinal plants	A: B:	Banning all sales of medicinal plants Collecting plants only from mountainous areas
1.3.3	Result of non-disjunction of chromosome pair 21 in humans	A: B:	Gamete with 22 chromosomes Gamete with 24 chromosomes

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

1.4 The diagram below represents a human brain.



Give the LETTER and NAME of the part of the brain responsible for:

1.4.1 Memorising a cellular phone number (2)

1.4.2 Coordinating all voluntary movements (2)

1.4.3 Secreting hormones (2)

1.4.4 Connecting the two hemispheres of part **B** (2)

1.4.5 The reflex action that occurs when stepping barefooted on a sharp object (2)
(10)

1.5 The diagrams below represent organisms with different reproductive strategies.

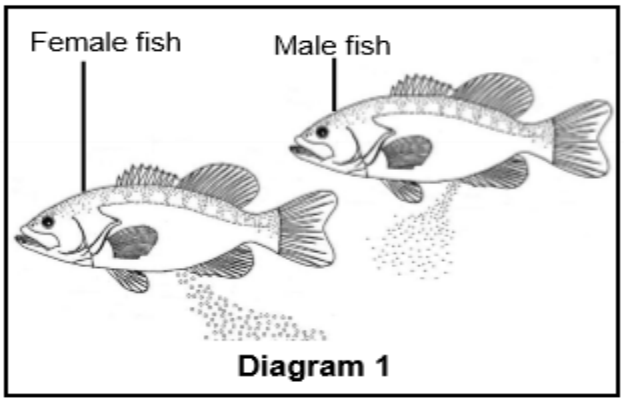


Diagram 1

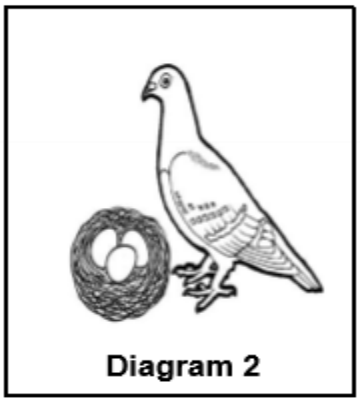


Diagram 2

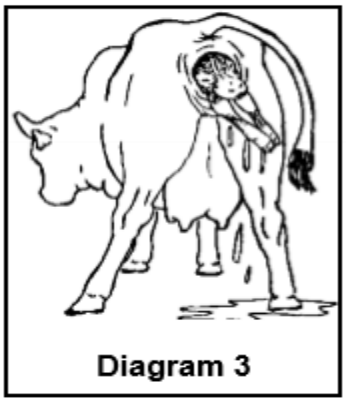


Diagram 3

1.5.1 Which diagram(s) (**1**, **2** or **3**) represent(s) organism(s):

(a) Where external fertilisation takes place (1)

(b) Where extra-embryonic membranes develop to assist with the protection and nutrition of the embryo (2)

(c) Which is/are oviparous (2)

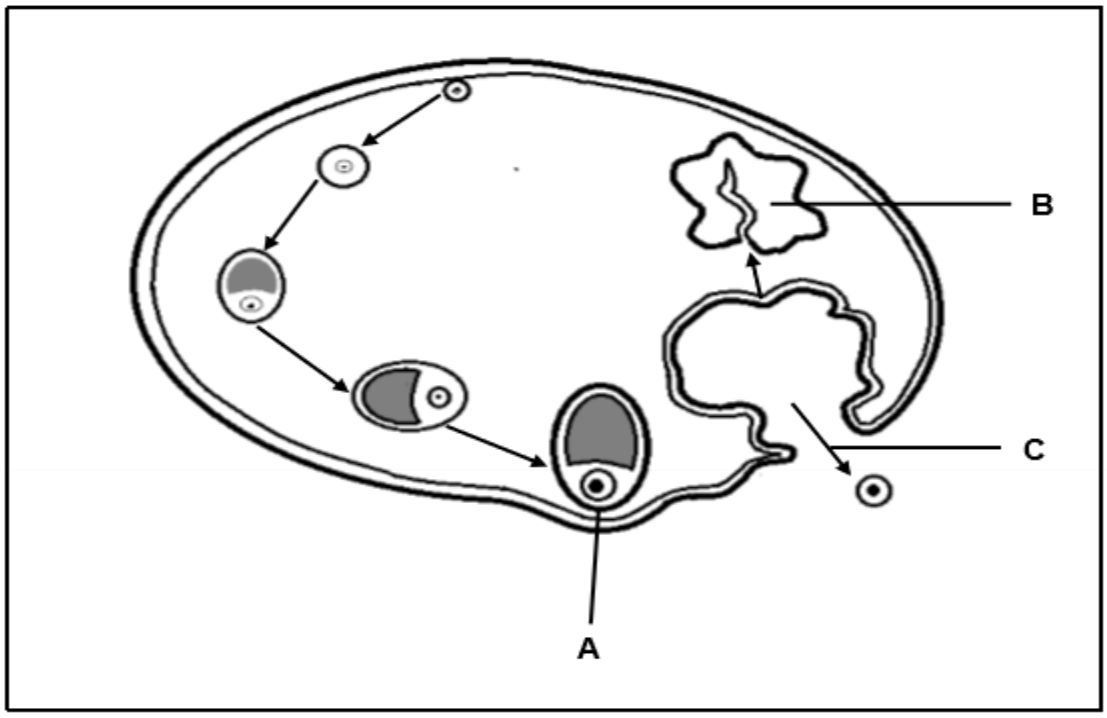
1.5.2 Name the type of egg produced by the organism represented in Diagram **2**. (1)
(6)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents the sequence of events that takes place during the ovarian cycle of a female.



2.1.1 Give the name of the:

(a) Hormone that controls the development of structure **A** (1)

(b) Process taking place at **C** (1)

2.1.2 Describe the change that takes place in the uterus as the result of the hormone secreted by structure **A**. (2)

2.1.3 Structure **B** degenerates if fertilisation does not take place.

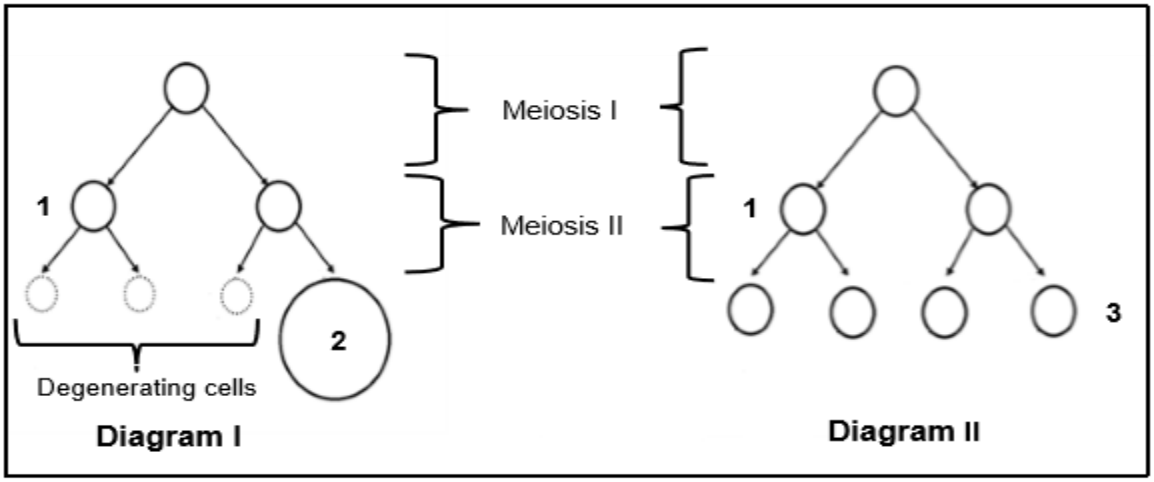
Explain the implications of this for the:

(a) Ovarian cycle (3)

(b) Uterine cycle (3)
(10)

2.2 Diagrams **I** and **II** below represent gametogenesis in human males and females (not in any particular sequence).

The diagrams are NOT drawn to scale.



2.2.1 Identify the specific type of gametogenesis in Diagram **I**. (1)

2.2.2 Explain your answer to QUESTION 2.2.1 by referring to a visible difference between Diagram **I** and Diagram **II**. (2)

2.2.3 Where in the human body does the type of gametogenesis shown in Diagram **II** take place? (1)

2.2.4 Give the chromosome number of:

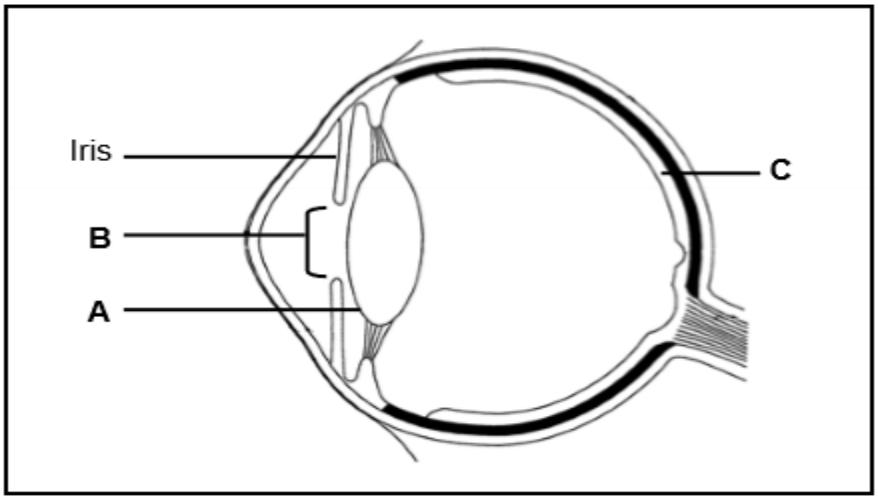
(a) The cells at **1** (1)

(b) Cell **2** (1)

2.2.5 Name TWO processes that take place during Meiosis I that lead to genetic variation in the four cells shown at **3** in Diagram **II**. (2)

2.2.6 Explain the implication for the human population size if the three cells referred to in Diagram **I** did not degenerate, but remained as gametes. (2)
(10)

2.3 The diagram below represents the structure of the human eye.



2.3.1 State ONE function of part:

(a) **A** (1)

(b) **C** (1)

2.3.2 Nocturnal animals sleep during the day and are active at night.

Explain how part:

(a) **B** of nocturnal animals will differ from that found in animals that are active during the day (2)

(b) **C** of nocturnal animals will differ from that found in animals that are active during the day (2)

2.3.3 Describe how the iris controls the amount of light entering the eye when a person is exposed to bright light. (4)
(10)

2.4 Describe how balance and equilibrium is maintained by the ear when a person changes his/her speed and direction. **(5)**

2.5 As the human population in South Africa increases, there is a proportional increase in the amount of solid waste that needs to be disposed of.

2.5.1 State TWO ways (apart from recycling) in which landfill sites can be managed to prevent further pollution. (2)

2.5.2 Explain how the recycling of paper can reduce global warming indirectly. (3)
(5)
[40]

QUESTION 3

3.1 Study the extract and the table below.

EMISSIONS FROM ELECTRICITY PRODUCTION

Most of the electricity in South Africa is produced by burning coal. Coal burning is a very 'dirty' or inefficient way of producing energy because for every unit of electricity produced, more CO_2 is released than with other fuels or methods.

The cleanest methods of producing electricity are the ones using renewable energy sources. Solar energy, hydroelectric energy (falling water drives turbines which generate electricity) or wind power are examples of renewable energy sources. These renewable energy sources do not burn any fuel. Less than 1% of South Africa's electricity comes from renewable sources.

Nuclear power production also avoids greenhouse gas emissions. However, unlike renewable energy, nuclear power results in hazardous nuclear waste and high safety and security risks.

[Source: Climate change, Ethekweni Municipality Environmental Management Department, 2007, http://www.durban.gov.za/durban/municipality/environment]

The table below shows the amount of CO_2 emitted when producing energy from different sources.

ENERGY SOURCE	CO_2 EMISSION (kg CO_2/kW)
Coal	0,30
Petrol	0,24
Diesel	0,25
Paraffin	0,20
Solar, wind, hydro power	0,0

3.1.1 State why coal, petrol, diesel and paraffin are not renewable energy sources. (1)

3.1.2 State why the burning of coal to produce electricity is considered to be 'dirty' compared to using renewable sources or nuclear power. (1)

3.1.3 Name ONE greenhouse gas, other than CO_2. (1)

3.1.4 Explain how increasing CO_2 emissions could decrease food security. (4)

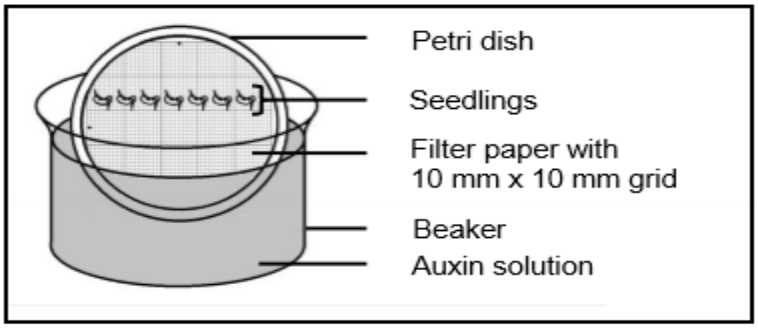
3.1.5 Draw a bar graph to represent the information in the table above. (6)
(13)

3.2 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.
- In each group the seven seedlings were attached with Prestik to filter paper on which a 10 mm x 10 mm grid was drawn.
- The filter paper with seedlings was then glued to the inside of a petri dish.
- Each of these five petri dishes 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 was measured.
- The average increase in length of the plumule in each beaker was calculated and recorded in the table below.

The table below shows the results of the investigation after three days.

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

3.2.1 For this investigation identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.2.2 State the purpose of the grid that was placed inside each petri dish. (1)

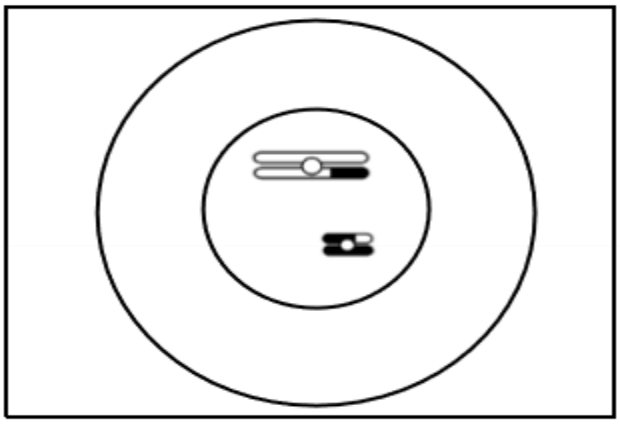
3.2.3 Explain why the beakers were placed in a dark cupboard. (2)

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

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

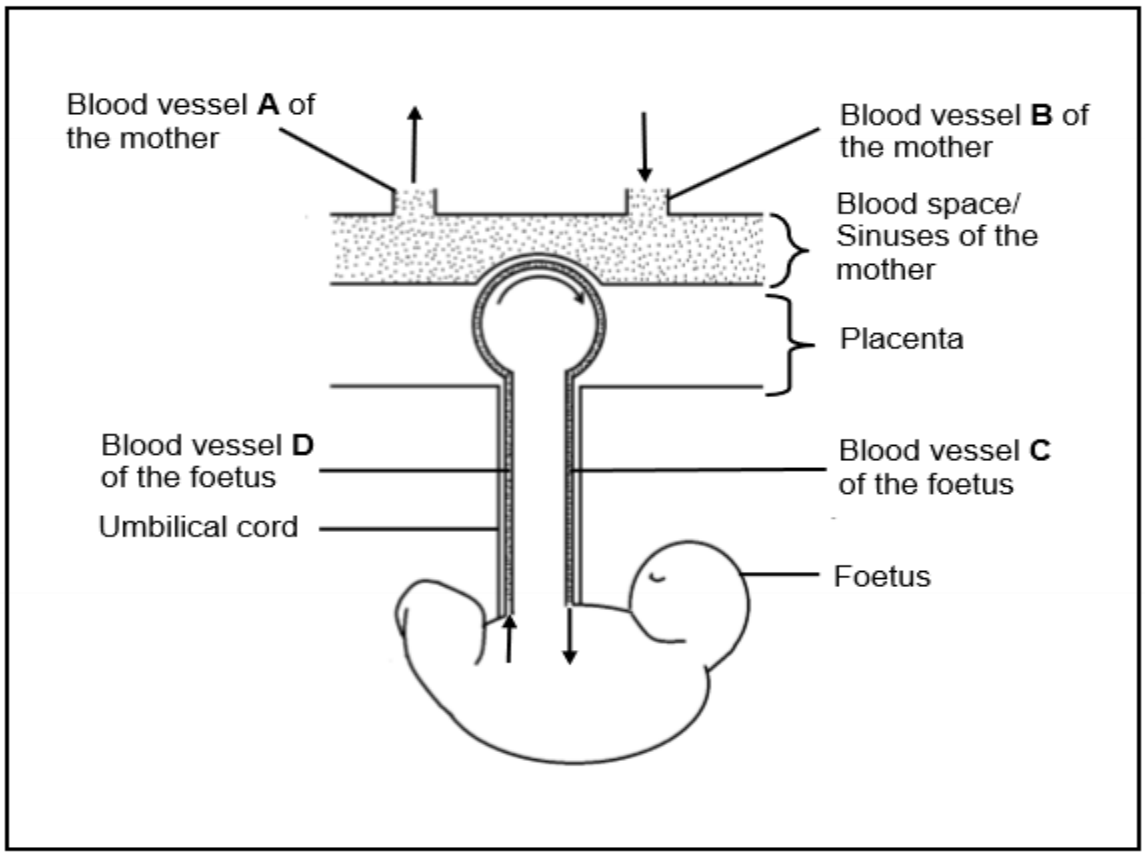
3.2.6 State the conclusion that can be made from the results in the table. (2)
(11)

3.3 The diagram below represents one of the two cells that formed during Telophase I of meiosis in an organism.



Draw a labelled diagram to show the cell during Anaphase II of meiosis. **(5)**

3.4 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.



3.4.1 Apart from playing a role in the diffusion of substances from the mother's blood to the foetus' blood, and vice versa, state TWO other functions of the placenta. (2)

3.4.2 Blood vessel **D** is an artery.

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

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

3.4.4 If the blood of the mother and the blood of the foetus come into contact with each another, it could lead to the death of the foetus.

Describe why this would occur. (2)
(11)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

An increase in the metabolic rate during strenuous exercise causes a decrease in the glucose level and an increase in the CO_2 level in the blood.

Describe the mechanism that leads to an increase in the metabolic rate and the mechanisms involved in increasing the glucose level and decreasing the CO_2 level back to normal.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of tables, flow charts or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2018

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 12 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	A✓✓		
	1.1.3	D✓✓		
	1.1.4	B✓✓		
	1.1.5	D✓✓		
	1.1.6	B✓✓		
	1.1.7	C✓✓		
	1.1.8	C✓✓		
	1.1.9	D✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Monoculture✓		
	1.2.2	Biological control✓		
	1.2.3	Blastocyst✓/blastula		
	1.2.4	ADH✓		
	1.2.5	Poaching✓		
	1.2.6	Acrosome✓		
	1.2.7	Prolactin✓		
	1.2.8	Peripheral✓nervous system	(8 x 1)	**(8)**
1.3	1.3.1	Both A and B✓✓		(2)
	1.3.2	None✓✓		(2)
	1.3.3	Both A and B✓✓		(2)
			(3 x 2)	**(6)**
1.4	1.4.1	B✓ - Cerebrum✓		(2)
	1.4.2	D✓ - Cerebellum✓		(2)
	1.4.3	A✓ - Pituitary gland✓/Hypophysis		(2)
	1.4.4	C✓ - Corpus callosum✓		(2)
	1.4.5	E✓ - Spinal cord✓		(2)
				(10)
1.5	1.5.1	(a) Diagram 1✓		(1)
		(b) Diagram 2✓ and Diagram 3✓		(2)
		(c) Diagram 1✓ and Diagram 2✓		(2)
	1.5.2	Amniotic✓ egg		(1)
				(6)

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

2.1	2.1.1	(a) FSH✓/Follicle stimulating hormone	(1)
		(b) Ovulation✓	(1)
	2.1.2	- It causes the endometrium✓ - To become thicker✓/more glandular/more vascular	(2)
	2.1.3	(a) - The levels of progesterone drop✓ - therefore FSH secretion is no longer inhibited✓/FSH secretion is resumed - and a new follicle starts to develop✓	(3)
		(b) - The levels of progesterone drop✓ - therefore the endometrium is no longer maintained ✓ - and menstruation takes place✓	(3) **(10)**
2.2	2.2.1	Oogenesis✓	(1)
	2.2.2	- At the end of the process in DIAGRAM I/oogenesis, one✓ gamete/ovum forms/three cells degenerate - At the end of the process in Diagram II/spermatogenesis four✓ gametes/sperm form/none of the cells degenerate	(2)
	2.2.3	Testes✓/seminiferous tubules	(1)
	2.2.4	(a) 23✓	(1)
		(b) 23✓	(1)
	2.2.5	- Crossing over✓ - Random arrangement✓ of chromosomes **(MARK FIRST TWO ANSWERS ONLY)**	(2)
	2.2.6	- This will result in multiple births✓/There will be increased chances of fertilisation - which will lead to an increase in human population✓	(2) **(10)**
2.3	2.3.1	(a) **A** - Refraction of light✓ - Focus light rays on the retina✓ (Any 1) **(MARK FIRST ANSWER ONLY)**	(1)
		(b) **C** - Converts light stimuli to impulses✓ - Forms images✓ (Any 1) **(MARK FIRST ANSWER ONLY)**	(1)

2.3.2 (a) - The pupil/part B can dilate more✓
- to allow more light to enter the eye✓ (2)

(b) - The retina/part C has more rods✓
- enabling them to see in dim light✓ (2)

2.3.3
- The radial muscles of the iris relax✓
- Circular muscle of the iris contract✓
- The pupil constricts✓
- and less light enters the eye✓ (4)
(10)

2.4
- The cristae✓
- are stimulated✓
- The stimuli are converted to impulses✓
- which are transported via the auditory nerve✓
- to the cerebellum✓
- Impulses are sent to the muscles to restore balance✓ (Any 5) **(5)**

2.5 2.5.1
- Cover the solid wastes brought in every day with soil✓
- The landfill site should be lined with clay✓/plastic/rubber
- No hazardous waste should be dumped at landfill sites✓
- The leachate should be removed and detoxified✓
- Remove methane gas from the dumpsite✓
- Use plants to remove contamination from soil✓ (Any 2) (2)

(MARK FIRST TWO ONLY)

2.5.2
- Fewer trees need to be cut down to make paper✓
- therefore more CO_2 will be absorbed by these trees for photosynthesis✓
- reducing the amount of CO_2 in the atmosphere✓
- This reduces the enhanced greenhouse effect✓that causes global warming (Any 3)

OR

- Less paper needs to be produced✓
- Less fossil fuels will be used for the production of paper✓
- therefore less greenhouse gases will be released✓
- This reduces the enhanced greenhouse effect✓that causes global warming (Any 3)

OR

- The amount of paper in the solid waste is reduced✓
- therefore less decomposition takes place✓
- Less greenhouse gases will be therefore released✓
- This reduces the enhanced greenhouse effect✓that causes global warming (Any 3) (3)

(5)
[40]

QUESTION 3

3.1 3.1.1 They are fuels that can be depleted✓/Millions of years required to replace (1)

3.1.2 - CO_2 is released✓ when coal is burned to generate electricity/ No CO_2 is released when renewable energy or nuclear power is generated (1)

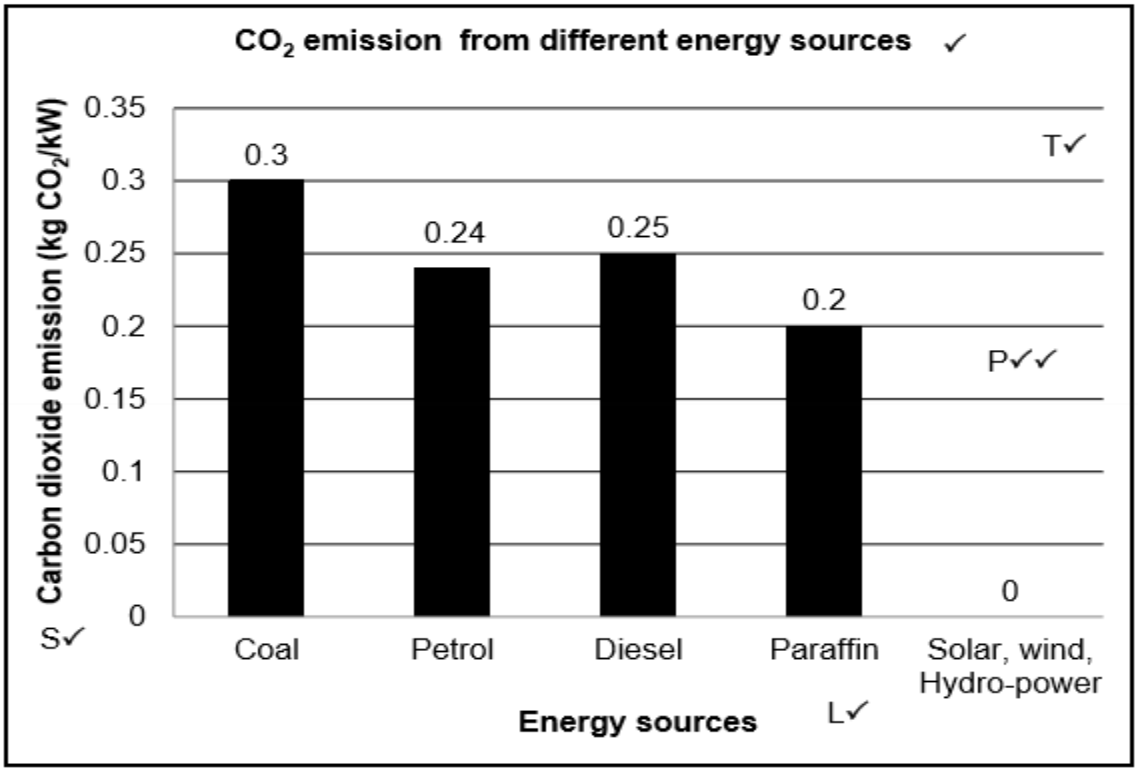
3.1.3

Methane✓/ CH_4		Carbon monoxide✓/CO
Sulphur dioxide✓/ SO_2		Water vapour✓/H_2O(g)
Nitrous oxide✓/ N_2O		Ozone✓/O_3

(MARK FIRST ONE ONLY) (Any 1) (1)

3.1.4
- An increase in CO_2 leads to global warming✓
- which causes climate change✓/changes in rainfall patterns
- that leads to more droughts✓/floods in certain areas
- resulting in crop losses✓
- and livestock deaths✓
- Therefore less food is produced✓ (Any 4) (4)

3.1.5



Mark allocation of the graph

Criteria	Marks
Bar graph drawn (T)	1
Title of graph (Including both variables)	1
Correct scale for X-axis (equal width and spacing of the bars) **and** Y-axis (S)	1
Correct label and unit for X-axis and Y-axis (L)	1
Plotting of the bars (P)	0: No bars plotted correctly 1: 1 to 4 bars plotted correctly 2: All 5 bars plotted correctly

NOTE:
If a line graph is drawn – marks will be lost for the 'type of graph' and for 'plotting' only.
If a histogram is drawn – marks will be lost for the 'type of graph' and 'correct scale' only

(6)
(13)

3.2 3.2.1 (a) Auxin concentration✓ (1)

(b) Plumule growth✓ (1)

3.2.2 For measurement of the plumule length✓ (1)

3.2.3
- To simulate the same conditions✓ under which germination takes place for the normal growth✓ of the seedlings
- To expose the seedlings to uniform light✓ so that no other variable is introduced/to ensure validity/ to allow upward growth of the plumule for easy measuring✓

(MARK FIRST ONE ONLY) (Any 1 x 2) (2)

3.2.4
- They used seven seedlings in each group✓/35 seeds in total/a large sample
- They calculated the average✓ increase in plumule length

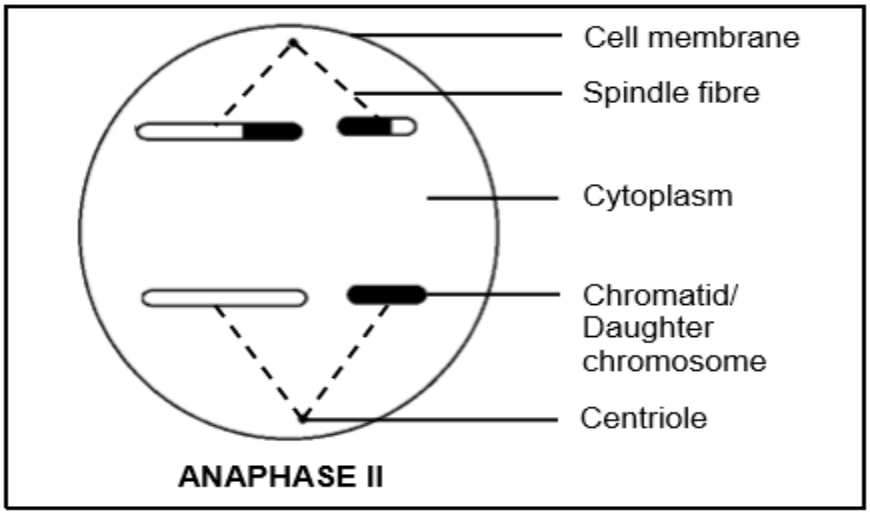
(MARK FIRST ONE ONLY) (Any 1) (1)

3.2.5
- 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/volume of solution) ✓

(Any 3) (3)
(MARK FIRST THREE ONLY)

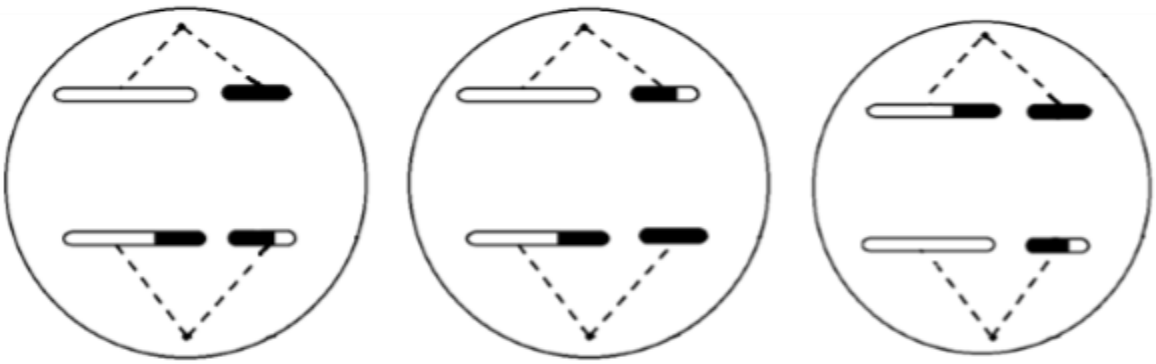
3.2.6 An increase in auxin concentration up to an optimum stimulates the growth rate of the plumule/stem. With further increase in auxin concentration there is an inhibition of plumule/stem growth ✓✓ (2)
(11)

3.3



OR

ANY ONE OF THE FOLLOWING ARRANGEMENTS INCLUDING CORRECT LABELS



MARK ALLOCATION FOR DIAGRAM

Correct phase drawn/chromatids separating **(P)**	1
Correct shading of chromatids **(S)**	1
Correct number and size of individual chromatids/daughter chromosomes (2 short and 2 long) **(N)**	1
Any TWO correct labels	2
TOTAL	**5**

(5)

3.4 3.4.1
- It act as a micro-filter✓/prevents harmful substances from reaching the foetus
- It secretes progesterone✓/oestrogen during pregnancy
- Immunity is transferred from the mother to the foetus✓ (Any 2) (2)

(MARK FIRST TWO ONLY)

3.4.2

BLOOD VESSEL C	BLOOD VESSEL D
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) and (Any 2 x 2) (5)

3.4.3
- Waste products/nitrogenous waste/CO_2 will accumulate✓ in the foetus' body causing the death of the foetus✓ (2)

(MARK FIRST ONE ONLY)

3.4.4
- 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)

(11)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Increasing the metabolic rate

- To increase the metabolic rate the level of thyroxin must increase✓
- The pituitary gland is stimulated✓
- to secrete more TSH✓
- which stimulates the thyroid gland✓
- to secrete more thyroxin✓ (Any 4) (4)

Increasing the level of glucose

- As a result of the decrease in glucose level the pancreas is stimulated✓
- to secrete glucagon✓
- which stimulates the conversion of stored glycogen to glucose✓
- in the liver✓/muscles
- The glucose is then released into the bloodstream✓
- The glucose level in the blood increases✓and returns to normal (Any 5) (5)

Decreasing the level of CO_2

- High CO_2 levels stimulate the receptor cells in the carotid artery✓
- The stimulus is converted to an impulse✓
- and sent to the medulla oblongata✓
- which stimulates the heart✓
- to beat faster✓
- bringing blood with CO_2 quickly to the lungs ✓
- It also stimulates the breathing muscles✓
- to increase the depth and rate of breathing✓
- CO_2 is exhaled quickly from the lungs✓
- The CO_2 level in the blood decreases✓and returns to normal

(Any 8) (8)
Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to the: - Mechanism to increase metabolic rate - Mechanism to increase glucose level - Mechanism to decrease CO_2 level There is no irrelevant information.	All the information regarding the: - Mechanism to increase metabolic rate - Mechanism to increase glucose level - Mechanism to decrease CO_2 level is arranged in a logical manner.	At least the following points should be included: - Mechanism to increase metabolic rate **(3/4)** - Mechanism to increase glucose level **(3/5)** - Mechanism to decrease CO_2 level **(5/8)**
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2016

MARKS: 150

TIME: 2½ hours

This question paper consists of 17 pages.

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SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (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 stimulated when a learner is exposed to a change in environmental temperature:

A Cerebellum
B Cerebrum
C Hypothalamus
D Corpus callosum

1.1.2 Which ONE of the following is a function of gibberellins?

A Apical growth
B Stimulation of seed germination
C Inhibition of side branches
D Dropping of leaves in winter

1.1.3 Below is a list of changes that occur in the human eye when viewing an object closer than 6 metres.

(i) The lens becomes more convex.
(ii) The ciliary muscles contract.
(iii) There is less tension on the lens.
(iv) The suspensory ligaments slacken.

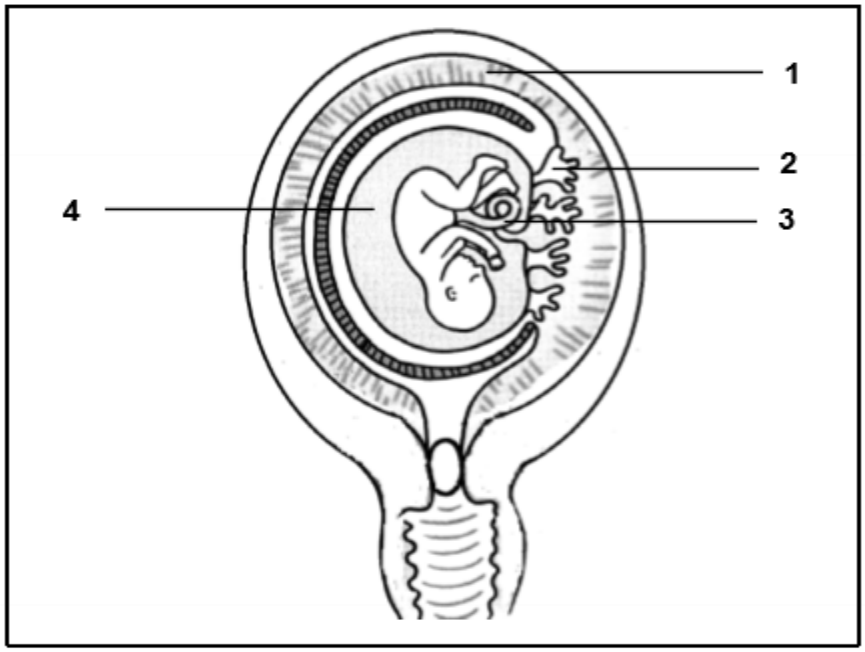
Which ONE of the following represent the correct sequence in which the changes take place?

A (i) → (ii) → (iii) → (iv)
B (ii) → (iv) → (iii) → (i)
C (i) → (iii) → (ii) → (iv)
D (ii) → (iii) → (i) → (iv)

1.1.4 The structure in the amniotic egg that supplies nutrients:

A Shell
B Allantois
C Chorion
D Yolk sac

QUESTIONS 1.1.5 AND 1.1.6 REFER TO THE DIAGRAM BELOW, WHICH REPRESENTS A DEVELOPING FOETUS IN THE UTERUS.



1.1.5 Which ONE of the following is responsible for protecting the foetus against temperature changes?

A 1
B 2
C 3
D 4

1.1.6 What would be a possible consequence for the foetus if part **2** produces insufficient progesterone?

A The foetus will not grow because there will be no cell division.
B The foetus may be underdeveloped due to a shortage of growth hormone.
C A miscarriage will take place because the endometrium will disintegrate.
D The foetus could be injured because there will be no shock absorption.

1.1.7 When a person spends most of his/her time looking at a cellphone or a computer screen the ciliary muscles of the eye are in a constant state of contraction. The muscles cannot return to their relaxed position.

As a result the muscles are unable to change the …

A shape of the lens to focus on distant objects.
B shape of the lens to focus on nearby objects.
C size of the pupil to let more light into the eye.
D size of the pupil to reduce the amount of light entering the eye.

1.1.8 An investigation was carried out to determine the effect of growth hormone on children with a particular disorder that causes their height to be below the average height expected for their age and sex.

The following procedure was followed:

- 740 children with the disorder were included in the investigation.
- Their initial heights were measured.
- They were divided into two groups (**A** and **B**).
- Group **A** was given a growth hormone injection every day for 3 years.
- Group **B** did not receive the treatment.
- The height of each child in each group was then measured.

The following is a list of variables in the investigation:

(i) Children of the same age and sex with the same disorder
(ii) The nutrition given to the children
(iii) The type of growth hormone used
(iv) The height of the children at the end of the investigation

Which ONE of the following combinations are factors that should have been kept constant during this investigation?

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

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1.1.9 A human male underwent a vasectomy where the sperm duct/ vas deferens was cut.

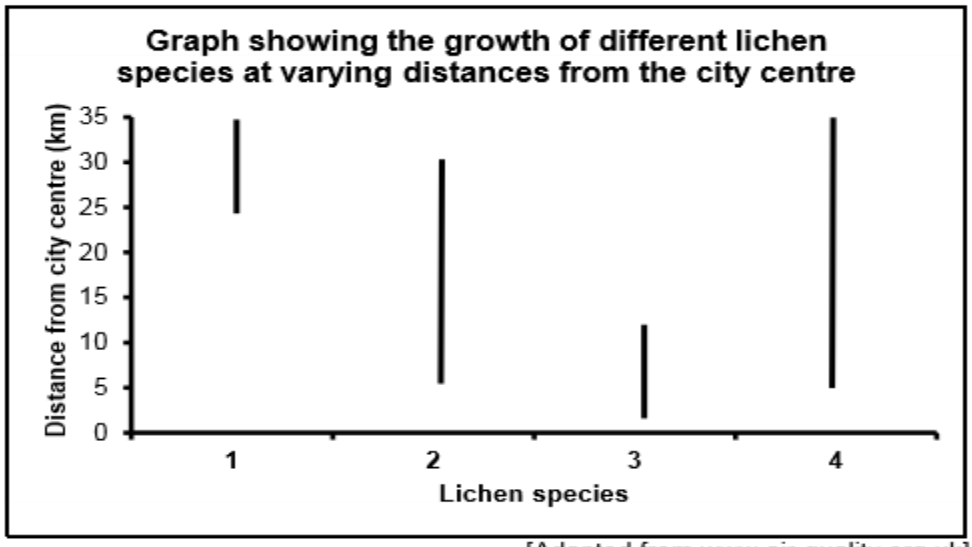
Which ONE of the following structures would no longer contribute to the production of semen?

A Seminal vesicles
B Prostate gland
C Seminiferous tubules
D Cowper's gland

1.1.10 Air pollution is generally higher in city centres than away from it.

The amount of pollution in the atmosphere can be estimated by using lichen. Lichen is a plant that consists of a fungus and an alga living together in a mutualistic relationship.

The graph below shows the growth of different lichen species at varying distances from the city centre.



[Adapted from www.air-quality.org.uk]

Which lichen has the HIGHEST tolerance for varying levels of pollution?

A Species 1
B Species 2
C Species 3
D Species 4

(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 1.2.7) in the ANSWER BOOK.

1.2.1 A type of fertilisation in which the nucleus of a sperm fuses with the nucleus of an ovum outside the body of the female

1.2.2 The growth of part of a plant in response to gravity

1.2.3 The condition of the blood vessels in the skin in humans when the environmental temperature is low

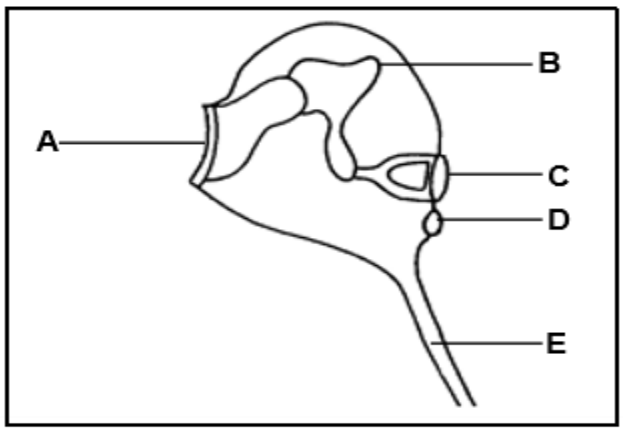
1.2.4 The reproductive strategy when hatchlings are able to move and feed themselves

1.2.5 The sensory receptors found in the semicircular canals

1.2.6 The type of pollution that occurs when hot fluids are released into rivers and oceans

1.2.7 A layer inside the eye that absorbs light, thus reducing reflection **(7)**

1.3 The diagram below represents the middle ear of humans.



1.3.1 Identify part:

(a) **A** (1)

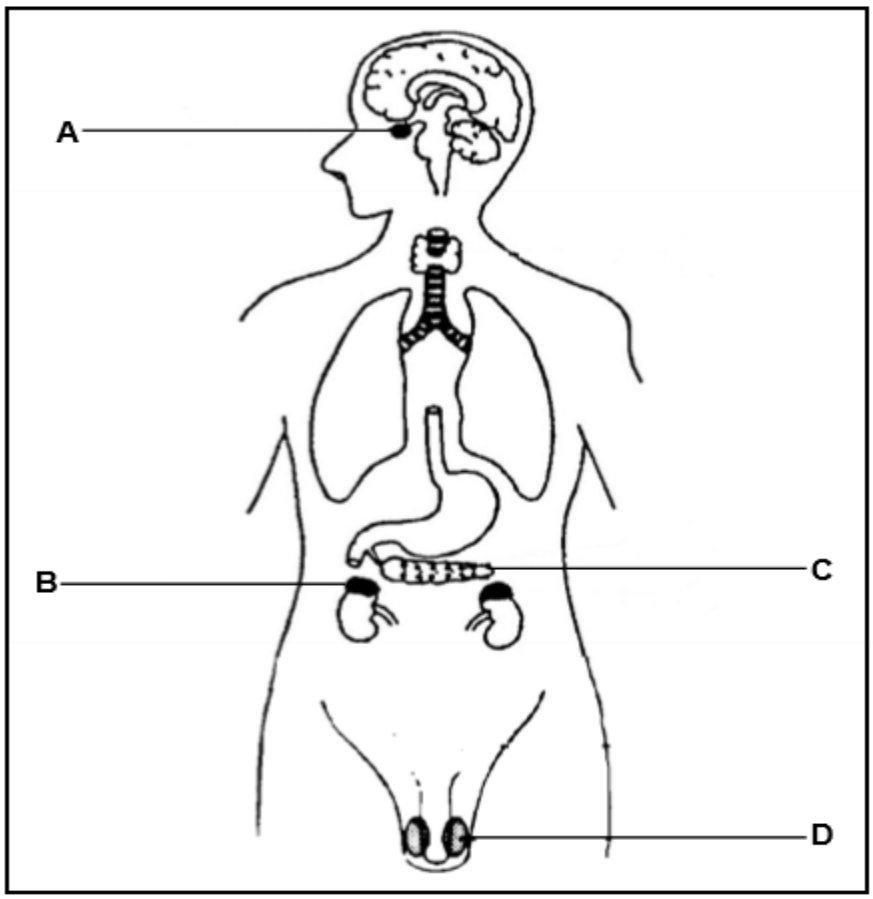
(b) **B** (1)

(c) **C** (1)

1.3.2 Give the LETTER of the part that absorbs sound waves to prevent an echo. (1)

1.3.3 Give the LETTER and the NAME of the part that may become blocked when infected, which may result in temporary hearing loss. (2)
(6)

1.4 The diagram below represents parts of the endocrine system in humans.



1.4.1 Identify gland:

(a) **A** (1)

(b) **B** (1)

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

(a) Starting puberty in males (2)

(b) Stimulating absorption of glucose by cells (2)

(c) Making the kidney tubules permeable to water (2)
(8)

1.5 The diagrams below represent parts of the central nervous system of humans.

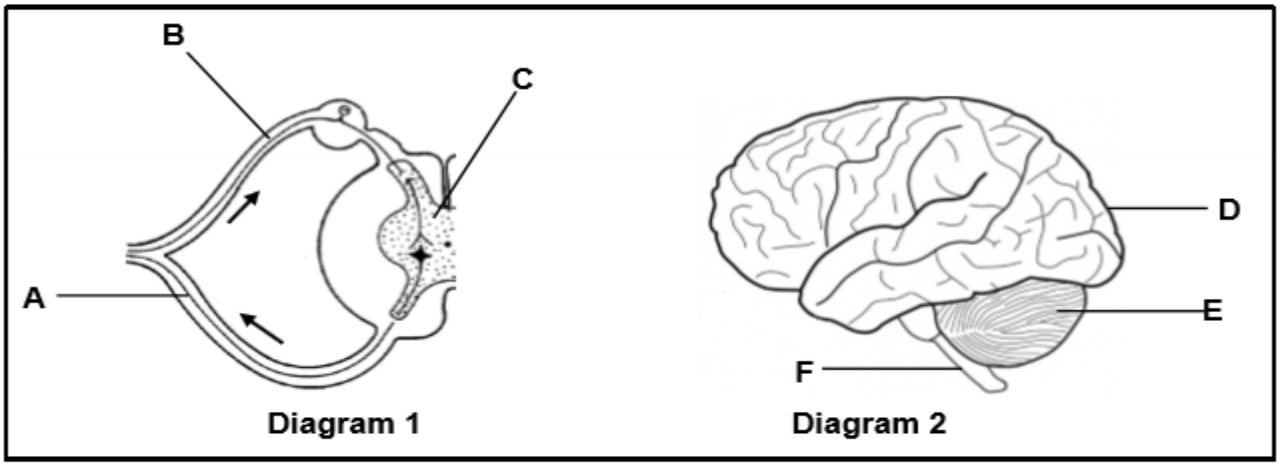


Diagram 1 **Diagram 2**

1.5.1 Identify part:

(a) **C** (1)

(b) **D** (1)

1.5.2 Give the LETTER and the NAME of the part in diagram **2** that receives impulses from the:

(a) Rods and cones (2)

(b) Receptors in the heart muscles (2)

1.5.3 Name the process taking place in diagram **1** which minimises injury to the body. (1)

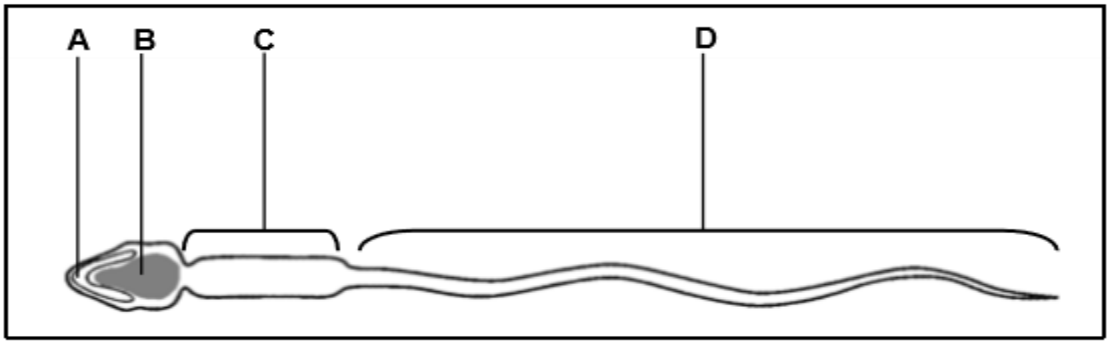
1.5.4 Give the LETTER and the NAME of the neuron that transports impulses from the central nervous system (CNS) to the effectors. (2)
(9)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a sperm cell.



2.1.1 Identify part:

(a) **B** (1)

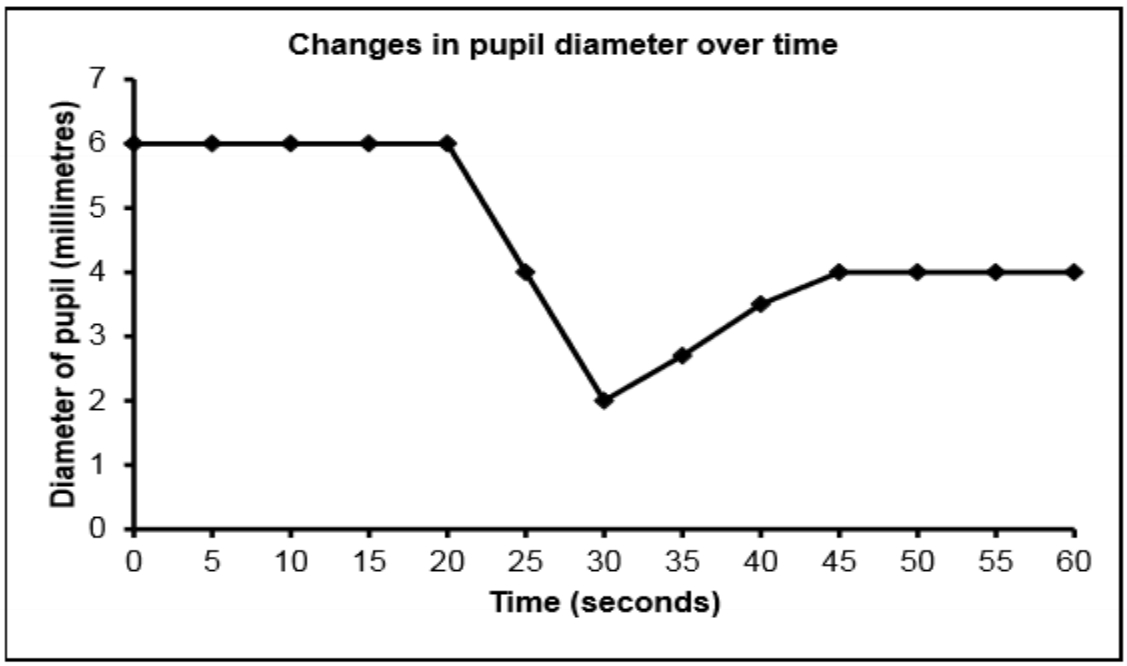
(b) **D** (1)

2.1.2 Explain ONE way in which the sperm cell is adapted to ensure effective movement towards the Fallopian tubes. (2)

2.1.3 Explain the consequences for reproduction if a sperm cell did not have part **A**. (3)
(7)

2.2 Describe the path followed by a sound wave from its source to the cochlea in the human ear. **(6)**

2.3 The graph below indicates the changes in diameter of the pupil of the human eye.



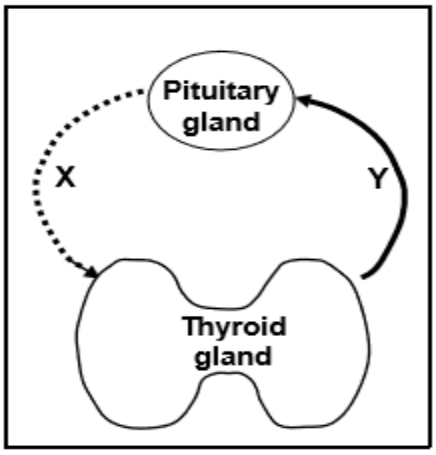
2.3.1 Which structure in the human eye is responsible for the changes indicated in the graph? (1)

2.3.2 During which period of time was the person moving from **dim light** to **bright light**? (1)

2.3.3 Describe the changes that took place in the eye that led to the diameter change indicated from 30 to 35 seconds. (3)

2.3.4 Draw a labelled diagram of the front view of the eye to show the exact size of the pupil at 20 seconds, as indicated in the graph. (4)
(9)

2.4 The diagram below represents a negative feedback mechanism. **X** and **Y** represent hormones secreted by the respective glands.



2.4.1 What is the role of any negative feedback mechanism in the human body? (1)

2.4.2 Identify hormone **X**. (1)

2.4.3 Explain the consequences for a person if hormone **Y** remained abnormally high for extended periods of time. (3)
(5)

2.5 Research shows that the average age of first menstruation is influenced by socio-economic status as well as race.

Scientists carried out an investigation to determine the average age of the first menstruation of the girls in a community.

Their hypothesis was:

The average age of first menstruation has decreased over time.

2.5.1 For the investigation, state the:

(a) Independent variable (1)

(b) Dependent variable (1)

2.5.2 Name THREE planning steps that had to be considered before carrying out the investigation. (3)

2.5.3 If the results show that the average age of first menstruation has remained at 12,9 years of age for the last 25 years, explain the implications for the hypothesis stated by the scientists. (2)

2.5.4 Name TWO physical characteristics in girls which would indicate the start of puberty. (2)
(9)

2.6 One contraceptive method for females is to take a daily oral pill that contains progesterone.

Explain how this pill functions to prevent pregnancy. **(4)**
[40]

QUESTION 3

3.1 The table below shows the change in the concentration of carbon dioxide (CO_2) in a person's veins, as exercise levels increase.

The person in the investigation was asked to ride a bicycle which generated electricity, measured in watts. The faster the person cycled, the more watts he generated.

EXERCISE (watt)	CO_2 CONCENTRATION IN VENOUS BLOOD (mol/mℓ)
0	0,50
50	0,51
100	0,53
150	0,55
200	0,55
250	0,54

[Adapted from www.umc.edu]

3.1.1 What is a normal carbon dioxide concentration in the venous blood for this person? (1)

3.1.2 Explain the significance of measuring the carbon dioxide concentration in the blood when the person is not doing any exercise. (2)

3.1.3 Explain why the carbon dioxide concentration in the veins increased during strenuous exercise. (2)

3.1.4 Describe the homeostatic response that takes place in the body to reduce the carbon dioxide concentration when exercising between 200 and 250 watts. (6)
(11)

3.2 Read the extract below and answer the questions that follow.

AUXINS AS HERBICIDES

There are many different herbicides (chemicals used as weed killers). Most herbicides that do not contain hormones damage the plant parts above the ground only, that is the leaves and stems. These herbicides are also poisonous to other organisms.

Hormone-based herbicides are usually a solution to this problem. They kill the plant as a whole and they are selective about which plants they target.

Usually auxins are used as herbicides because of their selective nature in the type of plant they affect. They are most effective against 'broad-leafed' dicotyledonous plants.

[Adapted from www.herbicidesymptoms.ipm.ucanr.edu]

3.2.1 Name ONE place in a plant where the auxins are naturally produced. (1)

3.2.2 State ONE function of auxins which results in the growth of a plant. (1)

3.2.3 Describe TWO disadvantages of using the herbicides that are NOT made of plant hormones. (4)

3.2.4 Explain why it would be a disadvantage for a farmer to use auxin herbicides in a field planted with beans that are dicotyledonous. (2)
(8)

3.3 The table below shows the rate of extinction of animal species due to humans since 1600.

CAUSE OF EXTINCTION	RATE OF EXTINCTION OF ANIMAL SPECIES (%)
Hunting	23
Introduction of alien species	39
Habitat destruction	36
Other	2

[Adapted from www.bio.miami.edu/dana]

3.3.1 Draw a pie chart to represent the data shown in the table above. (6)

3.3.2 Explain how alien vegetation would cause the extinction of an animal species. (3)

3.3.3 Suggest ONE illegal human activity that could be causing the 2% rate of extinction. (1)
(10)

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3.4 Read the extract below and answer the questions that follow.

FOOD SECURITY IS UNDER THREAT

Research has shown that the rapid growth in the human population has caused consumption of the four staple foods (wheat, rice, maize and soybeans) to be greater than its production over the past decade. The imbalance between supply and demand has resulted in two huge increases in staple food prices since 2007, with some staple foods more than doubling in cost. The price increases have led to famine (non-availability of food) for tens of millions of poor people in developing countries.

Unsustainable farming practices are responsible for decreased crop yield which also lead to an increase in the prices of basic foods.

The latest scientific research shows that climate change is a contributing factor. Many of the failed harvests of the past decade were a result of weather disasters, like floods, drought and heat waves.

[Adapted from www.iol.co.za]

3.4.1 Name ONE food type, according to the extract, that can be linked to food security. (1)

3.4.2 Explain why the use of monoculture to produce more food for the growing human population often results in the increased use of pesticides. (3)

3.4.3 Explain ONE way in which floods impact on food security. (2)

3.4.4 Explain why some grains have more than doubled in cost over time. (2)
(8)

3.5 Describe how deforestation would impact on global warming. **(3)**
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Describe how genetic variation is brought about in gametes through cell division and name and describe the specific process that takes place in the formation of an ovum.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2016

MEMORANDUM

MARKS: 150

This memorandum consists of 12 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	B✓✓		
	1.1.3	B✓✓		
	1.1.4	D✓✓		
	1.1.5	D✓✓		
	1.1.6	C✓✓		
	1.1.7	A✓✓		
	1.1.8	B✓✓		
	1.1.9	C✓✓		
	1.1.10	D✓✓	(10 x 2)	**(20)**
1.2	1.2.1	External✓ fertilisation		
	1.2.2	Geotropism✓/gravitropism		
	1.2.3	Vasoconstriction✓		
	1.2.4	Precocial✓		
	1.2.5	Cristae✓		
	1.2.6	Thermal✓ pollution		
	1.2.7	Choroid✓	(7 x 1)	**(7)**
1.3	1.3.1	(a) Tympanic✓membrane/tympanum/(eardrum)		(1)
		(b) Incus✓/Anvil		(1)
		(c) Oval window✓		(1)
	1.3.2	D✓		(1)
	1.3.3	E✓ – Eustachian tube✓		(2) **(6)**
1.4	1.4.1	(a) Hypophysis✓/Pituitary gland		(1)
		(b) Adrenal✓ gland		(1)
	1.4.2	(a) D✓ – Testis✓		(2)
		(b) C✓ – Pancreas✓/Islets of Langerhans		(2)
		(c) A✓ – Hypophysis✓/Pituitary gland		(2) **(8)**
1.5	1.5.1	(a) Grey matter✓/Spinal cord		(1)
		(b) Cerebrum✓		(1)
	1.5.2	(a) D✓ - Cerebrum✓		(2)
		(b) F✓ - Medulla oblongata✓		(2)
	1.5.3	Reflex action✓		(1)
	1.5.4	A✓ – Motor✓neuron /(efferent neuron)		(2) **(9)**
			TOTAL SECTION A:	**50**

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SECTION B

QUESTION 2

2.1 2.1.1 (a) Nucleus✓ (1)

(b) Tail✓ (1)

2.1.2
- C/ middle piece contains mitochondria✓ that provides energy for movement✓
- Has a tail✓ for swimming✓
- Torpedo shape✓ reducing friction✓

Any (1 x 2) (2)

(Mark first ONE only)

2.1.3
- No acrosome✓ will be present in the sperm cell
- therefore no enzymes present✓
- Sperm cell will be unable to penetrate the ovum✓
- *therefore no fertilisation will occur✓

***compulsory mark** + any other 2 (3)

(7)

2.2
- Pinna traps the sound waves✓
- and directs it into the ear canal✓/meatus
- This causes the tympanic membrane to vibrate✓
- The vibration is transmitted to the ossicles✓/names of all 3 ossicles
- The ossicles amplify the vibration✓
- and transmit it to the oval window✓
- The oval window vibrates✓
- creating pressure waves in the perilymph/endolymph✓(fluid)
- which stimulates the Organ of Corti✓

Any **(6)**

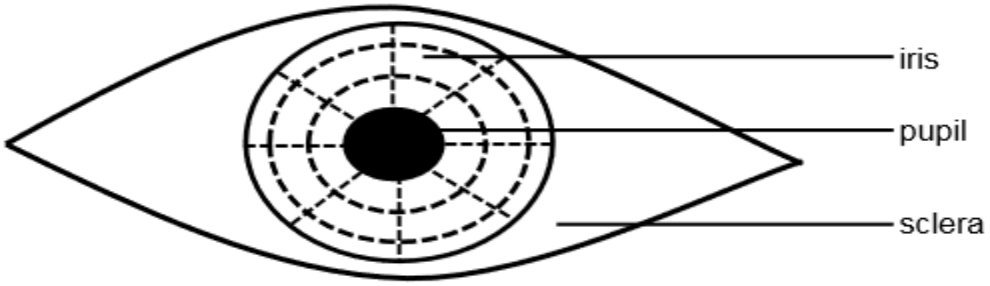
2.3 2.3.1 Iris✓/radial and circular muscles (1)

2.3.2 (20 – 30)✓s (1)

2.3.3
- Radial muscles contract✓
- Circular muscles relax✓
- Pupil increases in diameter✓/dilates

(3)

2.3.4



Correct drawing of the front view of an eye✓
Pupil = 6 mm✓
Any 2 correct labels✓✓

(4)

(9)

2.4	2.4.1	To maintain an internal balance✓/set point/homeostasis/regulate metabolism		(1)
	2.4.2	TSH✓/thyroid-stimulating hormone		(1)
	2.4.3	When Y/thyroxin is released at higher levels than normal: - Metabolism will be higher than normal✓/cellular respiration increases - Heart rate increases✓ - thus all the energy from food eaten will be used✓ - leaving nothing to be utilised for storage✓/therefore could lead to a person being underweight - can also lead to anxiety✓	(Any 3)	(3) **(5)**
2.5	2.5.1	(a) Time✓		(1)
		(b) Average age of first menstruation✓		(1)
	2.5.2	- Decide on sample size✓ - Decide on proportion from racial groups✓ - Decide on the age range of participants✓ - Decide on proportions from socio-economic status of sample✓ - Decide on the recording tool✓/ instrument /method - Ask permission ✓from participants **(Mark first THREE only)**	Any	(3)
	2.5.3	- The hypothesis will be rejected✓/not accepted - and therefore needs to be reformulated✓		(2)
	2.5.4	- Breast development✓ - Widening of hips✓ - Development of pubic hair✓/(body hair) **(Mark first TWO only)**	Any	(2) **(9)**
2.6		- High levels of progesterone✓ - Inhibits secretion of FSH✓ - There is no development of a follicle✓ - Therefore no ovum released/ovulation✓ - Thus there will be no fertilisation✓	Any	**(4)** **[40]**

QUESTION 3

3.1	3.1.1	0,50 ✓mol/mℓ		(1)
	3.1.2	- To establish a baseline✓/minimum CO_2 in the blood To allow a comparison with results✓ **OR** - Acts as a control✓ To determine if the results obtained are caused by the exercise✓/independent variable	Any (1 x 2)	(2)
	3.1.3	- Body's metabolic rate increases✓ - this means that the rate of cellular respiration increases✓ - to produce more energy✓/ ATP and therefore releases more CO_2	Any	(2)
	3.1.4	CO_2 levels in the blood increase above normal levels: - Receptor cells in the carotid artery in the neck are stimulated✓ - To send impulses to the medulla oblongata✓ in the brain - Medulla oblongata stimulates breathing muscles✓/(intercostal muscles and diaphragm) - and heart✓ - Breathing muscles contract more actively✓ - increasing the rate of breathing✓ - and depth of breathing✓ - The heart beats faster✓ - More CO_2 is taken to and exhaled from the lungs✓	Any	(6) **(11)**
3.2	3.2.1	Apical tips✓/stem tips/root tips/bud **(Mark first ONE only)**		(1)
	3.2.2	Promotes cell elongation✓ **(Mark first ONE only)**		(1)
	3.2.3	- Only kills part of a plant✓/leaves and stems leaving the chance of the roots to grow again✓ - Poisonous✓ can be harmful to other organisms✓ **(Mark first TWO only)**	Any (2 x 2)	(4)
	3.2.4	- It could kill the beans as well✓ thus reducing the yield of the crop✓		(2) **(8)**

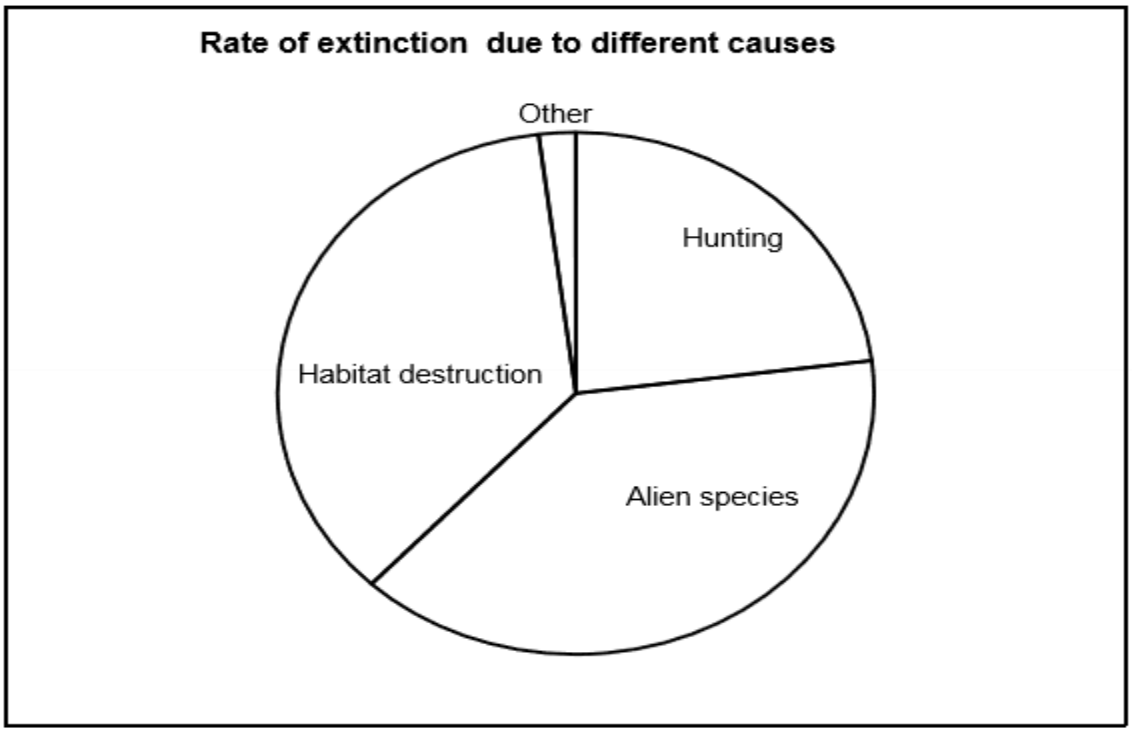
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3.3 3.3.1 $\frac{23}{100}$ X 360° = 82,8°/ 83°

$\frac{39}{100}$ X 360° = 140,4° /140°

$\frac{36}{100}$ X 360° = 129,6° /130°

$\frac{2}{100}$ X 360° = 7,2°/ 7°



Mark allocation for the graph

Criteria	Mark allocation
Correct type of graph (**pie chart**) (T)	1
Title of graph (including both variables)	1
Calculations/working to (C) determine the correct proportions	1: 1 to 3 calculations correct 2: All four calculations correct
Proportions accurate for each sector/slice labelled /key (P)	1: 1 to 3 sectors drawn correctly 2: All 4 sectors drawn correctly (**use transparency template)**

NOTE:
If the wrong type of graph is drawn: marks will be lost for 'correct type of graph' as well as for 'drawing of sectors in correct proportion'. (6)

3.3	3.3.2	- It may outcompete indigenous vegetation✓ - thus reducing the amount of food available for herbivores✓ - Leading to death of organisms✓ - This will disrupt food chains✓/webs - and the ecosystems✓ OR - An excessive growth of alien water plants on the surface of the water will block out the light✓/deprive submerged plants of sunlight/limits photosynthesis - thus reducing the amount of food available for herbivores✓ - Leading to death of organisms✓ - disrupting food chains✓/webs - and the ecosystems✓	Any	(3)
	3.3.3	Poaching✓/Poisoning/Trading in endangered species		(1) **(10)**
3.4	3.4.1	Wheat✓ Rice✓ Maize✓ Soybeans✓ **(Mark first ONE only)**	Any	(1)
	3.4.2	- A single crop is repeatedly planted over a large area✓ - This provides large amounts of food✓ for particular organisms/pests - Organisms/pests increase in number✓ - Causing more damage to crops✓	Any	(3)
	3.4.3	- Floods destroy present crops✓ leading to decreased crop yields✓ - Floods remove the upper fertile layers of soil✓/soil erosion leading to decreased fertility of soil causing decreased crop yield✓ - Floods supersaturate the soil✓ leading to rotting of crop✓/decomposition of roots **(Mark first ONE only)**	Any (1 x 2)	(2)
	3.4.4	- The demand✓ for staple food is higher than the supply✓ - Production/operating costs higher✓✓	Any (1 x 2)	(2) **(8)**

3.5
- Deforestation is the removal of vegetation from an area✓
- Plants use carbon dioxide from the atmosphere for photosynthesis✓
- Fewer trees means less photosynthesis✓
- Therefore less CO_2 removed from the atmosphere✓/more CO_2 remains in the atmosphere
- leading to enhanced greenhouse effect✓
- leading to **increased** global warming✓

Any **(3)**

[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Genetic variation is brought about in gametes through meiosis✓ in two ways:

Crossing-over ✓

- During Prophase I✓
- Homologous chromosomes✓/bivalents pair up
- Each chromosome has 2 chromatids✓
- Non-sister chromatids of the homologous pair overlap✓/cross over
- Points at which crossing-over takes place are referred to as chiasmata✓
- Genetic material is exchanged✓
- between non-sister chromatids✓
- After the process of crossing-over chromosomes have genes from its homologous partner✓
- This means that each gamete formed will have a mix of genes from maternal and paternal parents✓ Max (7)

***Random arrangement of chromosomes at the equator ✓**

- During Metaphase I✓
- Each pair of homologous chromosomes✓
- *may line up either way✓/randomly on the equator of the spindle
- *Independently of what the other pairs are doing✓/ independent assortment

- During Metaphase II✓
- Each individual chromosome✓
- *may line up either way✓/flipped on the equator of the spindle
- *This means that gametes will have differing number/mix of maternal and paternal chromosomes✓/chromatids Max (5)

(at least 1 of the *compulsory and any 4 which could include compulsory points)

Formation of an ovum

- During oogenesis✓
- diploid cells✓
- in the ovary✓
- undergo meiosis✓
- to form a primary oocyte✓
- consisting of haploid cells✓
- One cell✓ develops into an ovum

Max (5)
Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to crossing over, random arrangement and development of an ovum. There is no irrelevant information	All the information regarding crossing over, random arrangement and development of an ovum is arranged in a logical manner.	At least the following marks should be obtained: - Crossing over (**5/7**) - Random arrangement (**3/5**) - Development of an ovum (**3/5**)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Write down the question number (1.1.1–1.1.10), choose the answer and make a cross (X) over the letter (A–D) of your choice in the ANSWER BOOK.

EXAMPLE:

1.1.11	A	B	C	~~D~~

1.1.1 Monoculture refers to farming with …

A different crops every year.
B one type of irrigation.
C only one type of crop.
D plants and livestock on the same farm.

1.1.2 The part of a sperm cell that contains enzymes to digest the membrane of the ovum is the …

A tail.
B mid-piece.
C nucleus.
D acrosome.

1.1.3 Where are sperm cells in humans temporarily stored?

A Vas deferens
B Epididymis
C Urinary bladder
D Prostate gland

1.1.4 Poaching refers to the …

A relocation of organisms to a new habitat when the old habitat is destroyed by fire.
B intentional introduction of alien plants.
C use of chemicals to kill pests.
D illegal removal of organisms from their habitat.

1.1.5 The hormone that prepares the human body for an emergency situation is …

A ADH.
B thyroxin.
C adrenalin.
D GH.

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2017

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

1.1.6 A function of amniotic fluid is to …

A serve as a micro-filter preventing germs from entering the foetus.
B act as a shock absorber to protect the foetus.
C keep the foetus at a temperature lower than body temperature.
D serve as a medium for the sperm to swim in.

1.1.7 The part of the male reproductive system where meiosis takes place is the …

A seminiferous tubules.
B seminal vesicles.
C urethra.
D epididymis.

1.1.8 A scientist wants to investigate the influence of nitrogen-containing fertilisers on the pH of soil.

To make her investigation more reliable she should …

A use potassium-containing fertilisers on many soil samples.
B use nitrogen-containing fertilisers on many soil samples.
C test the effect of nitrogen-containing fertilisers on clay soils only.
D use different amounts of soil and potassium-containing fertilisers in each sample.

1.1.9 A municipality is planning the development of a new landfill site for a town. Some of the factors that need to be taken into consideration when developing this landfill site are:

(i) The site should be lined with an impermeable layer.
(ii) The site should be located far from water systems.
(iii) The site should be covered with soil daily.
(iv) All endangered species must be removed and relocated.

Which ONE of the following combinations is aimed at protecting the environment from pollution?

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

1.1.10 A cancerous tumour in the pituitary gland/hypophysis causes an undersecretion of TSH in a patient. One of the possible effects of this on the patient is that his weight ...

A decreases because his metabolic rate increases.
B remains the same because his metabolic rate is not affected.
C decreases because his metabolic rate decreases.
D increases because his metabolic rate decreases. (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 1.2.9) in the ANSWER BOOK.

1.2.1 The variety of plant and animal species on earth

1.2.2 Measurement of the total amount of carbon dioxide emissions of an individual per year

1.2.3 The type of pollution caused when water is released into a river or the sea after being heated in power stations or industries

1.2.4 The accumulation of nutrients in ponds from the over-use of fertilisers on land, stimulating excessive growth of algae

1.2.5 A hormone that stimulates the maturation of sperm and puberty in males

1.2.6 The tube in the male reproductive system that connects the epididymis with the urethra

1.2.7 The hormone which regulates the salt balance in humans

1.2.8 The hormone that stimulates the mammary glands to secrete milk

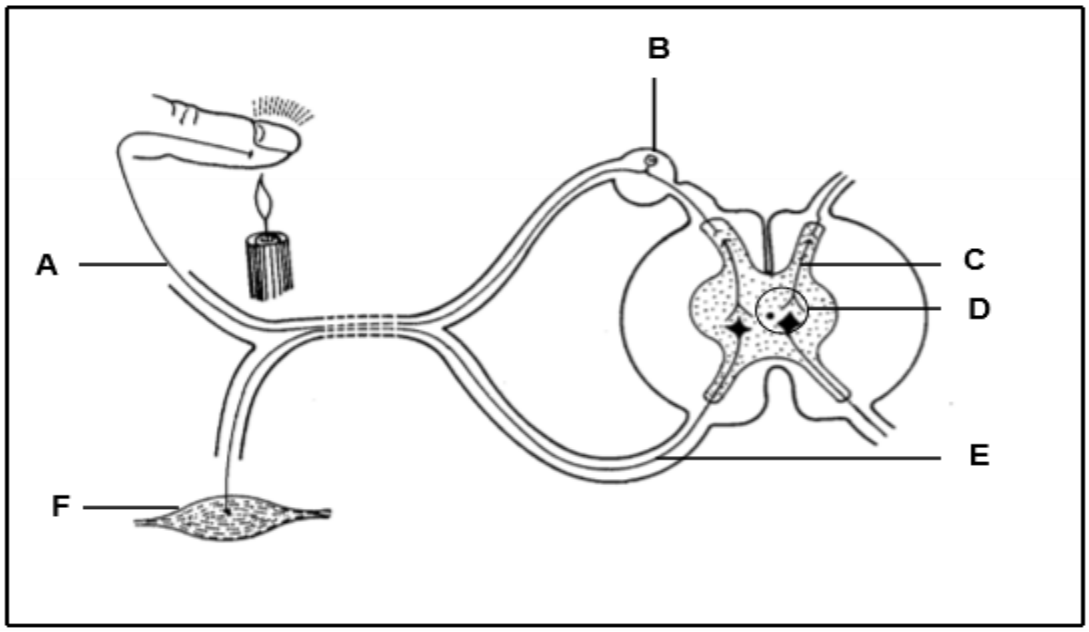
1.2.9 The division of the cytoplasm through the constriction of the cell membrane at the end of cell division (9 x 1) **(9)**

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 number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	Plant hormone that stimulates the germination of seeds	A: Gibberellins B: Abscisic acid
1.3.2	Hormones secreted by the pituitary gland/hypophysis	A: Thyroxin B: FSH
1.3.3	Secretions from this gland contribute to the formation of semen	A: Cowper's gland B: Prostate gland

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

1.4 The diagram below represents a reflex arc.



1.4.1 Give the LETTER and NAME of the part that:

(a) Controls one-directional transmission of impulses (2)

(b) Transmits impulses from the sensory neuron to the correct motor neuron (2)

(c) Transmits impulses to the cell body (2)

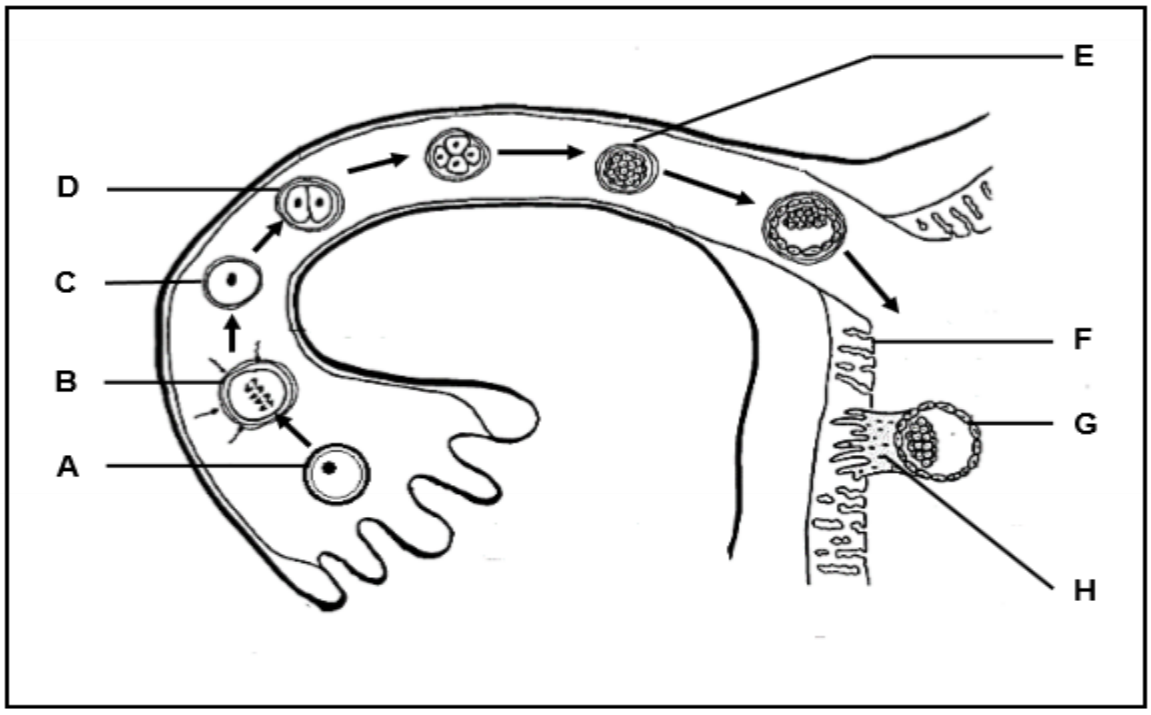
1.4.2 Give only the LETTER of the:

(a) Neuron that is damaged when a person is able to feel pain, but cannot react to the stimulus (1)

(b) Effector (1)
(8)

1.5 Study the diagram below of the sequence of events that takes place from the fertilisation of the ovum to the development of the embryo in a part of the human female reproductive system.

The arrows indicate the direction of development of one ovum after fertilisation.



1.5.1 Identify:

(a) Structure **C** (1)

(b) The stage of embryo development at **E** (1)

(c) The structure that develops from a combination of parts **F** and **H** (1)

1.5.2 Name the process that takes place:

(a) At **B** (1)

(b) When **G** attaches to part **F** (1)

1.5.3 Give the chromosome number of:

(a) The cells at **D** (1)

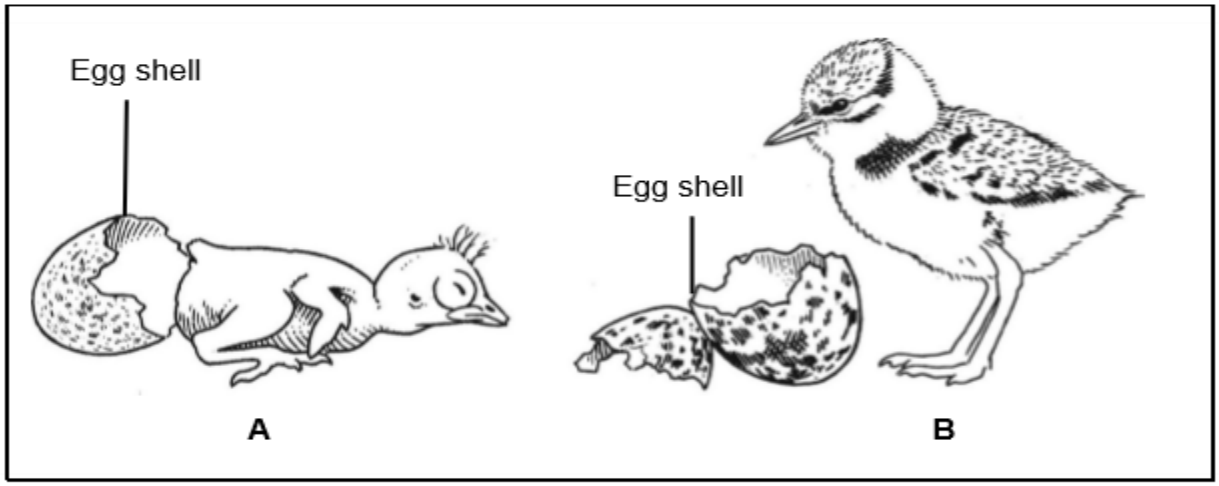
(b) Cell **A** (1)
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Study the diagram of one-day-old hatchlings **A** and **B** below. The diagram is not drawn to scale.



2.1.1 State TWO visible features in hatchling **A** which indicate altricial development. (2)

2.1.2 The diagram represents ovipary.

Explain ONE possible advantage of vivipary when compared to ovipary. (2)

2.1.3 Explain why you would expect that the yolk content of the egg of hatchling **B** was more than that of hatchling **A**. (2)
(6)

2.2 During a national census done in 2010 in a certain country, information was gathered on the number of people in the population who suffer from different eye diseases/disorders. The total population of this country was 142 million.

The results are shown in the table below.

TYPE OF EYE DISEASE/DISORDER	NUMBER OF PEOPLE (millions)
Macular degeneration (retina cells die)	2,1
Glaucoma (increased pressure in the eyeball)	2,7
Diabetic retinopathy (decreased blood flow to the retina)	7,6
Cataracts	24,4
Short-sightedness	34,1
Long-sightedness	14,1

2.2.1 Which eye disease/disorder is the least common in the population? (1)

2.2.2 What percentage of the population is suffering from long-sightedness? Show ALL your working. (3)

2.2.3 Draw a bar graph to represent the number of people in the population that suffer from cataracts, short-sightedness and long-sightedness. (6)

2.2.4 Which eye disease/disorder in the table is:

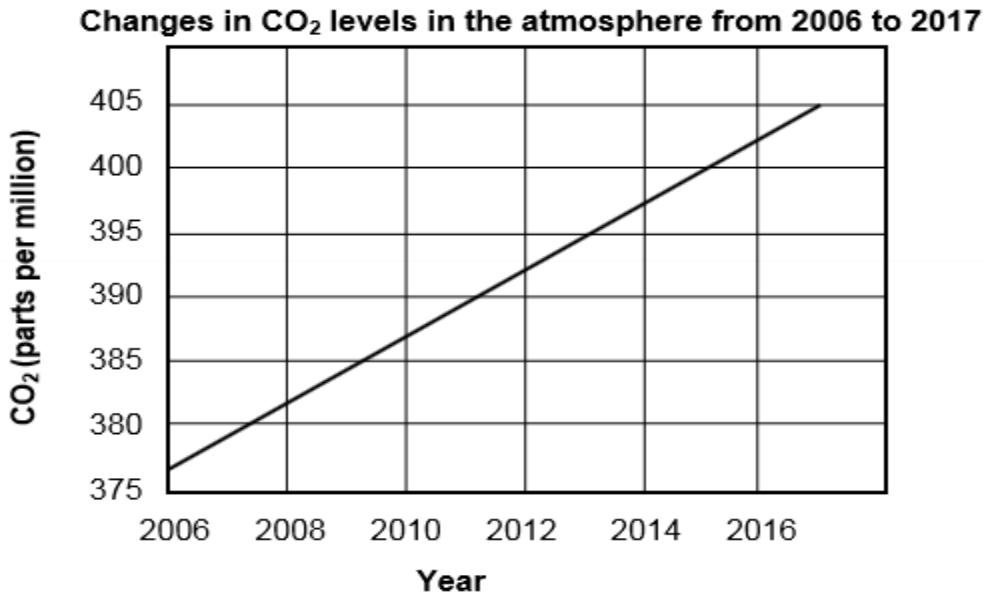
(a) The result of the lens becoming cloudy or opaque (1)

(b) Found in people that are able to see nearby objects clearly, while distant objects are blurred (1)
(12)

2.3 Read the passage and study the graph.

Accumulation of greenhouse gases in the atmosphere changes the climate. Melting glaciers, rising sea levels and new and more frequent weather extremes will change the entire world. Water supplies are decreasing, crop yields are dropping, forests are burning and our oceans are becoming more acidic.

Climate change scientists warn that if we do not reduce our greenhouse gas emissions, average global temperatures could increase by 4 °C or more by the year 2100, with frightening implications.



2.3.1 Write ONE phrase from the passage that indicates that climate change affects the following:

(a) Food security (1)

(b) Water availability (1)

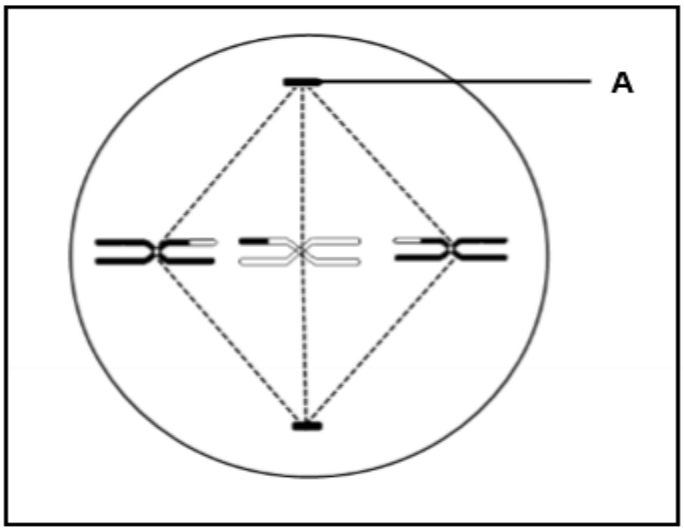
2.3.2 From the graph, state the CO_2 level in the atmosphere in 2013. (2)

2.3.3 Describe how the destruction of forests by humans contributes to global warming. (3)
(7)

2.4 *Eichornia sp.* (commonly called the water hyacinth) is an invasive alien species that reduces the water quality in many of South Africa's rivers, dams and lakes. It is a fast-growing floating plant. It can invade, cover and take over the entire surface of a lake or dam in a few months.

Explain THREE ways in which aquatic alien plants, like the water hyacinth, could upset the balance in ecosystems. **(6)**

2.5 Study the diagram of a phase during meiosis below.



2.5.1 Identify part **A**. (1)

2.5.2 Identify the phase represented in the diagram. (1)

2.5.3 Explain your answer to QUESTION 2.5.2. (2)

2.5.4 Explain how the phase identified in QUESTION 2.5.2 contributes to variation in the gametes. (2)

2.5.5 How many chromosomes:

(a) Were present in the original cell at interphase (1)

(b) Will be present in each gamete that forms at the end of meiosis (1)

2.5.6 Which process resulted in the two chromatids in each chromosome being different from each other? (1)

(9)
[40]

QUESTION 3

3.1 A scientific investigation was conducted with 20 cyclists to determine whether caffeine can increase stamina.

The procedure was as follows:

- The group of cyclists was given the first cup of coffee, containing no caffeine, to drink.
- The group then had to cycle for as long as possible at the same speed.
- They cycled around a 400 m track on level ground.
- The group was given a second cup of coffee, containing caffeine, to drink before cycling for the second time.

The table below shows the average time the group of cyclists was able to pedal after drinking decaffeinated coffee (coffee without caffeine) and drinking coffee with caffeine.

TYPE OF COFFEE	AVERAGE DURATION OF CYCLING (minutes)
Decaffeinated coffee (250 mℓ with no caffeine)	82
Coffee with caffeine (250 mℓ with caffeine)	123

3.1.1 State the question that the scientists were trying to answer through this investigation. (2)

3.1.2 Identify the:

(a) Independent variable (1)

(b) Dependent variable and how it was measured (2)

3.1.3 What is the relationship between caffeine consumption and the stamina of the cyclists? (2)

3.1.4 Explain the purpose of giving the cyclists decaffeinated coffee to drink during the investigation. (2)

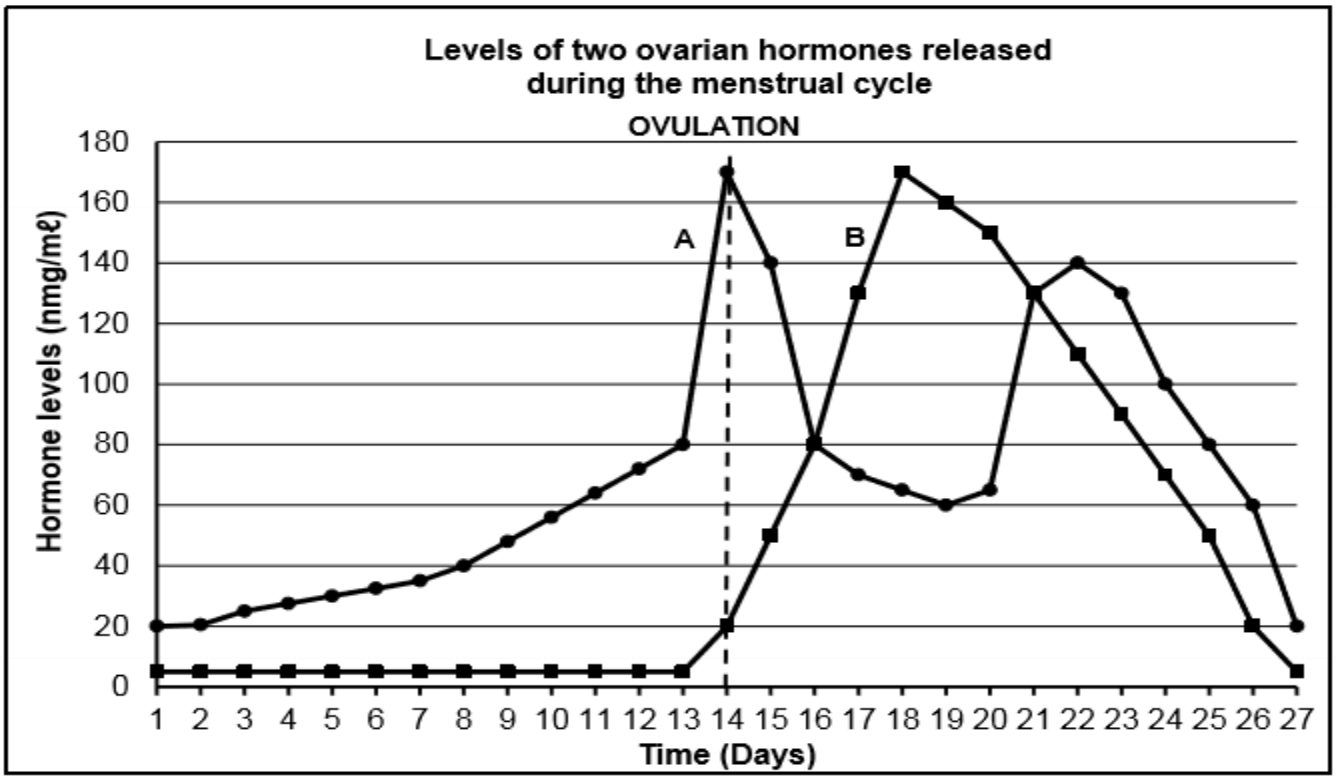
3.1.5 The cyclists were NOT told whether or not the coffee they drank contained caffeine.

Explain why the cyclists were NOT given this information. (2)

3.1.6 The procedure does not indicate how much time passed between each cycling exercise.

Explain why this is an important factor to know. (2)
(13)

3.2 Study the graph below.



3.2.1 Identify:

(a) Hormone **A** (1)

(b) Hormone **B** (1)

3.2.2 What effect does an increase in hormone **A** have on the endometrium? (2)

3.2.3 Ovulation is indicated on the graph.

(a) Define *ovulation*. (2)

(b) On which day did ovulation take place? (1)

(c) Which hormone secreted by the pituitary gland stimulates ovulation? (1)

3.2.4 Explain why high levels of hormone **B** prevent the development of new follicles. (2)

3.2.5 Explain evidence in the graph that indicates that no fertilisation took place during the menstrual cycle shown above. (3)
(13)

3.3 Diagram **A** shows an upright pot plant. Diagram **B** shows the same pot plant one week after falling over. The plant was exposed to uniform light from all directions before and after falling over.

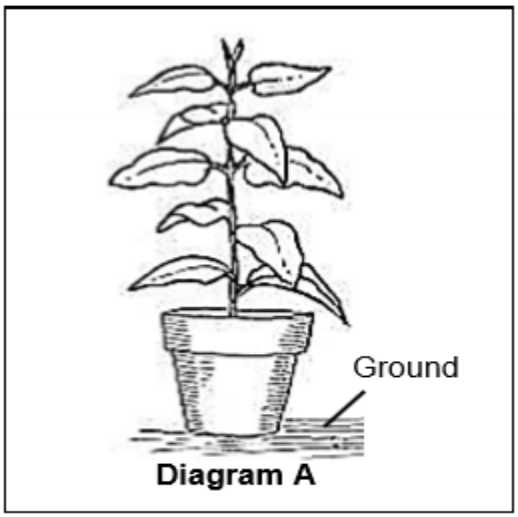


Diagram A

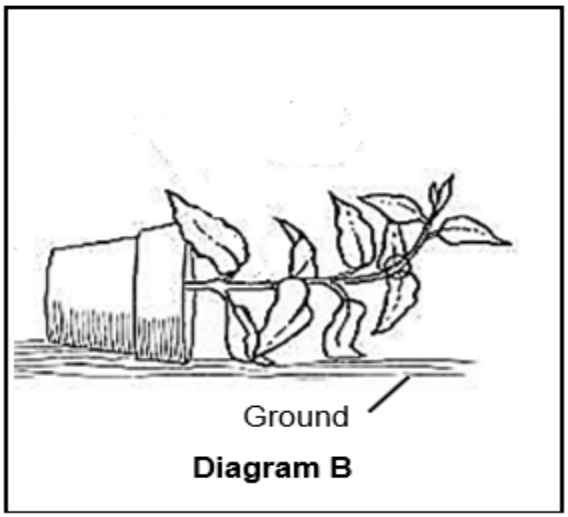


Diagram B

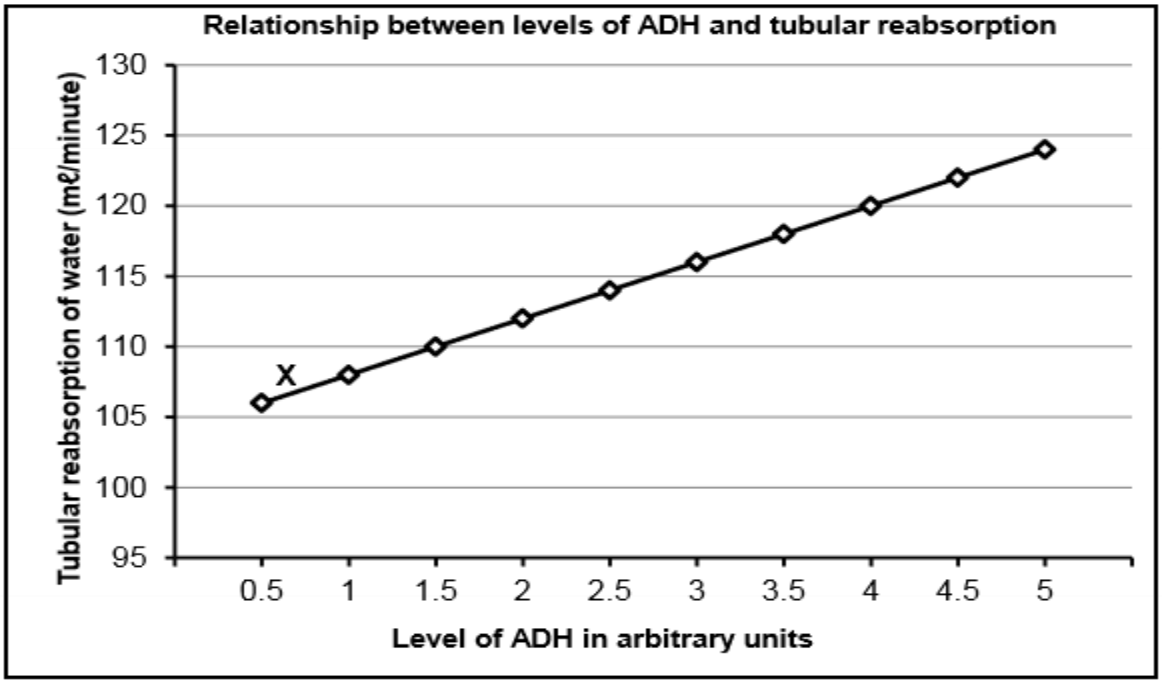
3.3.1 Which type of tropism is illustrated in diagram **B**? (1)

3.3.2 Explain why the stem of the plant bent upwards, as illustrated in diagram **B**. (4)

3.3.3 Explain the advantage that the upward bending of the stem could have for the plant. (2)

3.3.4 State how the roots in diagram **B** would react. (1)
(8)

3.4 The graph below shows the relationship between the levels of ADH in the blood and tubular reabsorption in the kidney.



3.4.1 Which structure in the body produces ADH? (1)

3.4.2 Describe the relationship shown in the graph. (2)

3.4.3 Explain why the level of ADH at **X** probably indicates that the person is experiencing a cold day. (3)
(6)

TOTAL SECTION B: 80

SECTION C

QUESTION 4

A man was accidentally locked in a cool room in which the temperature was 8 °C. He was only released after six hours when a co-worker heard his cries for help.

Describe how his body maintained his temperature at 37 °C and how his co-worker heard his cries for help.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2017

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 10 pages.

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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✓✓		
	1.1.7	A✓✓		
	1.1.8	B✓✓		
	1.1.9	B✓✓		
	1.1.10	D✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Biodiversity✓		
	1.2.2	Carbon footprint✓		
	1.2.3	Thermal✓pollution		
	1.2.4	Eutrophication✓		
	1.2.5	Testosterone✓		
	1.2.6	Vas deferens✓/sperm duct		
	1.2.7	Aldosterone✓		
	1.2.8	Prolactin✓		
	1.2.9	Cytokinesis✓	(9 x 1)	**(9)**
1.3	1.3.1	A only✓✓		(2)
	1.3.2	B only✓✓		(2)
	1.3.3	Both A and B✓✓		(2)
			(3 x 2)	**(6)**
1.4	1.4.1	(a) D✓ Synapse✓		(2)
		(b) C✓ Interneuron✓/Connector neuron		(2)
		(c) A✓ Dendrite✓		(2)
	1.4.2	(a) E✓		(1)
		(b) F✓		(1)
				(8)
1.5	1.5.1	(a) Zygote✓		(1)
		(b) Morula✓		(1)
		(c) Placenta✓		(1)
	1.5.2	(a) Fertilisation✓		(1)
		(b) Implantation✓		(1)
	1.5.3	(a) 46✓/23 pairs		(1)
		(b) 23✓		(1)
				(7)
			TOTAL SECTION A:	**50**

SECTION B

QUESTION 2

2.1 2.1.1
- The hatchling's eyes are closed✓
- The hatchling can't move✓
- The hatchling can't feed on its own✓
- The hatchling has no feathers✓/wings are not developed

(Any 2) (2)

(MARK FIRST TWO ONLY)

2.1.2
- Foetus develops inside the uterus✓ for greater protection✓
- Food is supplied by the mother✓ and is therefore supplied for a longer period✓ (Any 1 x 2) (2)

(MARK FIRST ONE ONLY)

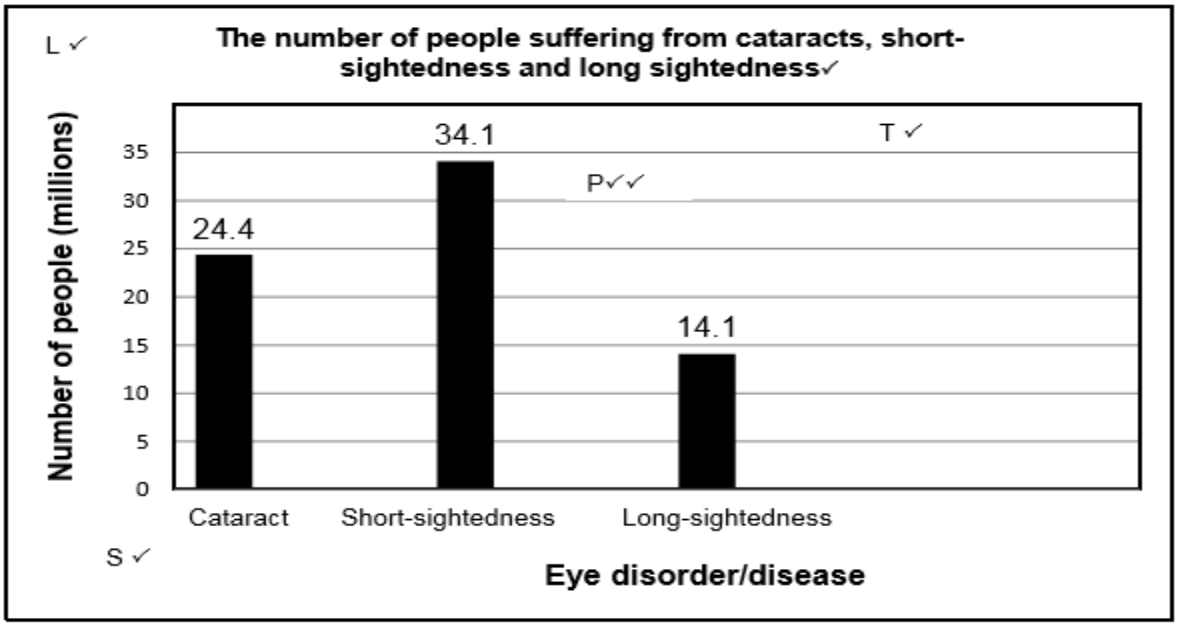
2.1.3
- More yolk allows for greater development✓ of the chick
- so that it can be more independent✓ after hatching (2)

(6)

2.2 2.2.1 Macular degeneration✓/Retina cells die (1)

2.2.2 14.1/142 ✓x 100✓ = 9.93✓%
(Accept 9.9 and 10%) (3)

2.2.3



Mark allocation of the graph

Criteria	Mark allocation
Bar graph drawn for 3 relevant diseases (T)	1
Title of graph	1
Correct scale for X-axis (equal width and spacing of the bars) and Y-axis (S)	1
Correct label and unit for X-axis and Y-axis (L)	1
Plotting of the bars (P)	0: No bars plotted correctly 1: 1 to 2 bars plotted correctly 2: All 3 bars plotted correctly

NOTE:
If a line graph is drawn – marks will be lost for the 'type and scale'
If a histogram is drawn – marks will be lost for the 'type of graph and correct scale'

(6)

2.2.4 (a) Cataract✓ (1)

(b) Short-sightedness✓ (1)
(12)

2.3 2.3.1 (a) Crop yields are dropping✓ (1)

(b) Water supplies are decreasing✓ (1)

2.3.2 395✓ parts per million✓/ppm (Accept 394 – 396 ppm) (2)

2.3.3
- Decreased photosynthesis✓
- Less CO_2 ✓used from the atmosphere
- therefore more carbon dioxide accumulates in the atmosphere✓
- This leads to the enhanced greenhouse effect✓ causing more global warming (Any 3)

OR

- Burning of forests✓
- releasing CO_2✓
- leading to the enhanced greenhouse effect✓ causing more global warming (3)

(7)

2.4
- An excessive growth of water hyacinths on the surface of the water will block out the light✓/deprive submerged plants of sunlight
- this limits photosynthesis✓/disrupts food chains/food webs

- Alien plants outcompete the indigenous species✓/Alien plants have no natural enemies
- this may lead to some of the indigenous species becoming eliminated✓/ disruption of the food chain/web

- The great demand of alien plants on natural resources,✓
- results in less resources being available for the indigenous species✓

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

(MARK FIRST THREE ONLY)

2.5	2.5.1	Centriole✓	(1)
	2.5.2	Metaphase II✓	(1)
	2.5.3	- Single chromosomes✓ - arranged at the equator✓ of the cell	(2)
	2.5.4	- There is a random arrangement of chromosomes at the equator✓/the chromosomes flip over - Causing the chromosomes in the gametes to be different✓/Chromatids move in different combinations into each gamete	(2)
	2.5.5	(a) 6✓	(1)
		(b) 3✓	(1)
	2.5.6	Crossing over✓	(1) **(9)** **[40]**

QUESTION 3

3.1 3.1.1 Does drinking coffee containing caffeine increase stamina? ✓✓ (2)

3.1.2 (a) Amount of caffeine✓/Presence or absence of caffeine (1)

(b) - Stamina✓
- By measuring the average duration of cycling✓ (2)

3.1.3 The average cycling time of the cyclists/stamina increased with the use of caffeine✓✓ (2)

3.1.4 - Decaffeinated coffee serves as a control✓
- to eliminate any other factor✓ that may cause an increase in stamina/to confirm that caffeine causes the change (2)

3.1.5 - Knowing✓ whether caffeine is taken or not
- may subconsciously influence the performance✓ of the participants.

OR

- The participants may think they have more stamina✓ if they know that they are taking caffeine and
- this may influence their performance✓ (2)

3.1.6 - If too little time passes between the exercise tests, the participants may be tired✓
- which will influence their stamina for the second cycle test and therefore the validity✓ of the investigation

OR

- The participants must be equally rested✓ for both tests
- to ensure the validity✓ of the investigation

OR

- The cyclist may perform better in the second test because they are better warmed up✓ if the time between the tests is too short.
- This may influence the validity of the investigation✓ (Any 1 x 2) (2)

(13)

3.2 3.2.1 (a) Oestrogen✓ (1)

(b) Progesterone✓ (1)

3.2.2 - It increases✓
- the thickness✓ of the endometrium/the blood vessels in the endometrium/the amount of glandular tissue in the endometrium (2)

3.2.3 (a) Release of an ovum✓ from the ovary✓/Graafian follicle (2)

(b) Day 14✓ (1)

(c) LH✓/Luteinizing hormone (1)

	3.2.4	- High levels of hormone B/progesterone will inhibit✓ - the secretion of FSH✓ **OR** - No new ova/mature follicles✓ - are required during pregnancy✓	(2)
	3.2.5	- The progesterone✓ - levels decreased✓ - because the corpus luteum degenerated✓	(3) **(13)**
3.3	3.3.1	Geotropism✓/gravitropism	(1)
	3.3.2	- Auxins✓ - accumulate at the lower✓ part of the stem - because of gravity✓ - The higher concentration of auxins at the lower part of the stem stimulates cell elongation✓/growth on the lower side of the stem - The lower concentration of auxins at the upper part of the stem inhibits cell elongation✓/growth on the upper side of the stem (Any 4)	(4)
	3.3.3	- The leaves and stem will be carried in such a way that they receive maximum sunlight✓ - for photosynthesis✓ **OR** - Exposes the flowers more favourably✓ - for pollination✓/seed dispersal	(2)
	3.3.4	The roots will grow downwards✓/towards gravity	(1) **(8)**
3.4	3.4.1	Hypothalamus✓	(1)
	3.4.2	- As the level of ADH in the blood increases the tubular reabsorption of water increases✓✓ **OR** - As the level of ADH in the blood decreases the tubular reabsorption of water decreases✓✓	(2)
	3.4.3	- On a cold day the body loses less water through sweating✓/ the blood has more water than normal - The hypothalamus✓ sends impulses to the - pituitary gland✓ - to secrete less ADH✓ (Any 3)	(3) **(6)** **[40]**
		TOTAL SECTION B:	**80**

SECTION C

QUESTION 4

Thermoregulation✓
- Receptors✓ in the skin detect the stimulus
- Send the impulses to the hypothalamus✓ of the brain
- The hypothalamus sends impulses to the blood vessels✓ of the skin
- Blood vessels constrict✓ (become narrow)/vasoconstriction occurs
- Less blood flows to the skin✓
- Less heat is lost✓ from the skin
- Less blood is sent to the sweat glands✓
- Sweat glands become less active✓/Less sweat is released
- There is less evaporation of sweat✓
- and less cooling of the skin✓ Max (8)

Hearing
- The pinna traps the sound waves✓
- and directs them into the auditory canal✓/meatus
- This causes the tympanic membrane to vibrate✓
- The vibration is transmitted to the auditory ossicles✓/(malleus, incus, stapes)
- The ossicles amplify the vibration✓
- and transmit it to the oval window✓
- The oval window vibrates✓
- creating pressure waves✓
- in the endolymph✓
- which stimulates the Organ of Corti✓
- The stimulus is converted to an impulse✓
- The impulse is transmitted via the auditory nerve✓
- to the cerebrum✓
- where sound is interpreted✓ Max (9)
Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
Only information regarding: - Thermoregulation in cold conditions and - Hearing is described No irrelevant information.	The sequence of events in thermoregulation and hearing is in the correct order.	At least the following points should be included: - Thermoregulation in cold conditions **(5/8)** - Hearing **(6/9)**
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2018

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

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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 to D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, e.g. 1.1.10 D.

1.1.1 Which part of the male reproductive system secretes testosterone?

A Cowper's glands
B Prostate gland
C Testis
D Epididymis

1.1.2 Which ONE of the following represents the CORRECT sequence of development in humans?

A Zygote →morula →blastocyst → foetus
B Morula →blastocyst →zygote →foetus
C Foetus →morula → blastocyst → zygote
D Zygote →foetus → morula →blastocyst

1.1.3 A function of the medulla oblongata is to …

A control higher thought processes.
B regulate blood glucose levels.
C regulate breathing.
D inhibit voluntary movement.

1.1.4 A disorder of the brain that is characterised by memory loss and confusion is …

A Alzheimer's disease.
B haemophilia.
C multiple sclerosis.
D Down syndrome.

1.1.5 Which ONE of the following is a part of the ear where grommets are inserted?

A Oval window
B Semi-circular canal
C Tympanic membrane
D Pinna

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1.1.6 Depth perception refers to the ability to judge distance.

An investigation was carried out to determine the effect of using one eye only or both eyes on depth perception.

Participants were asked to thread a needle as a test of depth perception. The number of attempts needed to successfully thread the needle was counted when using one eye only and then when using both eyes.

The results of the investigation are provided in the table below.

EYES USED	NUMBER OF ATTEMPTS
One eye only	12
Both eyes	2

The results of this investigation show that …

A binocular vision reduces depth perception.
B using one eye only increases depth perception.
C the number of eyes used has no effect on depth perception.
D binocular vision increases depth perception.

1.1.7 Which ONE of the following refers to a part of the nervous system that is involved in the regulation of body temperature?

A Corpus callosum
B Cerebellum
C Hypothalamus
D Spinal cord

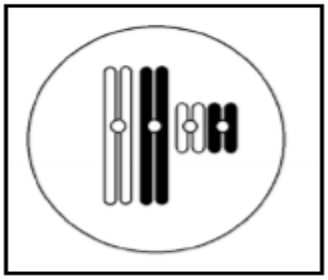
1.1.8 A person experiences the following symptoms:

- Loses weight easily
- Is always hungry
- Never feels cold

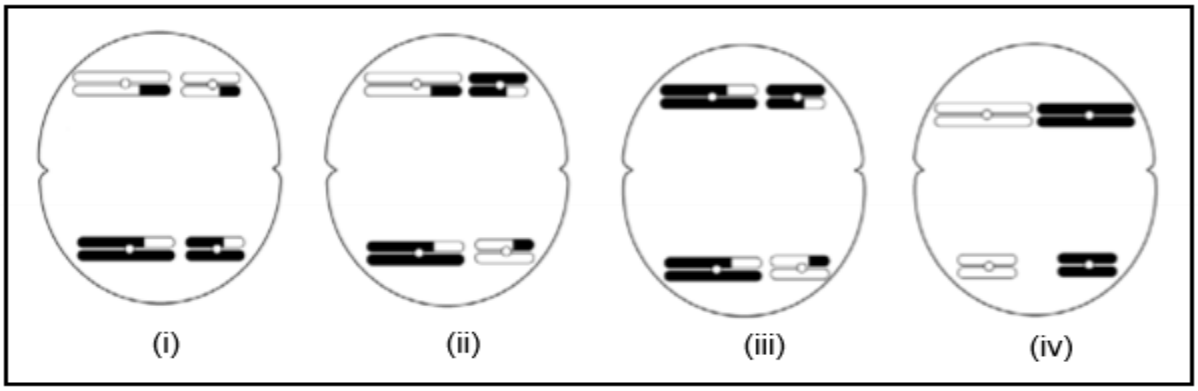
The most likely explanation for this combination of symptoms is that the person …

A secretes too much growth hormone.
B has an overactive thyroid gland.
C is diabetic and just had an insulin injection.
D has an underactive hypothalamus.

1.1.9 The diagram below represents a cell during the early stages of prophase I.



Various combinations of chromosome arrangements are given below.



Which diagrams, (i) to (iv), are possible representations of the chromosomes at the poles of the cell during telophase I of normal meiosis?

A (iii) and (iv) only
B (i) and (ii) only
C (i) and (iii) only
D (i), (ii) and (iv) only (9 x 2) **(18)**

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 1.2.7) in the ANSWER BOOK.

1.2.1 The system in the body that regulates processes by secreting hormones directly into the blood

1.2.2 The farming practice of growing a crop of a single species only

1.2.3 The production of male gametes through meiosis

1.2.4 The hormone that stimulates the production of milk in a mother after the birth of a baby

1.2.5 Sharp structures found in plants for protection from herbivores

1.2.6 A measure of the total amount of carbon dioxide emissions of a person/population/company per year

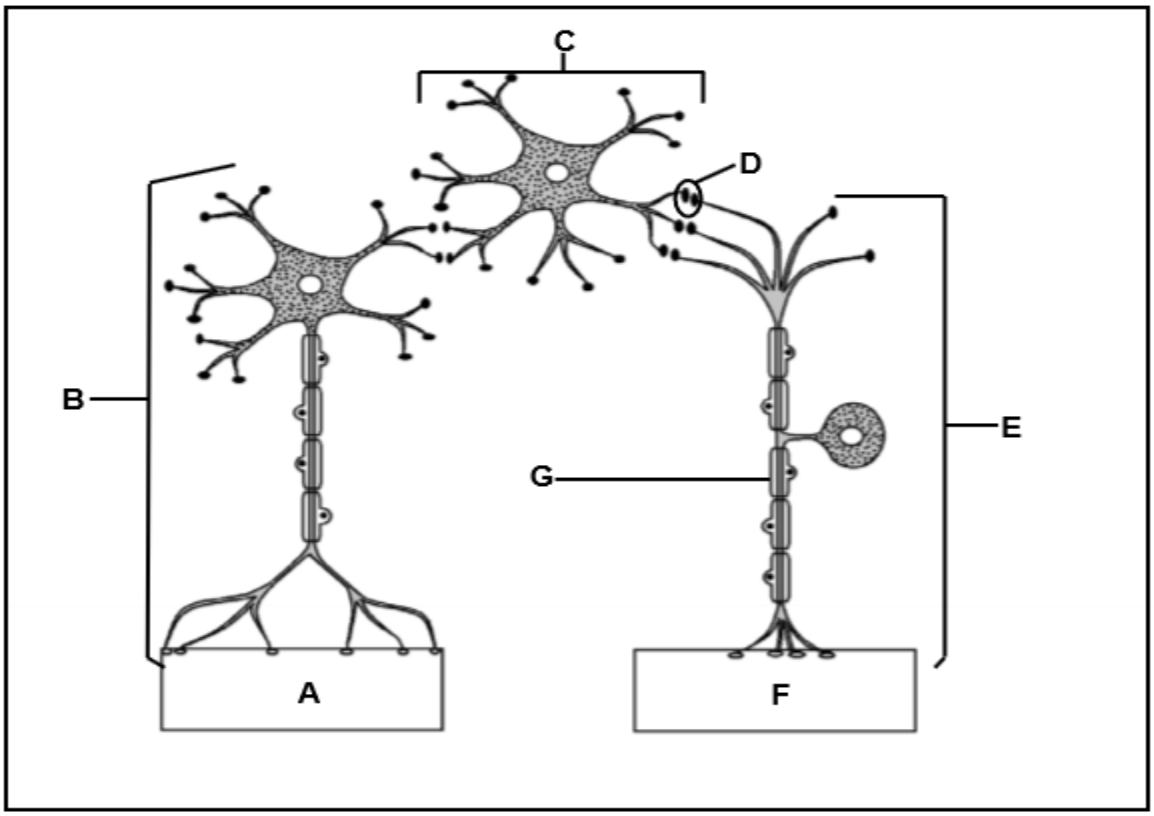
1.2.7 A plant growth response to an external stimulus (7 x 1) **(7)**

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	Decreases food security	A: B:	Alien plant invasion Exponential growth of the human population
1.3.2	The use of plant hormones to fight alien plant invasions	A: B:	Chemical control Mechanical control
1.3.3	Hormone secreted by the pituitary gland	A: B:	Aldosterone Growth hormone

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

1.4 The diagram below represents a possible 'path' followed by an impulse when a person touches a hot plate.



1.4.1 Name the 'path' represented in the diagram. (1)

1.4.2 Identify the type of neuron represented by:

(a) **B** (1)

(b) **C** (1)

(c) **E** (1)

1.4.3 Give the LETTER only of the part that represents the:

(a) Receptor (1)

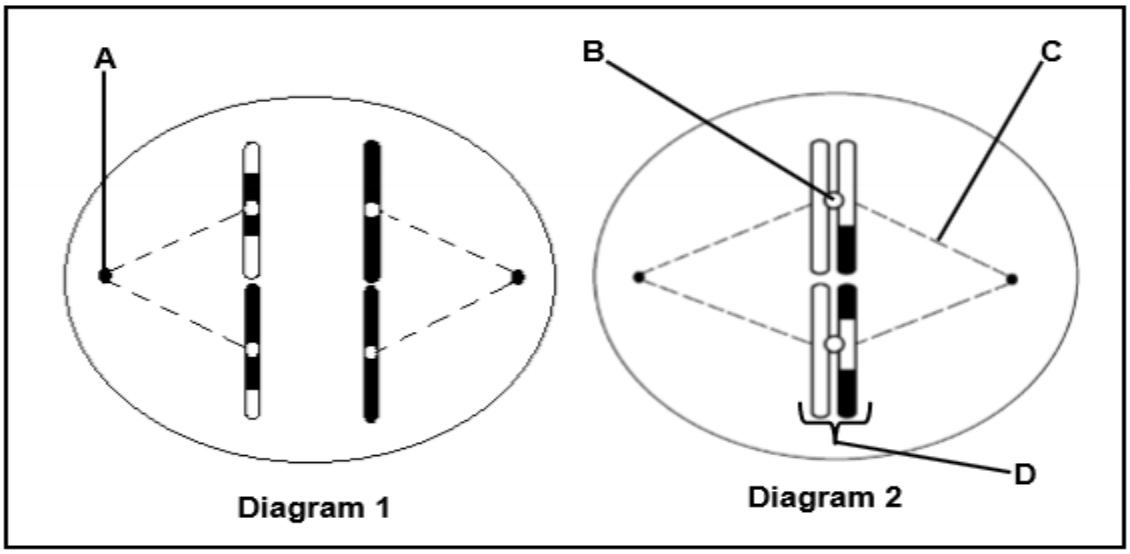
(b) Effector (1)

1.4.4 Give the LETTER and NAME of the:

(a) Region where the impulse is transmitted chemically (2)

(b) Part that has an insulating function (2)
(10)

1.5 The diagrams below represent two phases of meiosis in an organism.



1.5.1 Identify the phase of meiosis represented in Diagram **1**. (1)

1.5.2 Identify part:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

1.5.3 State what happens to structure **D** in the next phase of meiosis. (1)

1.5.4 Name the process during which genetic material was exchanged, as shown in the diagrams above. (1)

1.5.5 State the consequence if the process named in QUESTION 1.5.4 does not occur. (1)

1.5.6 Give the number of chromosomes present in:

(a) The original parent cell in this organism (1)

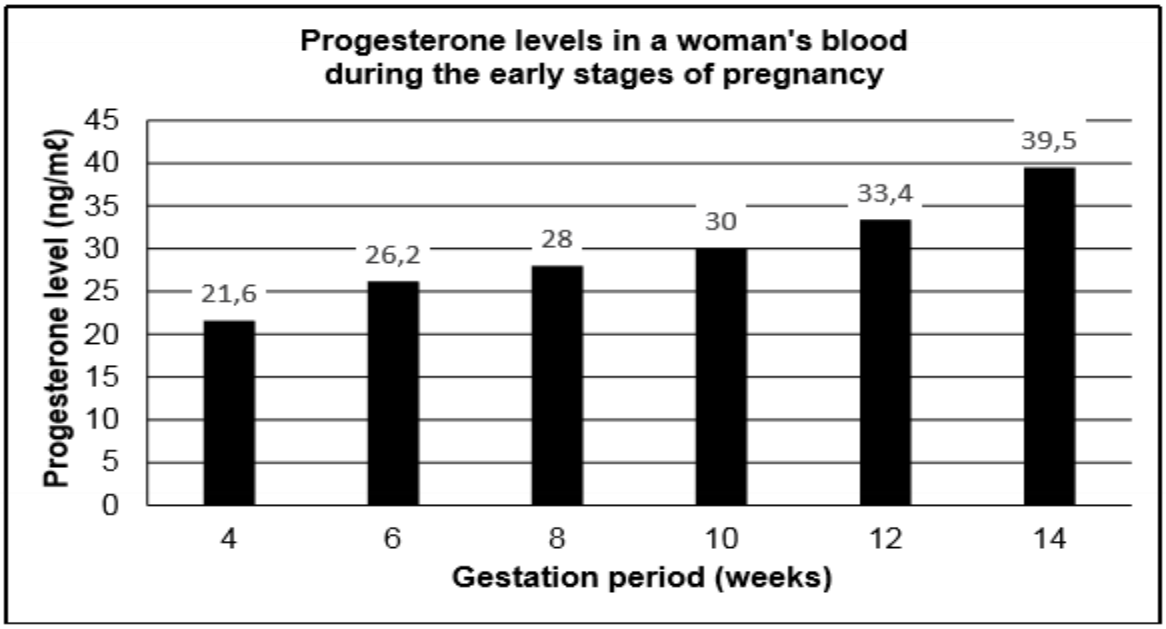
(b) A human cell in the same phase as that shown in Diagram **2** (1)
(9)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The graph below shows the concentration of progesterone in a woman's blood during the early stages of pregnancy.



2.1.1 Name TWO structures responsible for producing progesterone during pregnancy. (2)

2.1.2 Describe the general trend in the change in progesterone levels in the woman's blood during the early stages of pregnancy. (1)

2.1.3 Describe the negative feedback mechanism that occurs between progesterone and FSH during pregnancy. (2)

2.1.4 State the importance of the negative feedback mechanism described in QUESTION 2.1.3. (1)

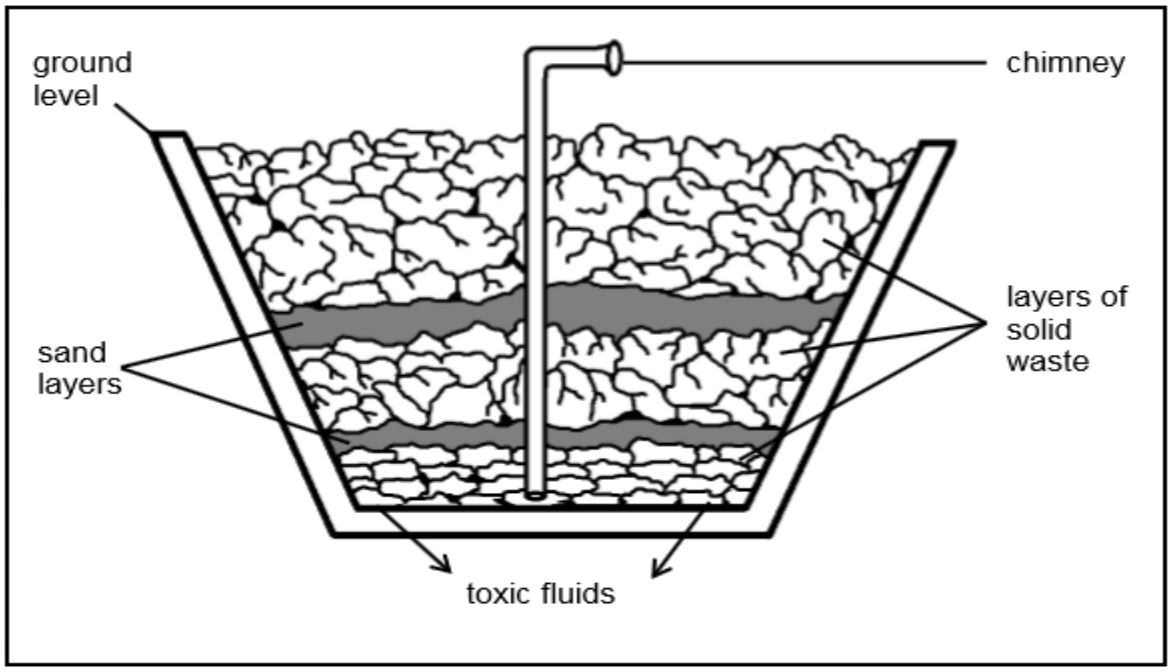
2.1.5 Calculate the percentage increase in progesterone levels between week **4** and week **14**. Show ALL calculations. (3)

2.1.6 The woman's progesterone level in week 16 was 25 ng/mℓ.

(a) Explain why this woman should be concerned about the decrease in progesterone levels. (2)

(b) Suggest ONE way in which this problem could possibly be treated by a doctor. (1)
(12)

2.2 The diagram below represents the structure of a landfill site.



2.2.1 Name the flammable gas that escapes through the chimney. (1)

2.2.2 State ONE possible use for the gas in QUESTION 2.2.1. (1)

2.2.3 Give ONE reason for covering the waste with layers of sand at landfill sites at regular intervals. (1)

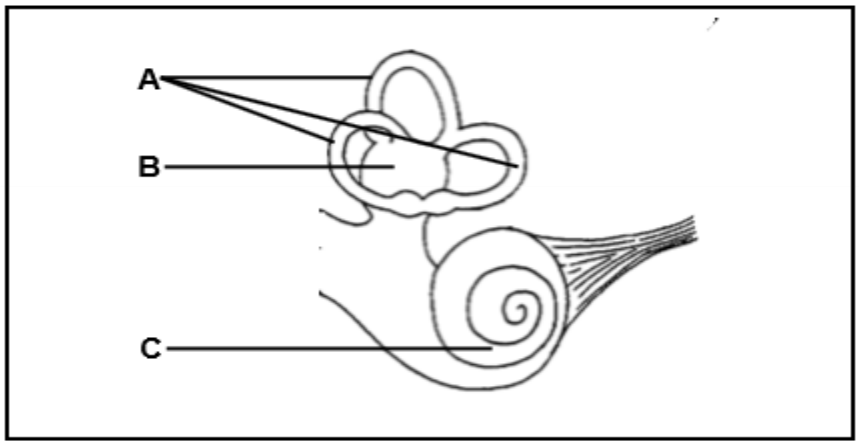
2.2.4 Give ONE visible reason why this landfill site would not be in use for much longer. (1)

2.2.5 State TWO ways in which the:

(a) Landfill site could be used after rehabilitation (2)

(b) Amount of waste going to the landfill site could be reduced (2)
(8)

2.3 The diagram below represents a part of the human ear.



2.3.1 Name the part of the brain that receives impulses from:

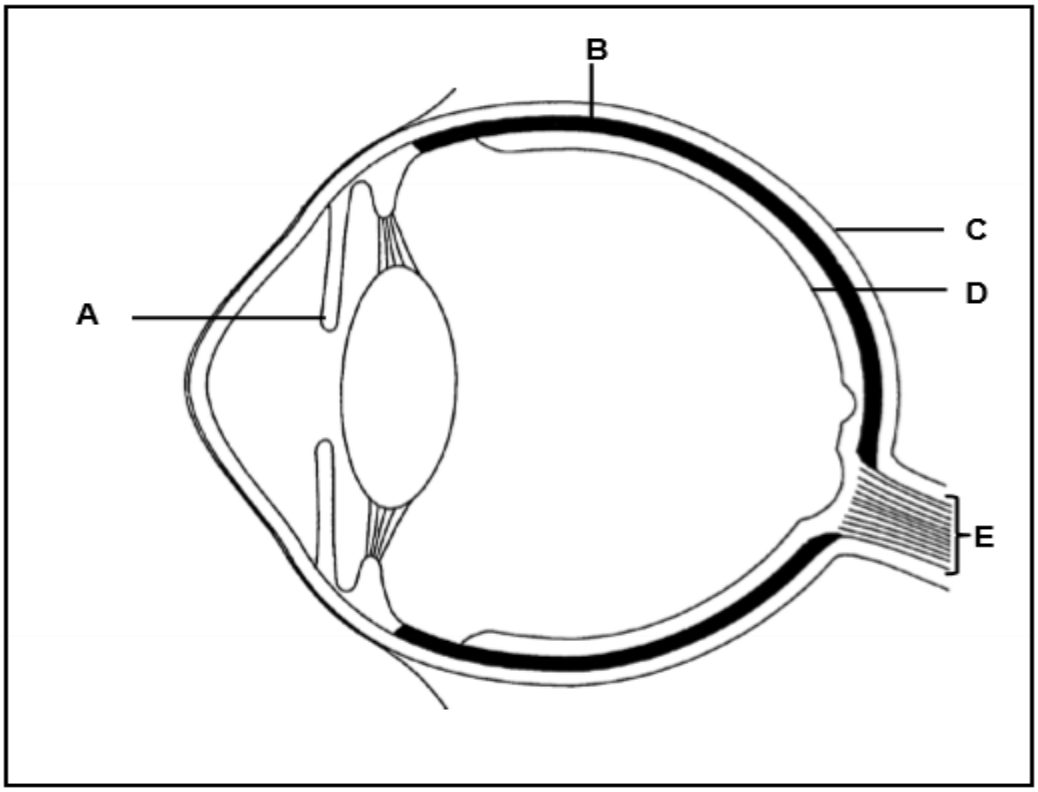
(a) Parts **A** and **B** (1)

(b) Part **C** (1)

2.3.2 Name the receptor found in part **C**. (1)

2.3.3 Explain TWO ways in which part **A** in the diagram is structurally suited to maintain balance. (4)
(7)

2.4 The diagram below shows the structure of the human eye.



2.4.1 Identify part:

(a) **B** (1)

(b) **C** (1)

2.4.2 Explain the effect on a person's vision if part **E** is cut. (2)

2.4.3 Part **D** can be damaged by very bright light.

Describe how part **A** helps to protect part **D** in very bright light. (4)

2.4.4 In a condition called presbyopia, lenses lose their elasticity and therefore maintain a constant flat shape.

(a) Explain how this condition would affect a person's vision. (4)

(b) Suggest the shape of the lens that may be prescribed by a doctor to correct this disorder. (1)

(13)
[40]

QUESTION 3

3.1 The table below gives information about the sources of marine pollution.

SOURCES OF MARINE POLLUTION	PERCENTAGE CONTRIBUTION TO POLLUTION
Sewage	30
Farm runoff	20
Air pollution	20
Marine transportation	10
Industrial waste	10
Offshore oil	5
Organic litter	5

3.1.1 Draw a bar graph to represent the percentage contribution of sewage, farm runoff, industrial waste and organic litter to marine pollution. (7)

3.1.2 Untreated sewage and organic litter sometimes flow into dams.

Describe how this pollution reduces oxygen levels in the water. (4)
(11)

3.2 The endocrine system plays a role in helping a person to cope during a dangerous situation.

3.2.1 Name the hormone that is secreted in the person's body in response to a dangerous situation. (1)

3.2.2 State THREE effects that the hormone in QUESTION 3.2.1 has on the body. (3)
(4)

3.3 Describe the homeostatic control of blood glucose levels in a person who consumed a drink with a large amount of sugar. **(5)**

3.4 An investigation was carried out to determine the influence of alcohol on the volume of urine produced.

12 healthy, 23-year-old males of similar height and mass participated in the investigation.

The investigation was conducted as follows:

- The men were divided into two groups of six each, Group **A** and Group **B**.
- The two groups ate the same food and did the same exercise for the 24-hour-period before testing.
- Each group was given the following to drink after the 24-hour-period:
  - Group **A**: 1 litre of alcohol-free beer (beer that does not contain alcohol)
  - Group **B**: 1 litre of alcoholic beer
- Urine was collected from each man every hour.

Assume that the volume of urine collected is equal to the volume of urine produced.

The results of the investigation are shown in the table below.

TIME OF COLLECTION	AVERAGE VOLUME OF URINE COLLECTED (mℓ)	
	GROUP A	GROUP B
After 1 hour	599	643
After 2 hours	413	504
After 3 hours	112	132

3.4.1 State:

(a) The dependent variable in this investigation (1)

(b) TWO planning steps the investigators had to take before the investigation could start (2)

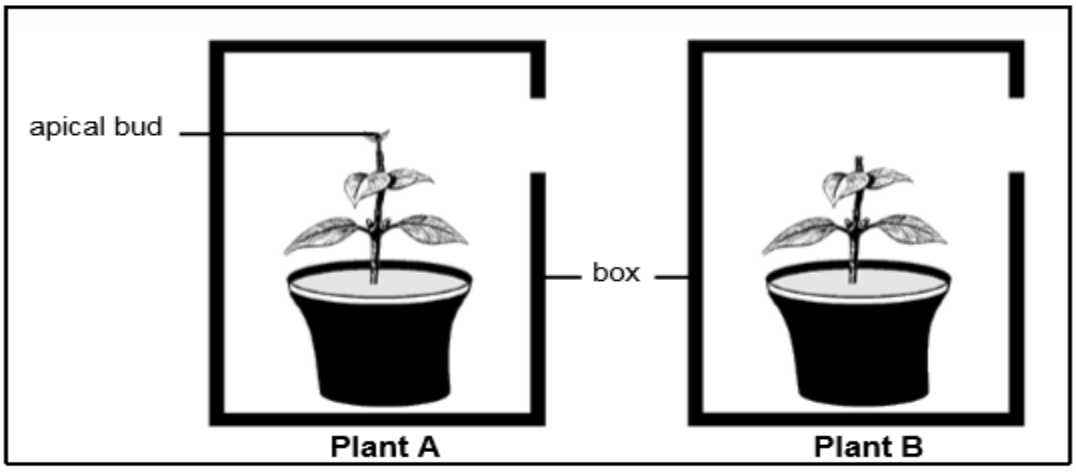
(c) TWO factors that need to remain constant, other than the ones already mentioned (2)

(d) TWO steps that the investigators took to ensure the reliability of the investigation (2)

3.4.2 Based on the results, explain how the intake of alcohol influences the secretion of ADH and consequently the volume of urine that is produced by the kidneys. (4)
(11)

3.5 The diagram below shows two plants (**A** and **B**) at the start of an investigation. The plants were treated in the following ways:

- No changes were made to plant **A**.
- The apical bud of plant **B** was removed.
- Each plant was covered with a box with a single opening, as shown in the diagram, and placed in a lit room.



3.5.1 State the role of the boxes in the investigation. (1)

3.5.2 Name the hormone that is removed by cutting off the apical bud from plant **B**. (1)

3.5.3 Tabulate TWO differences between plants **A** and **B** you would expect after two weeks. (5)

3.5.4 The diagram below shows plant **B** seven days after being sprayed with gibberellins.



Explain the effect that the gibberellins had on the plant by referring to the changes observed in the diagram. (2)
(9)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Protection, nourishment and gaseous exchange are important requirements for the successful development of an embryo.

Describe how gaseous exchange and the nourishment of the embryo occur in an amniotic egg and how gaseous exchange and nourishment as well as protection of the foetus occur in humans.

Content: (17)
Synthesis: (3)

NOTE: NO marks will be awarded for answers in the form of a table, flow charts or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2018

FINAL MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 11 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	A✓✓		
	1.1.3	C✓✓		
	1.1.4	A✓✓		
	1.1.5	C✓✓		
	1.1.6	D✓✓		
	1.1.7	C✓✓		
	1.1.8	B✓✓		
	1.1.9	B✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Endocrine✓		
	1.2.2	Monoculture✓		
	1.2.3	Spermatogenesis✓		
	1.2.4	Prolactin✓		
	1.2.5	Thorns✓		
	1.2.6	Carbon footprint✓		
	1.2.7	Tropism✓		**(7)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	A only✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	Reflex arc✓		(1)
	1.4.2	(a) B - Motor✓ neuron/multipolar neuron/efferent neuron		(1)
		(b) C - Interneuron✓/connector neuron		(1)
		(c) E - Sensory✓ neuron/unipolar neuron/afferent neuron		(1)
	1.4.3	(a) F✓		(1)
		(b) A✓		(1)
	1.4.4	(a) D✓ - Synapse✓		(2)
		(b) G✓ - Myelin sheath✓		(2) **(10)**

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1.5	1.5.1	Anaphase II✓	(1)
	1.5.2	(a) Centriole✓	(1)
		(b) Centromere✓	(1)
		(c) Spindle fibre✓	(1)
	1.5.3	The chromatids separate✓/centromere splits	(1)
	1.5.4	Crossing over✓	(1)
	1.5.5	Reduces genetic variation✓	(1)
	1.5.6	(a) Four✓/4	(1)
		(b) 23✓	(1) **(9)**

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1
- Corpus luteum✓
- Placenta✓
(Mark first TWO only) (2)

2.1.2 Progesterone levels are increasing✓ (1)

2.1.3
- High levels of progesterone✓
- inhibits/causes a decrease in the secretion of FSH✓ (2)

2.1.4 To prevent the growth of a new follicle✓/ovulation during the pregnancy (1)

2.1.5 $39,5 - 21,6$✓ $= 17,9$

$\frac{17,9}{21,6} \times 100$✓ $= 82,87$✓/82,9/83% (3)

2.1.6 (a)
- The endometrium/uterine lining/placenta will not be maintained✓
- Menstruation will begin✓/the placenta will detach/ she will have a miscarriage (2)

(b) Give the woman progesterone supplements✓ (1)
(12)

2.2 2.2.1 Methane✓/CH_4 (1)

2.2.2 Used as a fuel✓/cooking/heating/light/electricity
(Mark first ONE only) Any (1)

2.2.3
- Reduce pests✓/rats/flies
- Reduce bad smells✓/pollution
- To promote decomposition✓
(Mark first ONE only) Any (1)

2.2.4 It is full✓/It has reached ground level
(Mark first ONE only) (1)

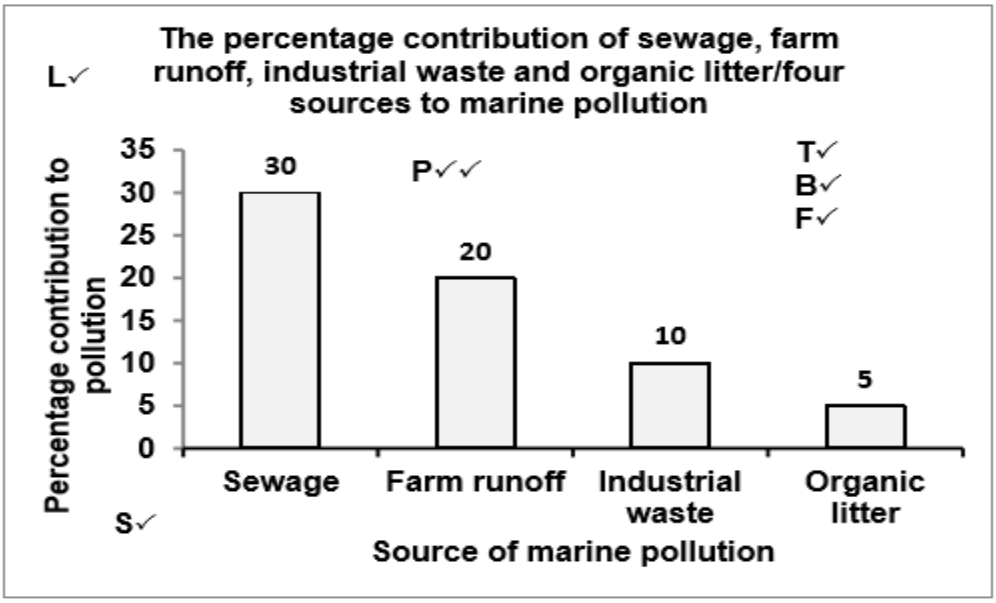
2.2.5 (a)
- Golf course✓
- Recreational park✓
- Car park✓
- Forestry✓
(Mark first TWO only) Any (2)

(b)
- Reuse✓ waste materials
- Recycle✓ waste materials
- Reduce the amount of waste produced✓
- Manufacture more products that can be recycled✓
(Mark first TWO only) Any (2)
(8)

2.3	2.3.1	(a)	Cerebellum✓	(1)
		(b)	Cerebrum✓	(1)
	2.3.2		Organ of Corti✓	(1)
	2.3.3		- The semi-circular canals/part **A** contain fluid✓ /endolymph which moves when the person moves✓ - There are cristae✓/receptors present which convert the stimulus to an impulse✓/are sensitive to the movement of the fluid - The canals lie on three different planes✓ to detect movement in any direction✓ **(Mark first TWO only)** Any 2 x 2	(4) **(7)**
2.4	2.4.1	(a)	Choroid✓	(1)
		(b)	Sclera✓	(1)
	2.4.2		- The person cannot see✓/is blind in that eye/has no binocular vision - because the impulses from the retina cannot be transmitted to the cerebrum✓ from one eye	(2)
	2.4.3		- The circular muscles of part A/the iris contract✓ - and the radial muscles relax✓ - making the pupil smaller✓/constricting the pupil - so that less light enters the eye✓	(4)
	2.4.4	(a)	- Accommodation will not occur✓ - The refractive power of the lens is low✓/lens cannot become more convex - and light rays are not refracted/bent enough✓ - and would not be focussed onto the retina✓/would be focussed behind the retina/a clear image would not be formed on the retina - Therefore the person cannot focus on objects that are closer than 6m✓/the person can only focus on distant objects Any	(4)
		(b)	Convex✓/biconvex	(1) **(13)** **[40]**

QUESTION 3

3.1 3.1.1



Mark allocation of the graph

Criteria	Mark Allocation
Title of graph (**T**) including both variables	1
Bar graph drawn (**B**)	1
Correct scale for X-axis (equal width and spacing of the bars) and Y-axis (**S**)	1
Correct label and unit for X-axis and Y-axis (**L**)	1
Only the correct four bars have been plotted (**F**)	1
Plotting of the bars (**P**)	0: No bars plotted correctly 1: 1 to 3 bars plotted correctly 2: All 4 bars plotted correctly

NOTE:
If a line graph is drawn – marks will be awarded for the 'title and label for X and Y axes' only
If a histogram is drawn – marks will be lost for the 'type of graph and correct scale' only

(7)

3.1.2
- The sewage/organic litter contains nutrients✓
- The amount of nutrients in the water increases✓/eutrophication occurs
- causing an algal bloom✓
- The algae cover the surface of the water✓/blocks out sunlight
- causing water plants to die✓
- thereby reducing photosynthesis✓
- and increasing decomposition✓ thus reducing the oxygen content of the water

Any (4)
(11)

3.2 3.2.1 Adrenalin✓ (1)

3.2.2
- Increases the heart rate✓
- Increases blood pressure✓
- Stimulates the conversion of glycogen into glucose✓
- Increases the blood supply to the heart✓/skeletal muscles
- Decreases blood flow to the digestive system✓
- Decreases blood flow to the skin✓
- Increases muscle tone✓
- Increases the rate/depth of breathing✓
- Increases the rate of respiration✓/metabolism
- Dilates/increases the diameter of the pupils✓

(Mark first THREE only) Any (3)
(4)

3.3
- Blood glucose levels rise✓ above normal
- The pancreas✓/islets of Langerhans
- secretes insulin✓ into the blood
- which travels to the liver✓/muscle cells
- and stimulates them to absorb glucose✓ from the blood
- and to convert the excess glucose into glycogen✓
- which decreases the blood glucose levels✓ to normal

Any **(5)**

3.4 3.4.1 (a) Volume of urine✓ (1)

(b)
- Decide on a time✓/date/place to conduct the investigation
- Decide on the apparatus✓/materials that need to be used
- Decide how to record the data✓
- Decide on the number of participants to include✓
- Decide what factors to keep constant✓/example of factor to be kept constant
- Decide on the composition of the sample✓
- Develop an indemnity form for the participants to sign✓
- Recruit✓/get permission from volunteers to participate

(Mark first TWO only) Any (2)

(c) - The same room✓/environment/temperature
- The same apparatus✓
- The same investigator✓
- No other liquid intake by both groups✓
- Same type of beer✓
(Mark first TWO only) Any (2)

(d) - They used a large sample✓/12 men/6 men in each group
- The average volume of urine produced was calculated✓ (2)
(Mark first TWO only)

3.4.2
- Alcohol inhibits/reduces the secretion of ADH✓
- causing the renal tubules✓/distal convoluted tubules and collecting ducts
- to become less permeable to water✓
- Less water is reabsorbed✓ back into the blood
- A larger volume of urine is produced✓ Any (4)
(11)

3.5 3.5.1 To ensure unilateral light✓/the plant receives light from one direction only (1)

3.5.2 Auxins✓/IAA/indole acetic acid (1)

3.5.3 <u>Differences between plants A and B after two weeks</u>

T✓

Plant A	Plant B
The stem of the plant will bend towards the light✓	The stem of the plant will remain straight✓/will not bend towards the light
Does not have lateral branches✓/only lower lateral branches will start to grow	All the lateral branches will grow✓along the whole stem
The plant will be taller✓	The plant will be shorter✓

(Mark first TWO only) 1 table (T) + (2 x 2) (5)

3.5.4
- The gibberellins cause the stem/plant to grow longer✓/taller
- because gibberellins stimulate the elongation/growth of the internodes✓ (2)
(9)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Gaseous exchange in amniotic eggs **(A)**
- Gases move by diffusion✓
- into and out of the egg✓
- through the porous shell✓/allantois/chorion

Nourishment of the embryo in amniotic eggs
- The egg contains yolk✓/albumin
- which provide nutrients✓ to the embryo

Max (4)

Gaseous exchange and nourishment of the foetus in humans **(F)**
- In the placenta✓
- the mothers blood comes into close contact with the foetal blood✓
- Oxygen✓
- and nutrients✓
- diffuse from the mothers blood into the foetal blood✓
- in the umbilical veins✓
- This nutrient rich blood is carried to the foetus through the umbilical cord✓
- Carbon dioxide diffuses from the foetal blood✓
- in the umbilical artery✓
- into the maternal blood✓

Max (7)

Protection of the foetus in humans **(P)**
- The foetus develops inside the uterus✓
- and is protected by the mothers body✓
- Antibodies from the mothers blood✓
- pass into the foetus' blood and provide immunity✓
- The placenta acts as a microfilter✓
- preventing toxins from the mother entering the foetal blood✓
- The foetus is enclosed in the amnion✓
- which contains amniotic fluid✓
- The amniotic fluid provides protection against dehydration✓
- and acts as a shock absorber✓
- It provides a suitable temperature✓ for the developing embryo

Max (6)
Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to: - Gaseous exchange and nourishment in amniotic eggs - Gaseous exchange, nourishment and protection in the human foetus There is no irrelevant information	All the information regarding the: - Gaseous exchange and nourishment in amniotic eggs - Gaseous exchange, nourishment and protection in the human foetus is arranged in a logical manner.	At least the following points should be included: - Gaseous exchange and nourishment in amniotic eggs **(2/4)** - Gaseous exchange and nourishment in the human foetus **(5/7)** - Protection in the human foetus **(4/6)**
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2019

MARKS: 150

TIME: 2½ hours

This question paper consists of 18 pages.

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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 to D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, e.g. 1.1.10 D.

1.1.1 Which ONE of the following involves the development of the young inside the uterus of the mother and where it receives nutrients through the placenta?

A Ovipary
B Vivipary
C Ovovivipary
D Amniotic egg

1.1.2 Below is a list of terms relating to reproduction:

(i) Precocial development
(ii) Altricial development
(iii) Amniotic egg
(iv) Parental care

Which of the terms above refer to strategies used by birds that incubate their eggs in a nest and feed their young until they are able to fly?

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

1.1.3 Which part of the eye absorbs excess light?

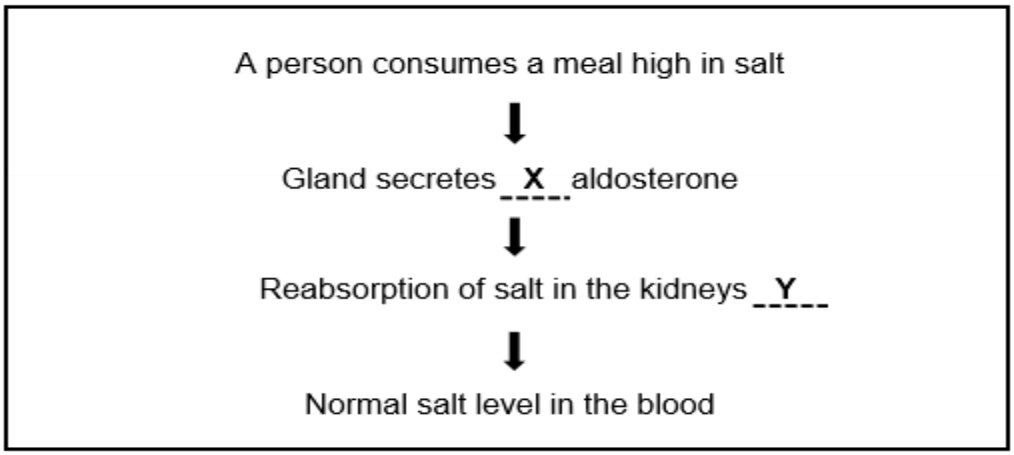
A Retina
B Blind spot
C Choroid
D Optic nerve

1.1.4 Which ONE of the following activities will help to maintain biodiversity in a country?

A Habitat destruction
B Poaching
C The introduction of alien plants
D Sustainable use of plant and animal resources

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QUESTIONS 1.1.5 AND 1.1.6 ARE BASED ON THE FLOW DIAGRAM BELOW.



1.1.5 Which gland secretes aldosterone?

A Adrenal
B Pituitary
C Thyroid
D Pancreas

1.1.6 Which ONE of the following is CORRECT with regard to **X** and **Y** in the flow diagram?

	X	Y
A	More	Increases
B	Less	Increases
C	More	Decreases
D	Less	Decreases

1.1.7 During an investigation a man was placed in an airtight room. Sensors were used to monitor his breathing and heart rate. The investigators were able to change the environmental conditions in the room.

After 30 minutes the man's breathing and heart rate had increased.

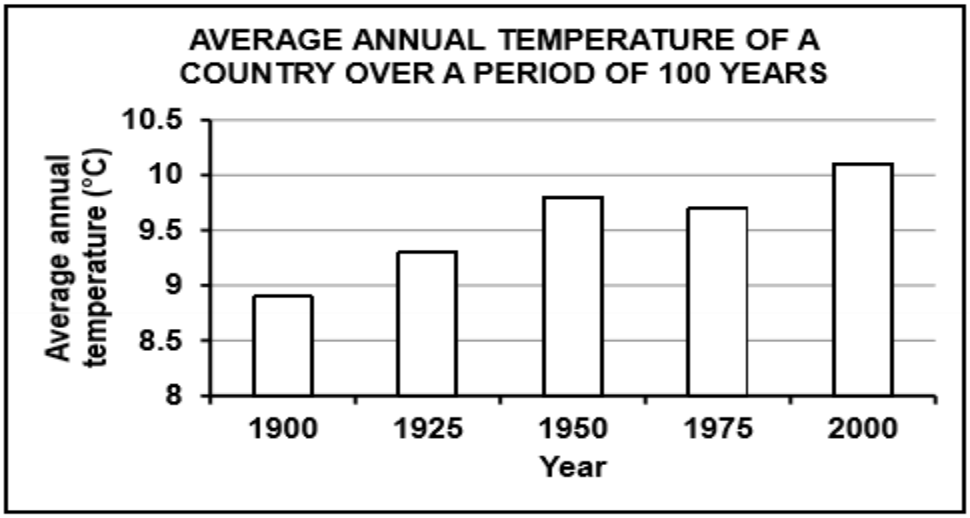
The investigators changed the environmental conditions in the room by …

A decreasing the light intensity.
B increasing the amount of carbon dioxide in the air.
C decreasing the humidity.
D increasing the amount of oxygen in the air.

1.1.8 Which ONE of the following is a consequence of the destruction of wetlands?

A Increased run-off of rainwater
B Increased biodiversity
C Increase in water availability
D Increase of water quality

1.1.9 The annual average temperature of a country was recorded over the past 100 years. The information is represented in the graph below.



Which ONE of the following is a possible inference that can be made from the information in the graph?

A Global warming has caused habitat destruction
B Ozone depletion has occurred
C Carbon dioxide levels in the atmosphere are increasing
D Desertification has occurred as a result of global warming

(9 x 2) **(18)**

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 structures formed by the centrioles during cell division

1.2.2 Receptors that provide information about the position of the head

1.2.3 A hormone that regulates the water balance in the body

1.2.4 A flammable gas produced in landfills

1.2.5 Areas with porous rock that store water

1.2.6 The part of the brain that regulates breathing

1.2.7 The process of maintaining a constant internal environment in the human body

1.2.8 The membrane that, together with the endometrium, forms the placenta

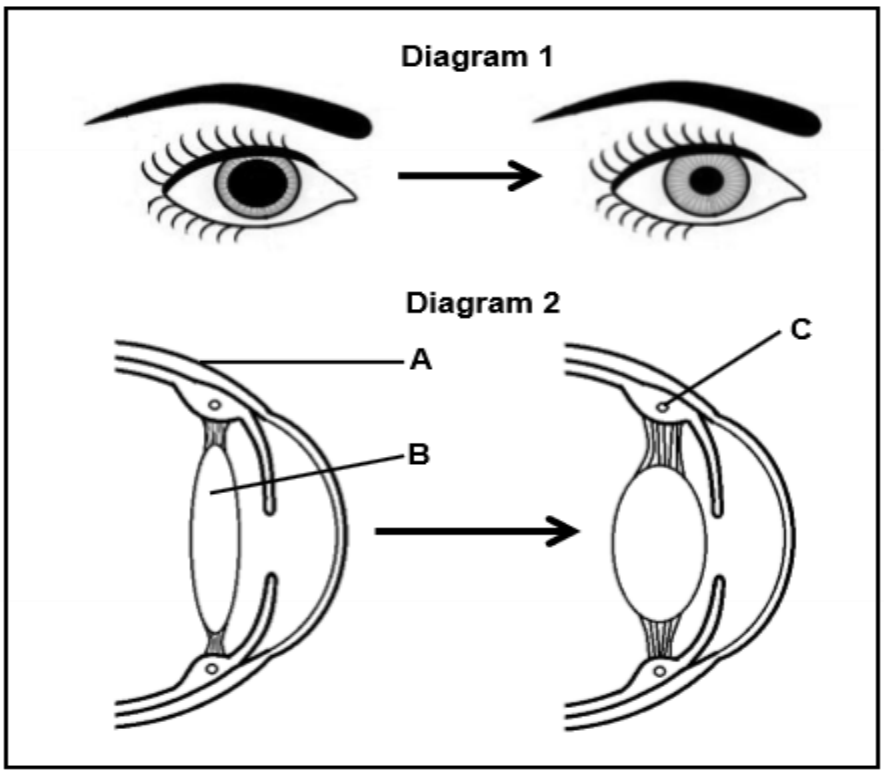
1.2.9 The structure in the head of a sperm containing digestive enzymes **(9)**

1.3 Indicate whether each of the statements 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	Unfertilised eggs are released from the female's body	A: B:	Asexual reproduction External fertilisation
1.3.2	Plant hormone that helps plant seeds to survive unfavourable conditions, e.g. droughts	A: B:	Gibberellins Abscisic acid
1.3.3	Hormones secreted by the pituitary gland	A: B:	Prolactin Growth hormone

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

1.4 The diagrams below show the response of the human eye to two different conditions.



1.4.1 Identify part:

(a) **A** (1)

(b) **B** (1)

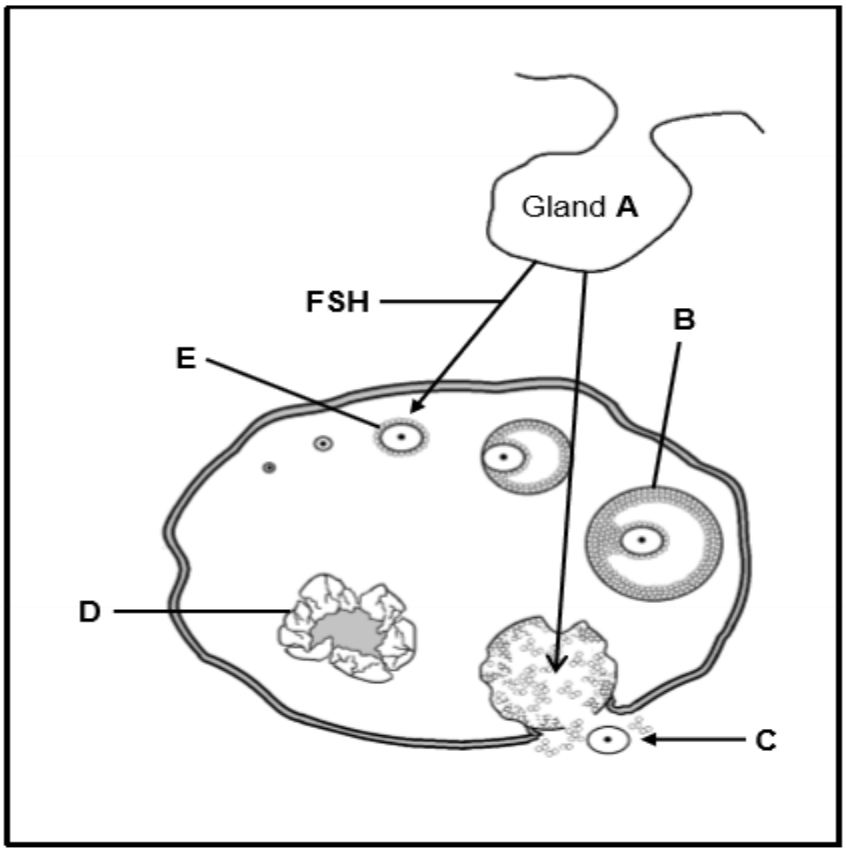
(c) **C** (1)

1.4.2 Identify the process in Diagram **1**. (1)

1.4.3 Name the part of the eye that is responsible for the response in Diagram **1**. (1)

1.4.4 State the consequence to the person's vision if the process in Diagram **2** does not occur. (1)
(6)

1.5 The diagram below represents an endocrine gland **A** and the events that take place in the ovary during the menstrual cycle in humans.



1.5.1 Identify:

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

(b) Structure **B** (1)

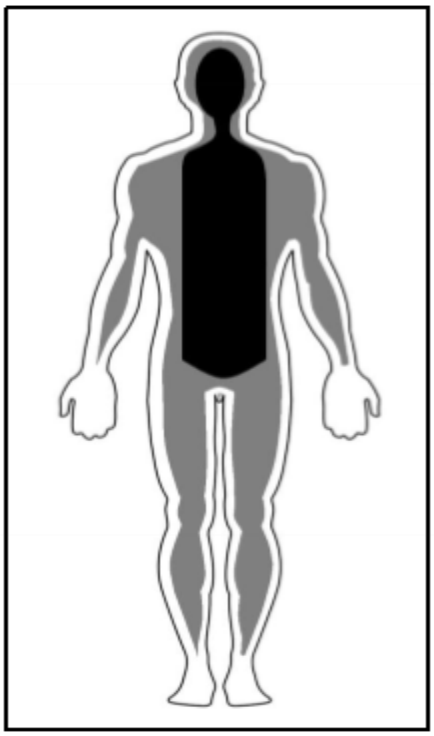
(c) Process **C** (1)

(d) Structure **D** (1)

1.5.2 State the effect on the oestrogen levels in the blood if gland **A** stops secreting FSH. (1)

1.5.3 State ONE function of LH. (1)
(6)

1.6 A normal, healthy person was placed in a cold room. After 30 minutes the thermal image shown below was produced. This thermal image indicates the temperature of different parts of the body. Lighter colours on the scan indicate temperatures lower than normal body temperature.



1.6.1 Which colour, black, grey or white, represents the normal body temperature? (1)

1.6.2 State what occurred in each of the following parts in this person's skin during temperature regulation:

(a) Blood vessels (1)

(b) Sweat glands (1)

1.6.3 Name the part of the brain that is responsible for thermoregulation. (1)

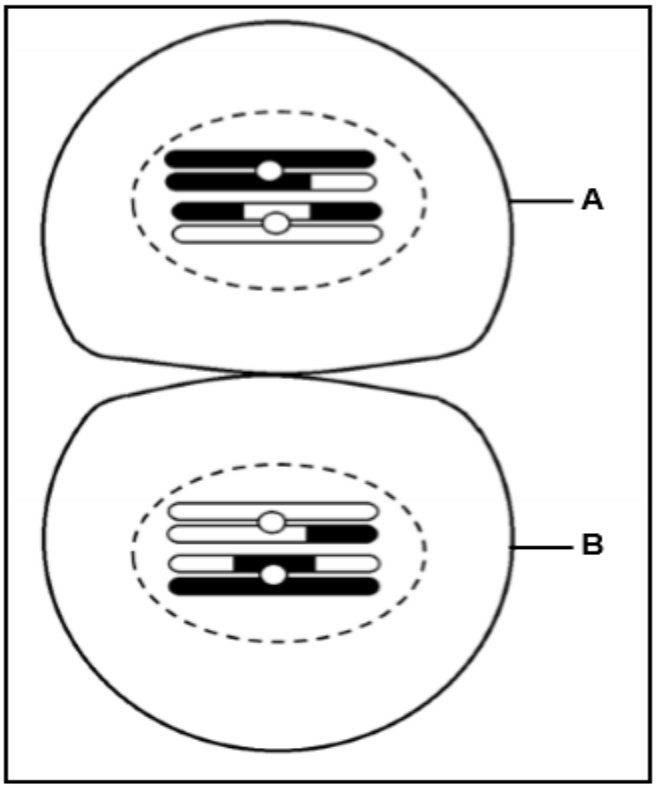
1.6.4 State ONE way in which the thermal image would differ if the person was placed in a hot room for 30 minutes. (1)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a phase of meiosis.



2.1.1 Identify the phase of meiosis in the diagram above. (1)

2.1.2 Draw a diagram to show only the TWO gametes formed from cell **A**. (NO labels required.) (4)

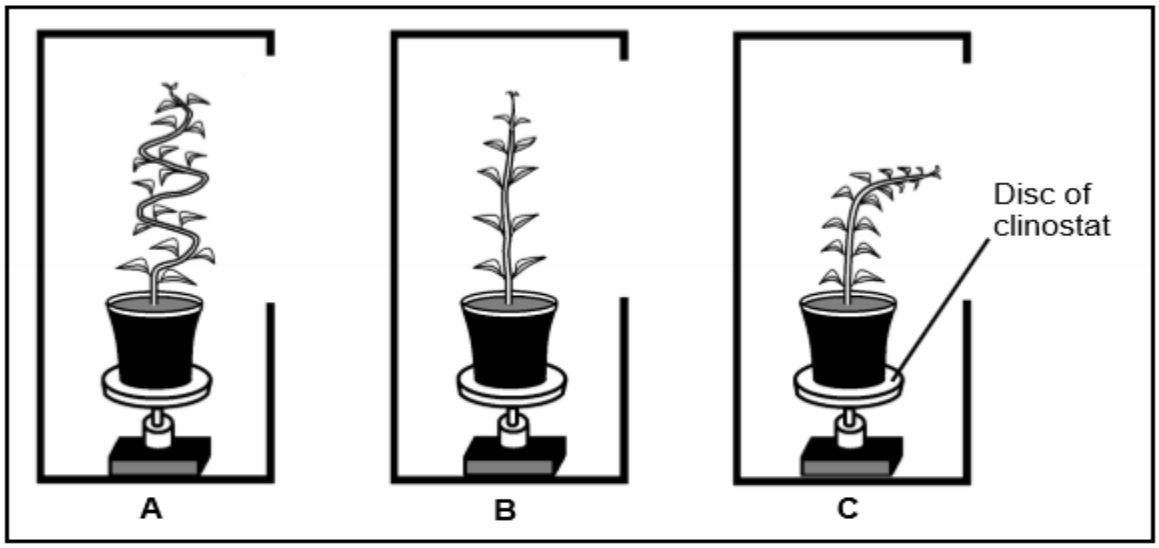
2.1.3 Tabulate TWO differences between prophase **I** and prophase **II**. (5)
(10)

2.2 A clinostat is a device used to investigate plant growth responses. It has a disc that rotates very slowly when the clinostat is switched on.

During an investigation on plant responses to light, the procedure below was followed:

- Three pot plants of the same species were used.
- Each pot plant was placed on one of three identical clinostats.
- Each set of apparatus, A, B and C, was placed in a box with a single opening.
- Each clinostat was treated in a different way over a period of five weeks.

The results of the investigation are represented in the diagrams below.



2.2.1 Name the plant growth response to light. (1)

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

2.2.3 Give ONE reason why the results of this investigation may be considered to be unreliable. (1)

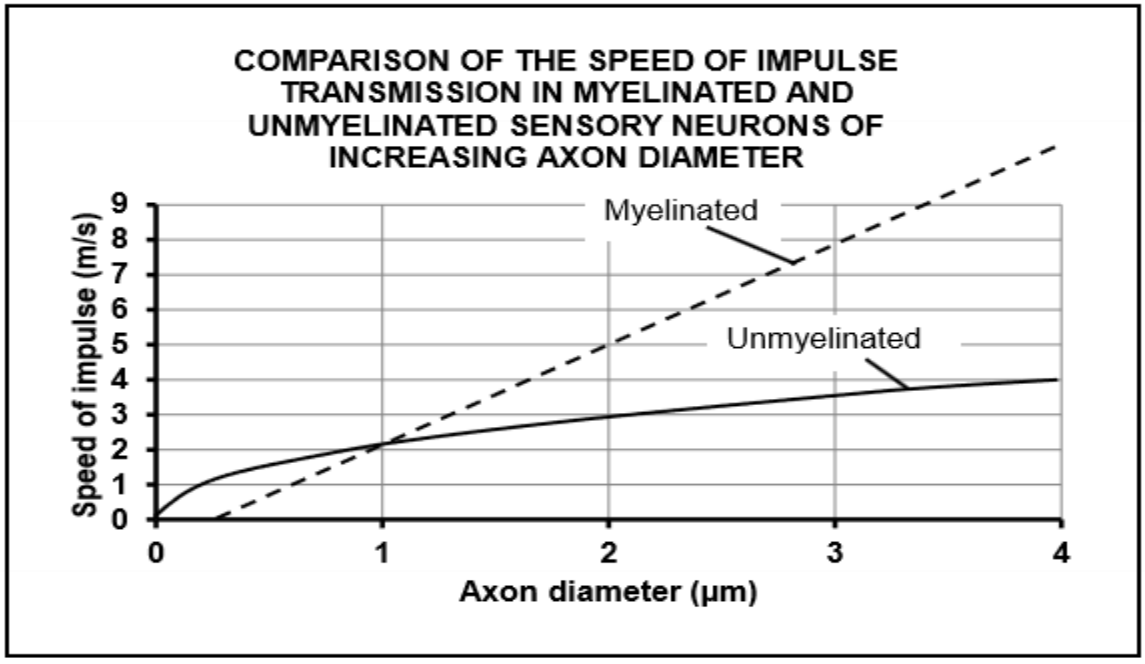
2.2.4 In which apparatus (**A**, **B** or **C**) was the clinostat:

(a) Switched on and rotating slowly (1)

(b) Switched off, but manually rotated through 180° once a week (1)

2.2.5 Explain the effect of the unilateral light on the distribution of auxins in the plant in apparatus **C**. (3)
(9)

2.3 The graph below shows the speed at which impulses are transmitted along sensory neuron axons of increasing diameter when the axons are myelinated (covered with myelin sheath) and unmyelinated (no myelin sheath present).



2.3.1 Describe the direction of the impulse within a neuron. (2)

2.3.2 Give the diameter range (in µm) when the speed of the impulse is faster in unmyelinated axons than in myelinated axons. (2)

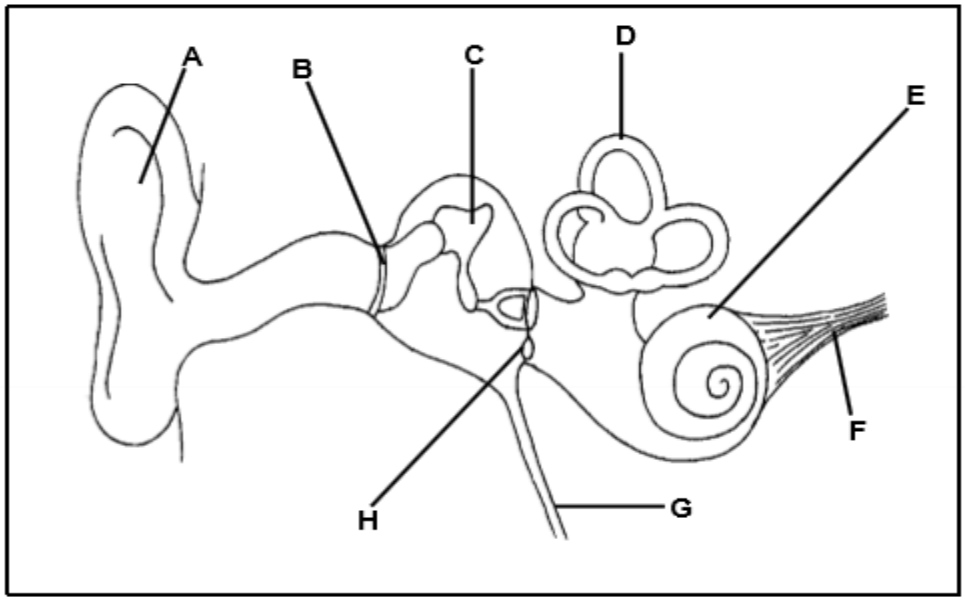
2.3.3 Describe the relationship between axon diameter and the speed of the impulse in myelinated axons. (2)

2.3.4 Use evidence from the graph to explain the effect of multiple sclerosis on a sufferer whose motor neuron axons are greater than 1 µm in diameter. (3)
(9)

2.4 TWO types of hearing loss occur in humans:

- Conductive hearing loss – occurs when sound vibrations cannot be conducted through the outer and middle ear
- Sensorineural hearing loss – occurs when sound waves in the inner ear are not converted into nerve impulses or when the impulses cannot be transmitted to the brain

The diagram below represents the human ear.



2.4.1 Give the LETTER and NAME of the part that:

(a) Transmits impulses to the brain (2)

(b) Allows pressure to equalise between the outer ear and the middle ear (2)

2.4.2 Give only the LETTER of TWO structures in the diagram of the ear that, when damaged, would result in the following:

(a) Conductive hearing loss (2)

(b) Sensorineural hearing loss (2)

2.4.3 Middle-ear infections are a common cause of hearing loss.

State ONE way in which middle-ear infections are treated. (1)

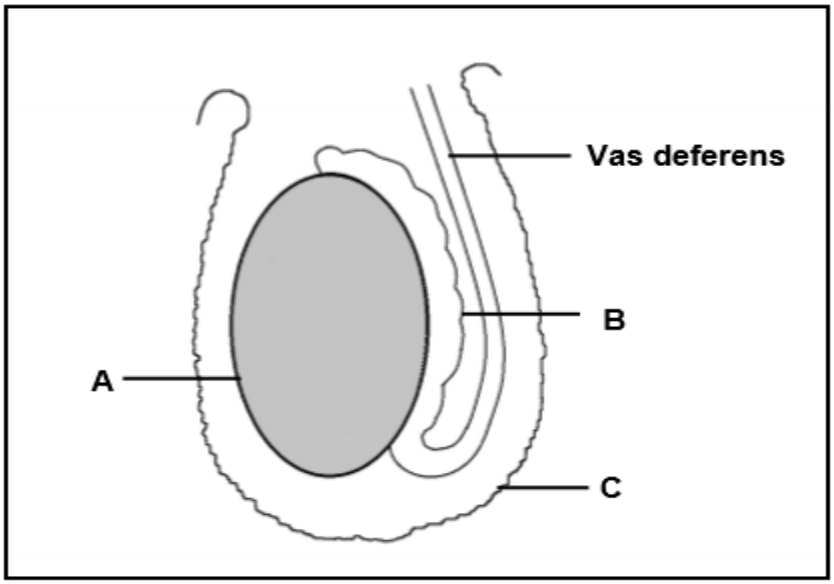
2.4.4 Name the part of the ear where ear wax is produced. (1)

2.4.5 Explain why hearing loss due to ear wax is usually temporary. (2)

(12)
[40]

QUESTION 3

3.1 The diagram below represents some parts of the male reproductive system.



3.1.1 Identify parts:

(a) **A** (1)

(b) **B** (1)

(b) **C** (1)

3.1.2 Describe the process of spermatogenesis in part **A**. (4)

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

Explain why a doctor would advise the man to wear underwear that is not tight. (3)

3.1.4 During a vasectomy the vas deferens from both testes is cut.

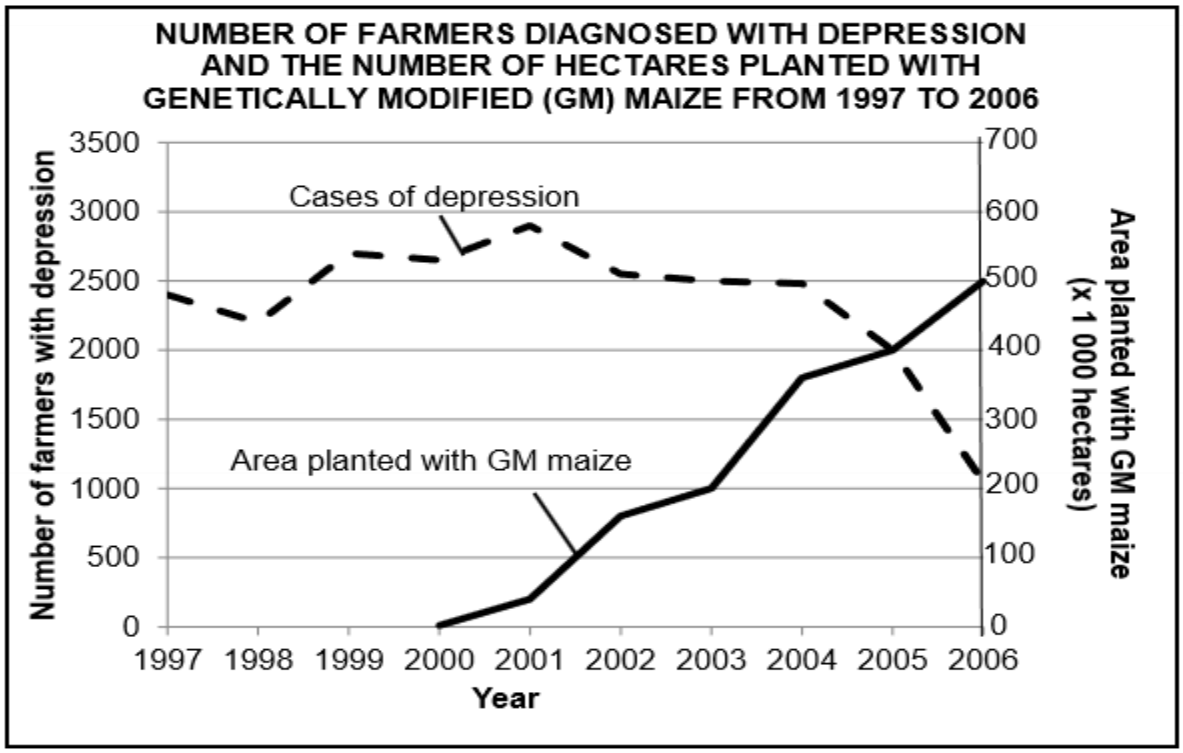
Explain ONE reason why a man who:

(a) Does not want to have children will choose to have a vasectomy (2)

(b) Has had a vasectomy is still capable of ejaculation (2)
(14)

3.2 Maize was genetically modified (GM) to increase its resistance to insects. This GM maize was introduced into a country to increase food security.

The graph below indicates the number of maize farmers in the country that were diagnosed with severe depression over a period of ten years. It also shows the area of agricultural land that was planted with GM maize crops.



3.2.1 Give a definition for *food security*. (3)

3.2.2 Name TWO farming practices other than growing GM foods, that the farmers may use to improve food security. (2)

3.2.3 From the graph, state how many farmers suffered from depression in 2003. (1)

3.2.4 Explain why more farmers suffered from depression before the introduction of GM maize. (3)
(9)

3.3 Read the extract and study the diagram below.

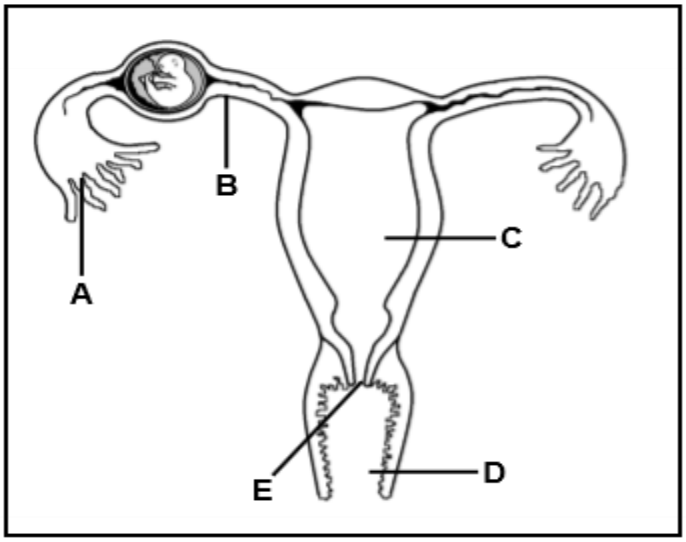
ECTOPIC PREGNANCIES

An ectopic pregnancy is a problem in which the embryo attaches outside the uterus. In most cases the embryo implants in the Fallopian tubes but implantation can also occur on the ovaries, in the cervix or in the abdominal cavity. An ectopic pregnancy cannot proceed normally. The embryo usually cannot survive.

Ectopic pregnancies are caused by one or more of the following:

- An infection or inflammation of the Fallopian tubes
- The development of scar tissue from a previous infection or a surgical procedure in the Fallopian tubes
- Previous surgery in the pelvic area

In most cases, the Fallopian tube where the ectopic pregnancy occurs, has to be removed surgically to save the woman's life.



3.3.1 Give only the LETTERS of the TWO parts in the diagram where implantation of the embryo may occur during an ectopic pregnancy. (2)

3.3.2 Explain why women who have had surgery on their Fallopian tubes have a greater risk of experiencing an ectopic pregnancy. (3)

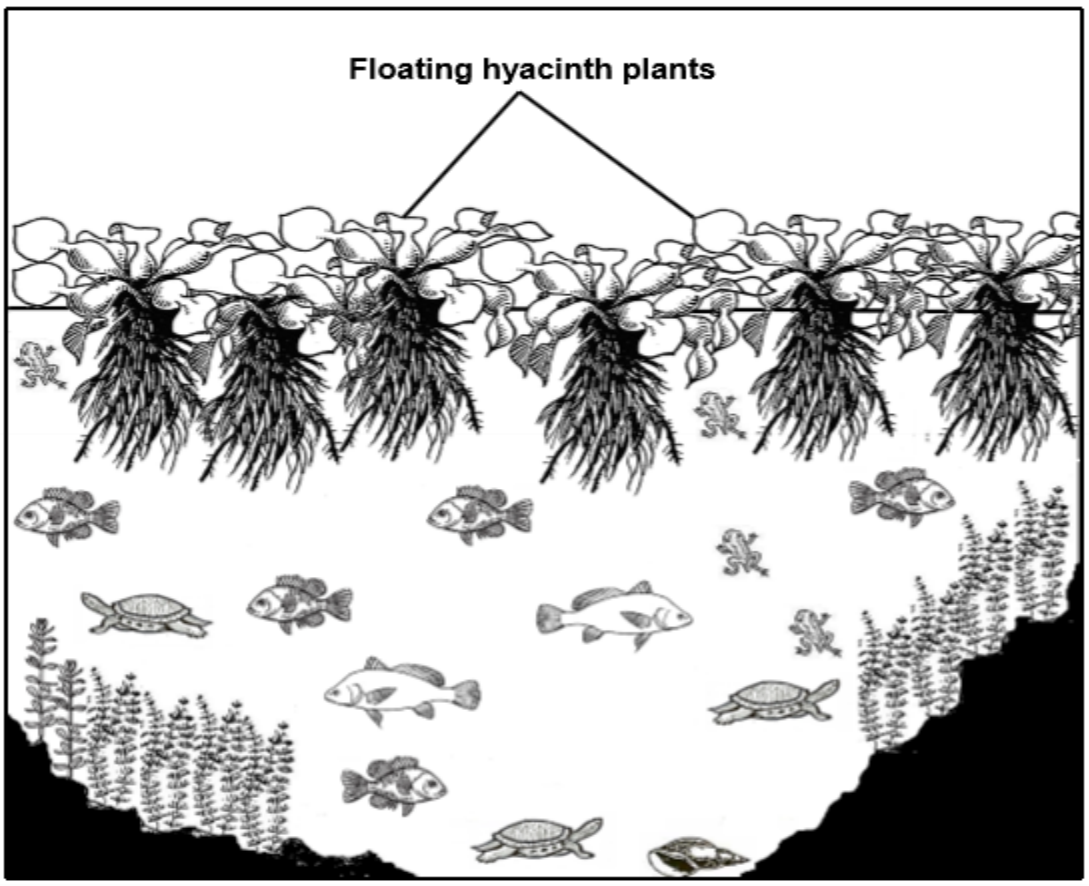
3.3.3 Explain why a woman who had her Fallopian tube removed after an ectopic pregnancy occurred, may still be able to fall pregnant. (2)

3.3.4 Give TWO reasons why the embryo may not be able to survive during an ectopic pregnancy inside the Fallopian tube. (2)
(9)

3.4 Water hyacinths are aquatic alien plants. The plants grow rapidly when introduced into a new environment.

Due to heavy rain, a few water hyacinths were washed into a natural pond from a dam further up the river.

The diagram below represents a longitudinal section through the pond two weeks later.



3.4.1 Name TWO methods that could be used to reduce the alien plant population. (2)

3.4.2 Explain how the alien plant invasion will negatively affect the availability of clean water for the surrounding community. (4)

3.4.3 Water hyacinths release oxygen during photosynthesis.

Explain why this process does not increase the oxygen concentration of the water. (2)
(8)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Both the nervous and the endocrine systems are involved when a person is in a dangerous situation.

Describe the path of an impulse in a reflex arc during a reflex action. Also describe the role of different glands of the endocrine system in providing the body with extra energy during the dangerous situation.

Content: (17)
Synthesis: (3)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2019

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 10 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	C✓✓		
	1.1.3	C✓✓		
	1.1.4	D✓✓		
	1.1.5	A✓✓		
	1.1.6	D✓✓		
	1.1.7	B✓✓		
	1.1.8	A✓✓		
	1.1.9	C✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Spindle fibres✓/spindle threads		
	1.2.2	Maculae✓		
	1.2.3	Anti-diuretic hormone✓/ADH		
	1.2.4	Methane✓/CH_4		
	1.2.5	Aquifer✓		
	1.2.6	Medulla oblongata✓		
	1.2.7	Homeostasis✓		
	1.2.8	Chorion✓		
	1.2.9	Acrosome✓		**(9)**
1.3	1.3.1	B only✓✓		
	1.3.2	B only✓✓		
	1.3.3	Both A and B✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Sclera✓		(1)
		(b) Lens✓		(1)
		(c) Ciliary body✓/ciliary muscle		(1)
	1.4.2	Pupillary mechanism✓		(1)
	1.4.3	Iris✓		(1)
	1.4.4	Near vision will be blurred✓/Only distant objects will be clearly visible		(1) **(6)**

1.5	1.5.1	(a) Pituitary✓gland/hypophysis		(1)
		(b) Graafian follicle✓		(1)
		(c) Ovulation✓		(1)
		(d) Corpus luteum✓		(1)
	1.5.2	Remains low✓/decreases		(1)
	1.5.3	- Stimulates ovulation✓ - Stimulates the development of the corpus luteum✓ **(Mark first ONE only)**	Any	(1) **(6)**
1.6	1.6.1	Black✓ **(Mark first ONE only)**		(1)
	1.6.2	(a) - They constricted✓/vasoconstriction occurred - Less blood flowed in the blood vessels✓ Any		(1)
		(b) - The sweat glands became less active✓ - Less sweat was secreted✓	Any	(1)
	1.6.3	Hypothalamus✓		(1)
	1.6.4	- The whole body will appear black✓/black and grey - There will be no white areas✓ **(Mark first ONE only)**	Any	(1) **(5)**
			TOTAL SECTION A:	**50**

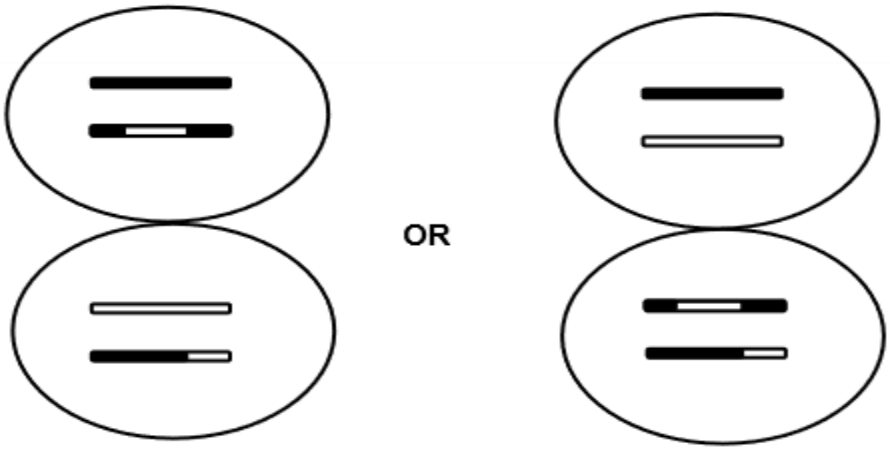
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SECTION B

QUESTION 2

2.1 2.1.1 Telophase I✓ (1)

2.1.2



MARKING GUIDELINE

Only two gametes drawn (**G**)	1
Gamete contains 2 chromosomes (**C**)	1
The chromosomes are unreplicated (**U**)	1
Correct shading on ALL the unreplicated chromosomes (**S**)	1

(4)

2.1.3

T✓

Prophase I	Prophase II
The cell is diploid✓/has homologous chromosomes	The cell is haploid✓/does not have homologous chromosomes
Crossing over takes place✓	No crossing over takes place✓

(Mark first TWO only) 1 + 4 (5)

(10)

2.2 2.2.1 Phototropism✓ (1)

2.2.2
- The same species✓ of plant was used in each set-up
- Identical clinostats✓ were used in each set-up
- The same period of time✓/5 weeks was used for each set-up
- Each apparatus was placed in a box with a single opening✓
- The opening on each box was in the same position✓/was the same size/allowed the same amount of light to enter

(Mark first TWO only) Any (2)

2.2.3
- The investigation was only done once✓/not repeated
- Only one plant was used in each set-up✓/the sample size was too small

(Mark first ONE only) Any (1)

	2.2.4	(a) B✓		(1)
		(b) A✓		(1)
	2.2.5	- The auxins moved away from the light✓/were destroyed by the light - so that the darker side had a high concentration of auxins✓ - and the lighted side had a low concentration of auxins✓		(3) **(9)**
2.3	2.3.1	- From the dendrite✓ - to the axon✓		(2)
	2.3.2	0 to 1✓✓ µm/ 0 to 0,9 µm		(2)
	2.3.3	As the axon diameter increases the speed of the impulse increases✓✓ OR As the axon diameter decreases the speed of the impulse decreases✓✓		(2)
	2.3.4	- The speed of the impulse will decrease✓ - resulting in it taking longer for impulses to reach the effectors✓ - and the person will react more slowly✓		(3) **(9)**
2.4	2.4.1	(a) F✓ - Auditory nerve✓		(2)
		(b) G✓ - Eustachian tube✓		(2)
	2.4.2	(a) B✓ and C✓ **(Mark first TWO only)**		(2)
		(b) E✓ and F✓ **(Mark first TWO only)**		(2)
	2.4.3	- Grommets✓ will be inserted in the tympanic membrane - Antibiotics✓ **(Mark first ONE only)**	Any	(1)
	2.4.4	Auditory canal✓		(1)
	2.4.5	- The ear wax can be removed✓ from the auditory canal - to allow sound to reach the tympanic membrane✓/which will allow the tympanic membrane to vibrate freely		(2) **(12)** **[40]**

QUESTION 3

3.1 3.1.1 (a) Testis✓ (1)

(b) Epididymis✓ (1)

(c) Scrotum✓ (1)

3.1.2
- Under the influence of testosterone✓
- diploid cells✓/germinal epithelium
- in the seminiferous tubules✓ of the testis
- undergo meiosis✓
- to form (haploid) sperm✓ Any (4)

3.1.3
- The testes will be away from the body✓
- The temperature of the testes will therefore be lower than body temperature✓/less pressure on the testes
- for successful sperm production✓

OR

- 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 (3)

3.1.4 (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)

3.2 3.2.1
- All people✓
- should have enough food✓
- The food should be nutritious✓/of good quality
- and be accessible at all times✓ Any (3)

3.2.2
- Use fertilisers✓
- Monoculture✓
- Use pesticides✓/example
- Improved irrigation✓
- Crop rotation✓
- Artificial selection✓

(Mark first TWO only) Any (2)

3.2.3 2 500✓ (1)

3.2.4
- Crops were destroyed by insects✓
- which led to a lower yield✓/added expenses for insecticides
- and resulted in lower profits✓ (3)

(9)

3.3	3.3.1	- A✓ - B✓ - E✓ **(Mark first TWO only)**	Any	(2)
	3.3.2	- The scar tissue✓ - may partially block the Fallopian tube✓ - preventing the embryo from reaching the uterus✓/resulting in implantation in the Fallopian tube		(3)
	3.3.3	- The other Fallopian tube is still present✓/not blocked - Fertilisation may still take place in this Fallopian tube✓/the developing embryo can move along this Fallopian tube OR - During invitro fertilisation✓ (IVF) - the resulting embryo is inserted into the uterus✓ OR - The ovum can be placed after the blockage✓ - allowing fertilisation✓		(2)
	3.3.4	- Insufficient space✓ - Poor/no placental development✓ - Decreased blood supply✓ - Insufficient nutrients✓/oxygen **(Mark first TWO only)**	Any	(2) **(9)**
3.4	3.4.1	- Biological control✓/example - Mechanical control✓/example - Chemical control✓/example **(Mark first TWO only)**	Any	(2)
	3.4.2	- The alien plants block out sunlight✓ - Water plants below the surface stop photosynthesising✓/die - and less oxygen is released into the water✓ - Other organisms die✓/decay - polluting the water✓	Any	(4)
	3.4.3	- The parts of the plants that photosynthesise are above the water✓ - therefore the oxygen from photosynthesis is released into the air✓/not into the water		(2) **(8)** **[40]**

TOTAL SECTION B: 80

QUESTION 4

Reflex arc (A)

- The receptor receives the stimulus✓ and
- converts it into an impulse✓
- which is transmitted by the sensory neuron✓
- through the dorsal root✓
- of spinal nerve✓
- to the spinal cord✓
- where the impulse is transferred via the interneuron✓
- to the motor neuron✓
- which carries the impulse via the ventral root✓
- to the effector✓/muscle/gland
- The impulse is transferred from one neuron to the next via a synapse✓ Any (8)

Role of the endocrine system in providing energy (E)

- More adrenalin✓ is secreted
- by the adrenal glands✓
- increases blood glucose✓/increase heart rate/ increase breathing rate/dilate blood vessels to essential organs

- More glucagon✓ is secreted
- by the pancreas✓/islets of Langerhans
- increases blood glucose✓

- More TSH✓ is secreted
- by the pituitary gland✓
- to increase thyroxin production✓

- More thyroxin✓is secreted
- by the thyroid gland✓
- to increase the body's metabolic rate✓/rate of respiration Any (9)

Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to: - Reflex arc - Role of the endocrine system in providing energy There is no irrelevant information	All the information regarding the: - Reflex arc - Role of the endocrine system in providing energy is arranged in a logical manner.	At least the following points should be included: - Reflex arc (**A**) (5/8) - Role of the endocrine system in providing energy(**E**) (6/9)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2021

MARKS: 150

TIME: 2½ hours

This question paper consists of 17 pages.

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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 to 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 function of the epididymis is to …

A produce semen.
B transport sperm to the urethra.
C produce sperm.
D store sperm until maturation.

1.1.2 Which ONE of the following is an exocrine gland?

A Pituitary
B Prostate
C Adrenal
D Thyroid

1.1.3 A list of the functions of the brain is provided below:

(i) Interprets sensation
(ii) Regulates involuntary actions
(iii) Controls higher thought processes
(iv) Controls voluntary actions

Which ONE of the following combinations are the functions of the cerebrum?

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

1.1.4 An acrosome has …

A mitochondria to produce energy for the movement of sperm.
B a chromatin network that carries genes.
C enzymes needed to penetrate the ovum.
D a tail to facilitate the movement of sperm.

1.1.5 Ovulation is stimulated by an increase in the levels of …

A progesterone.
B LH.
C FSH.
D oestrogen.

1.1.6 Barotrauma is a common condition that occurs when pressure builds up in the middle ear. This causes the tympanic membrane to bulge. It is most common among deep-sea divers.

Divers are advised against diving when they have a middle-ear infection because the …

A auditory canal cannot equalise the pressure in the middle ear.
B Eustachian tube is blocked and air cannot enter the middle ear.
C tympanic membrane is hardened and cannot pass the vibrations onto the middle ear.
D ossicles are fused together and cannot vibrate freely in the middle ear.

1.1.7 Which ONE of the following shows the correct combination of the hormone with its target organ?

	HORMONE	TARGET ORGAN
A	Prolactin	Pituitary gland
B	Glucagon	Pancreas
C	LH	Uterus
D	TSH	Thyroid gland

1.1.8 Oogenesis takes place in the …

A uterus.
B ovary.
C cervix.
D vagina.

1.1.9 A learner conducted an investigation to determine the effect of caffeine on reaction time.

The procedure was done as follows:

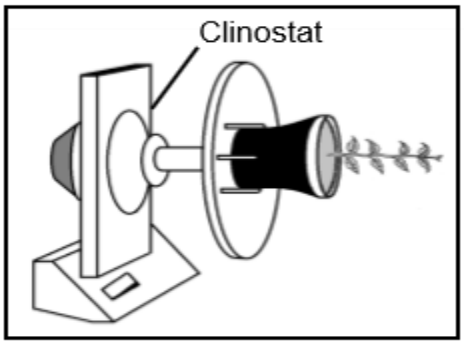
- 50 male volunteers of the same age participated.
- Their reaction times were measured using a computer program.
- They were all given 200 mℓ of an energy drink that contained caffeine.
- Their reaction times were measured again every 10 minutes for 2 hours.

Which ONE of the following increased the reliability of the results obtained?

A Gender of the volunteers
B Age of the volunteers
C 50 volunteers used
D Type of caffeine used

1.1.10 An investigation was done in which a potted plant was placed horizontally on a clinostat, as shown in the diagram. The plant was exposed to uniform light from all directions.

(A clinostat is a device with a disc that rotates when switched on, allowing the attached plant to rotate as well.)



The stem grew vertically upwards, which indicates that the clinostat was …

A stationary and the stem showed negative geotropism.
B rotating and the stem showed positive geotropism.
C stationary and the stem showed negative phototropism.
D rotating and the stem showed positive phototropism. (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 planting of the same crop on the same land repeatedly

1.2.2 The permanent removal of trees and vegetation from an area

1.2.3 A part of the male reproductive system used to transfer semen to the female

1.2.4 The part of the nervous system that is made up of spinal and cranial nerves

1.2.5 A type of vision in which both eyes are used together to focus on an object

1.2.6 The structure that the Graafian follicle develops into after ovulation

1.2.7 A functional gap between two consecutive neurons

1.2.8 An underground permeable rock that stores water

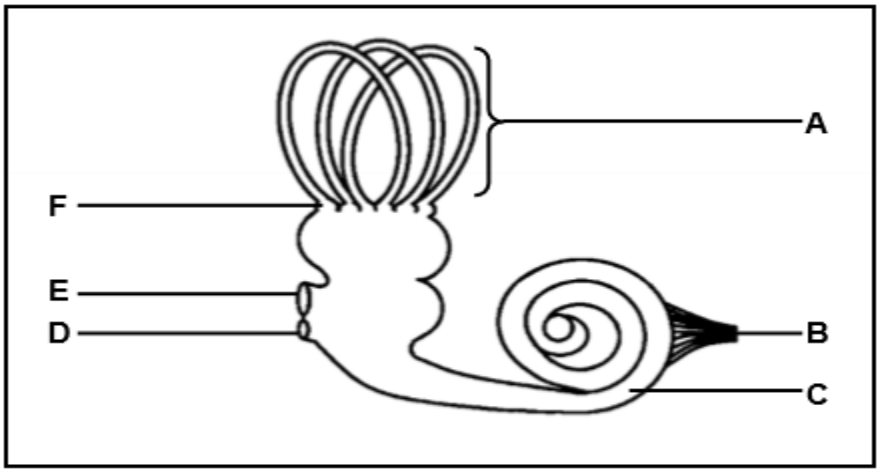
1.2.9 The hormone that stimulates puberty in females (9 x 1) **(9)**

1.3 Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	A factor that reduces food security	A: Floods B: Drought
1.3.2	The part of a neuron that speeds up the transmission of an impulse	A: Myelin sheath B: Axon
1.3.3	A factor that impacts on biodiversity	A: Poaching B: Habitat destruction

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

1.4 The diagram below represents a part of the human ear.



1.4.1 Identify part:

(a) **A** (1)

(b) **B** (1)

1.4.2 Give the LETTER and NAME of the part that:

(a) Creates pressure waves in the fluid of the inner ear (2)

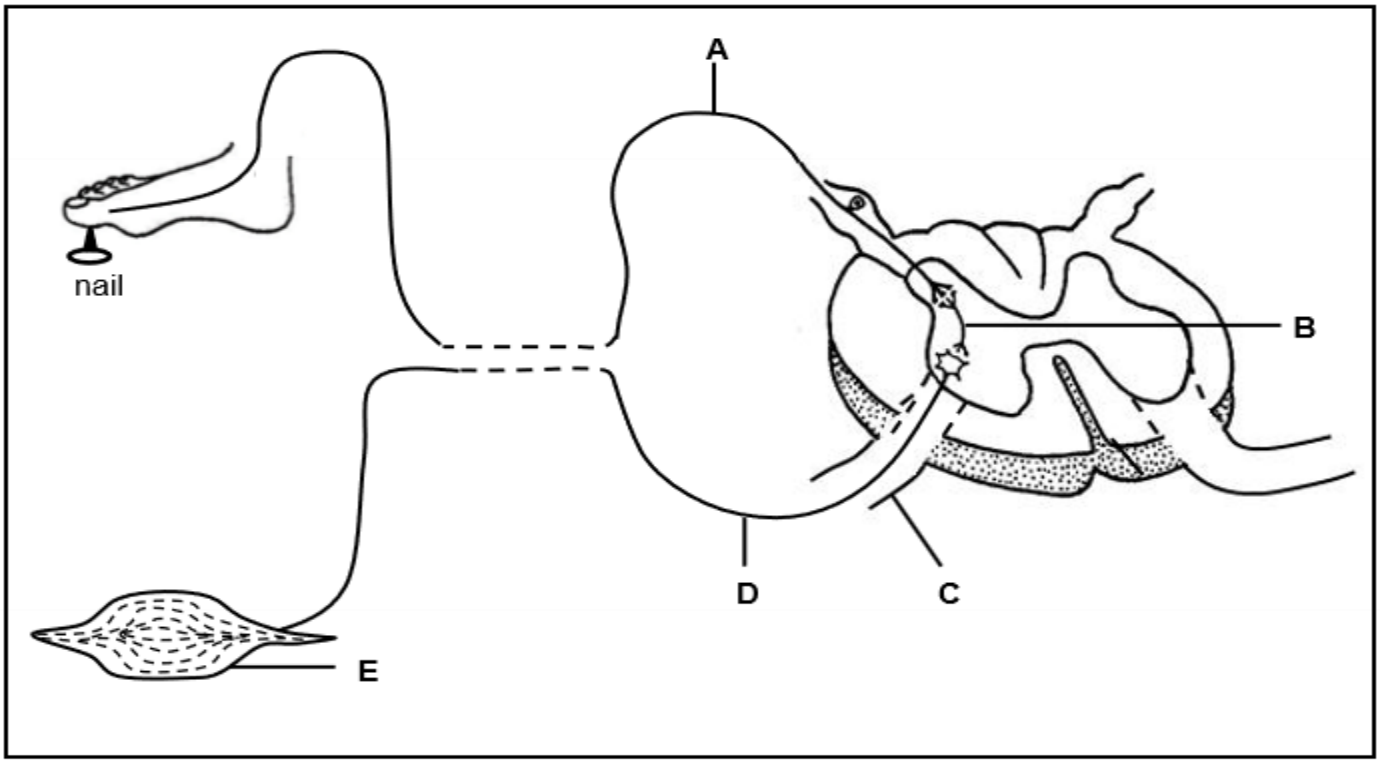
(b) Absorbs excess pressure waves in the inner ear to prevent the formation of an echo (2)

1.4.3 Name the:

(a) Part of the brain that interprets impulses from part **F** (1)

(b) Receptors found at **C** (1)
(8)

1.5 A boy steps on a nail and pulls his leg away suddenly. The diagram below shows the pathway taken to create this reaction.



1.5.1 Name the pathway represented by the diagram. (1)

1.5.2 Give ONE advantage of this type of reaction. (1)

1.5.3 Identify part:

(a) **B** (1)

(b) **C** (1)

(c) **E** (1)

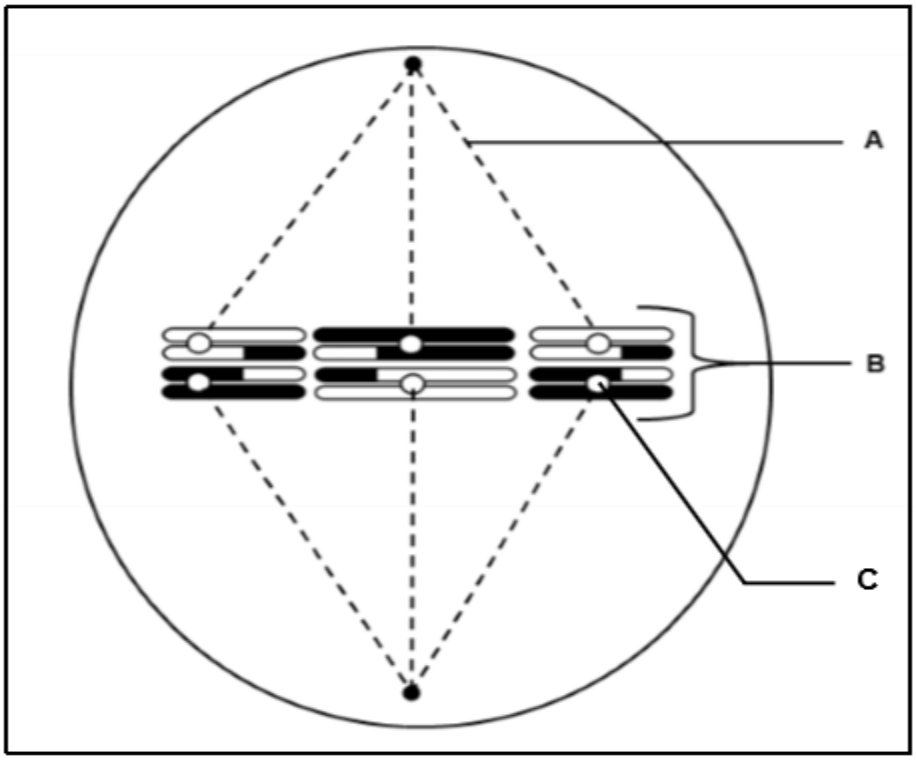
1.5.4 Give the LETTER and NAME of the neuron that transports impulses towards the spinal cord. (2)
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below shows a phase during meiosis in an animal cell.



2.1.1 Identify part **C**. (1)

2.1.2 Name the phase represented in the diagram. (1)

2.1.3 **B** represents homologous chromosomes.

What are *homologous chromosomes*? (2)

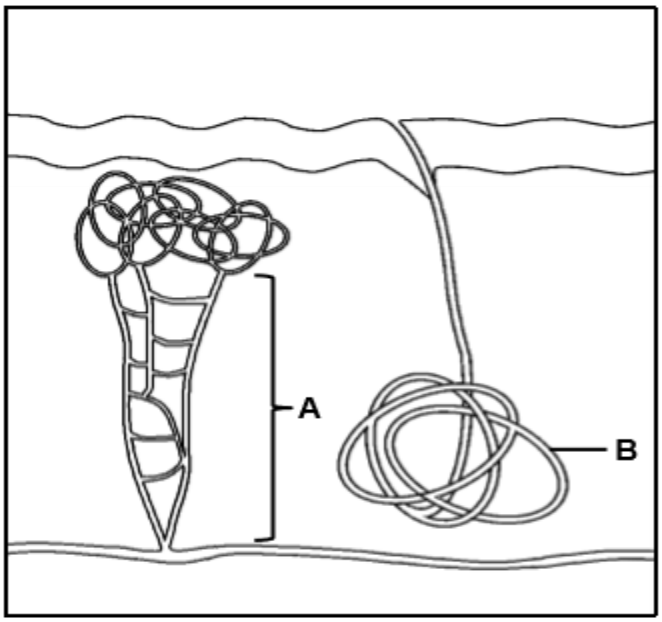
2.1.4 Explain the appearance of the chromosomes in the diagram. (3)

2.1.5 State the function of part **A** in the phase following the one represented in the diagram. (1)

2.1.6 The total amount of DNA is 12 arbitrary units in each daughter cell at the end of this cell division.

How much DNA (in arbitrary units) was in the parent cell at the beginning of the cell division? (2)
(10)

2.2 The diagram below represents a part of the human skin.



2.2.1 Identify part **B**. (1)

2.2.2 Describe how structure **A** functions during thermoregulation on a cold day. (3)

2.2.3 Explain why temperature needs to be kept constant in the human body. (2)
(6)

2.3 ADH plays a role in osmoregulation in the human body.

2.3.1 Name the gland that secretes ADH. (1)

2.3.2 Describe osmoregulation on a cold day. (3)

2.3.3 A person with a medical condition that causes the renal tubules to become resistant to the effects of ADH, always produces large volumes of urine.

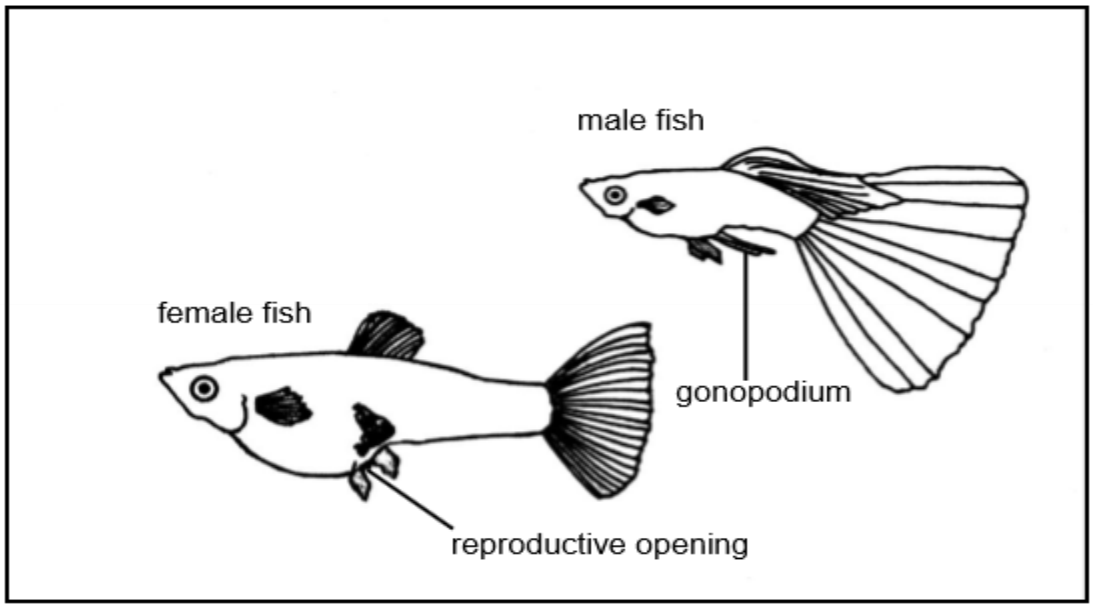
Explain why the ADH levels in the blood will always be higher than normal for this person. (3)
(7)

2.4 Read the extract below.

REPRODUCTION IN GUPPY FISH

Guppy fish have a very interesting method of breeding. During mating the male deposits packets of sperm inside the female's reproductive opening using an organ called the 'gonopodium'. This process takes place several times and the female stores some of the extra sperm.

The fertilised eggs remain in the female's body until they hatch and the young are born live. The gestation period is usually between 22 and 28 days.



2.4.1 Name the type of fertilisation in guppies. (1)

2.4.2 Explain TWO ways in which the type of fertilisation named in QUESTION 2.4.1 increases reproductive success. (4)

2.4.3 Why are guppies regarded as being ovoviviparous? (2)
(7)

2.5 Premature delivery of babies (babies born between weeks 28 to 35 of gestation) has been a concern in many countries. The care of premature babies is very costly. Women with a history of premature delivery are sometimes given a progesterone treatment between weeks 16 to 20 of pregnancy.

However, this treatment is believed to lead to the development of gestational diabetes mellitus in the mother.

An investigation was done to determine if progesterone treatment leads to the development of gestational diabetes mellitus.

The procedure was as follows:

- 300 pregnant women with a history of premature delivery participated in the investigation (those that had pre-existing diabetes mellitus were excluded).
- The women were divided into two equal groups (Group A and Group B).
- The women in Group A were injected once a week with 250 mg of progesterone between weeks 16 and 20.
- Their glucose levels were measured and recorded daily between week 16 and 36 of the pregnancy.
- Group B was the control.

2.5.1 Why is the injection of progesterone a good treatment to prevent premature delivery? (2)

2.5.2 Identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

2.5.3 Describe how the investigators determined whether any of the participants in Group **A** had developed gestational diabetes mellitus. (2)

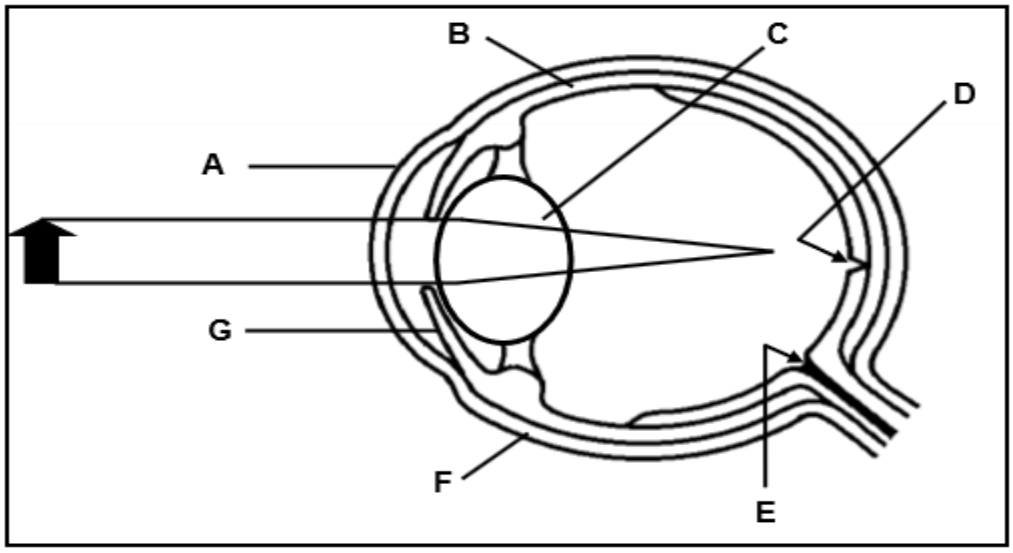
2.5.4 State TWO factors that were kept constant when the progesterone was administered in Group **A**. (2)

2.5.5 Group **B** was the control.

Explain the importance of group **B** in this investigation. (2)
(10)
[40]

QUESTION 3

3.1 The diagram below represents a type of visual defect.



3.1.1 Identify part **F**. (1)

3.1.2 State ONE function of part **B**. (1)

3.1.3 Explain why the light rays must focus on part **D** rather than on part **E**. (4)

3.1.4 Name the type of lens that is used to correct the visual defect shown in the diagram. (1)

3.1.5 Describe how the type of lens named in QUESTION 3.1.4 corrects the visual defect. (2)

3.1.6 Explain ONE way in which part **C** is structurally suited for accommodation. (2)

3.1.7 Name the TWO muscles found in part **G**. (2)

3.1.8 Name and describe the visual defect that occurs when part **A** is uneven. (3)
(16)

3.2 Read the extract below.

AUXINS CAN BE USED AS SELECTIVE HERBICIDES

Auxins stimulate plant growth, however, a high concentration of auxins may cause the plant to grow too fast. The plant is not able to sustain this rapid growth and as a result, it will die.

Farmers spray artificially manufactured auxins onto the surface of weeds to kill them. This type of herbicide (weed killer) is selective as it kills mainly the broad-leafed dicotyledonous plants without having any effect on narrow-leafed monocotyledonous plants, such as wheat, maize and grass.

Auxin-based herbicides are more environmentally friendly. Other herbicides may kill some organisms and the chemicals from these herbicides accumulate in the food chains, thus disturbing the ecosystems.

3.2.1 State ONE way in which auxins cause growth in plants. (1)

3.2.2 Explain why farmers would want to kill the weeds in their fields. (2)

3.2.3 According to the extract, state ONE disadvantage of using herbicides that are not auxin-based. (1)

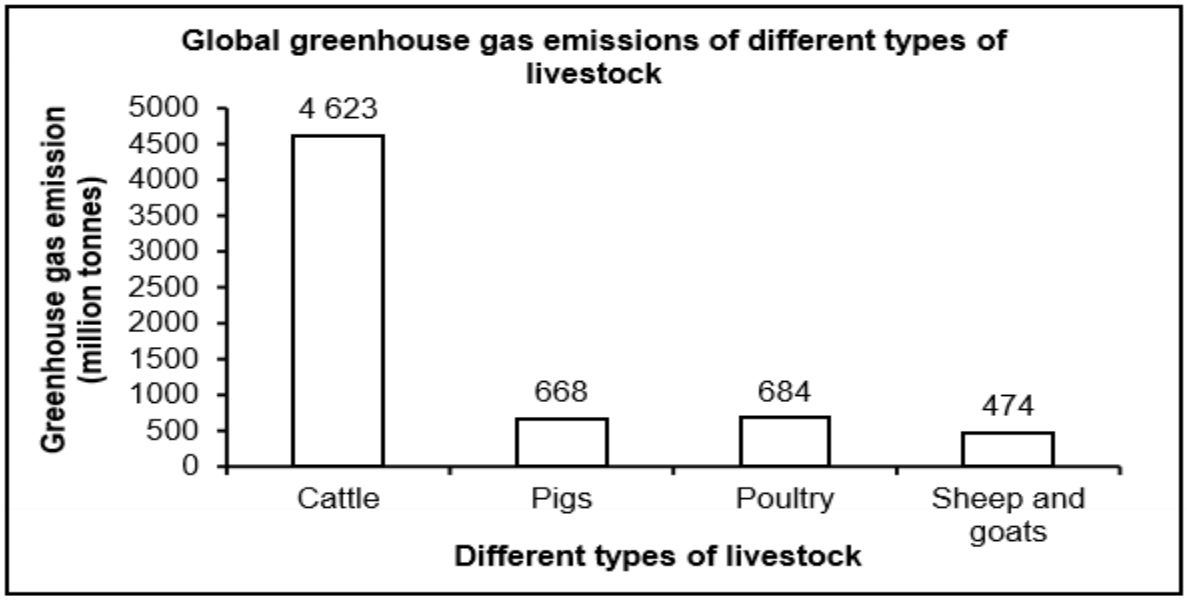
3.2.4 Give ONE reason for using auxin-based herbicides instead of physically removing the weeds. (2)

3.2.5 A farmer planted maize and beans (broad-leafed plants) in her field.

Explain why the farmer should not use an auxin-based herbicide in her field. (2)
(8)

3.3 Livestock farming contributes to approximately 14,6% of all global greenhouse gas emissions (release into atmosphere).

The graph below shows the global greenhouse gas emissions of different types of livestock.



3.3.1 Name the livestock farming that contributes the least to greenhouse gas emissions. (1)

3.3.2 Give ONE advantage of greenhouse gases. (1)

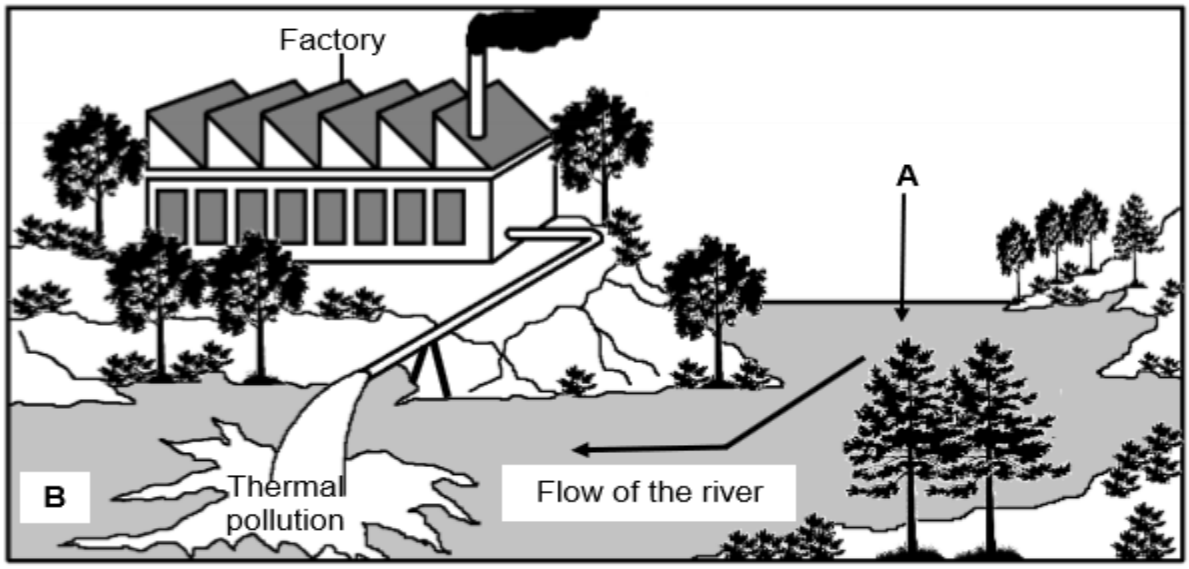
3.3.3 Calculate how much more greenhouse gases are emitted by cattle compared to all other types of livestock combined. Show ALL your workings. (2)

3.3.4 One of the greenhouse gases emitted by livestock is methane.

Name ONE other source of methane. (1)

3.3.5 Explain why an increase in livestock farming may lead to global warming. (3)
(8)

3.4 A factory was built on the banks of a river close to a fishing village. The factory used water from the river to cool down the machinery. The water was then released back into the river causing thermal pollution.



3.4.1 What is *thermal pollution*? (1)

3.4.2 Describe how thermal pollution affects the water quality. (2)

3.4.3 Suggest ONE way in which the factory can reduce thermal pollution. (1)

3.4.4 How will thermal pollution affect the fishermen in the village, economically? (2)

3.4.5 During the lockdown of the country due to Covid-19 restrictions, the factory was closed for a period of 4 months.

Suggest, with a reason, the impact that this would have had on the biodiversity in area **B**. (2)
(8)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Describe the events that lead to pregnancy from the time a zygote is formed, up to the formation of the foetus including the development of the placenta and umbilical cord.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2021

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 9 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	D✓✓		
	1.1.2	B✓✓		
	1.1.3	C✓✓		
	1.1.4	C✓✓		
	1.1.5	B✓✓		
	1.1.6	B✓✓		
	1.1.7	D✓✓		
	1.1.8	B✓✓		
	1.1.9	C✓✓		
	1.1.10	A✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Monoculture✓		
	1.2.2	Deforestation✓		
	1.2.3	Penis✓		
	1.2.4	Peripheral✓		
	1.2.5	Binocular✓/stereoscopic vision		
	1.2.6	Corpus luteum✓		
	1.2.7	Synapse✓		
	1.2.8	Aquifer✓		
	1.2.9	Oestrogen✓	(9 x 1)	**(9)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	A only✓✓		
	1.3.3	Both A and B✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Semi-circular canals✓		(1)
		(b) Auditory nerve✓		(1)
	1.4.2	(a) E✓ Oval window✓		(2)
		(b) D✓ Round window✓		(2)
	1.4.3	(a) Cerebellum✓		(1)
		(b) Hair cells✓/Organ of Corti		(1) **(8)**
1.5	1.5.1	Reflex arc✓		(1)
	1.5.2	To minimise injury✓		(1)
	1.5.3	(a) Interneuron✓/connector		(1)
		(b) Ventral root✓		(1)
		(c) Effector✓/muscle		(1)
	1.5.4	A✓ Sensory✓neuron		(2) **(7)**

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

	2.1.1	Centromere✓		(1)
	2.1.2	Metaphase I✓		(1)
	2.1.3	- A pair of chromosomes with the same structure✓/ location of centromere/ length and - the same sequence of genes✓ - One is of maternal origin and the other of paternal origin✓	Any	(2)
	2.1.4	- Some chromatids have a mixture of genetic material✓from its homologue - as crossing over✓ took place - during prophase I✓		(3)
	2.1.5	(Contracts) to pull the chromosome to the pole✓		(1)
	2.1.6	48✓✓ arbitrary units		(2) **(10)**
2.2	2.2.1	Sweat gland✓		(1)
	2.2.2	- Structure A will constrict✓/vasoconstriction occurs - Less blood flows towards the surface✓of the skin - Less heat is lost✓ through the surface of the skin - Temperature increases✓ / returns to normal	Any	(3)
	2.2.3	- Enzymes function optimally✓ at normal body temperature✓/37° C - Enzymes/proteins will denature✓ at high temperatures✓ - Enzymes will become inactive✓ at low temperatures✓ **(Mark first ONE only)**	Any (1 x 2)	(2) **(6)**
2.3	2.3.1	Pituitary gland✓/Hypophysis/Hypothalamus		(1)
	2.3.2	- Water levels are higher than normal in blood✓ - since less water is lost through sweating✓ - therefore less/no ADH will be secreted✓ - renal tubules become less permeable to water✓ - Therefore, less water is reabsorbed✓/ more urine is produced	Any	(3)
	2.3.3	- Water cannot be reabsorbed✓/the water is in the urine since renal tubules are resistant to the effects of ADH - Water levels are lower than normal in blood✓ - therefore, more ADH is secreted✓		(3) **(7)**

2.4	2.4.1	Internal✓ fertilisation	(1)
	2.4.2	- Sperm are deposited inside the female body✓ thereby increasing the chances of fertilisation✓ - Gametes/zygotes are inside the body✓ therefore protected from the predators✓/ environmental dangers (2 x 2) **(Mark first TWO only)**	(4)
	2.4.3	- The eggs hatch inside the female's body✓ - and the young are born live✓	(2) **(7)**
2.5	2.5.1	- Progesterone maintains/thickens the endometrium✓ - and therefore, maintains the pregnancy✓	(2)
	2.5.2	(a) Progesterone treatment✓	(1)
		(b) Development of gestational diabetes✓	(1)
	2.5.3	- Glucose levels were taken✓ daily - When the glucose level of a pregnant woman remains high continuously✓it indicates the development of gestational diabetes	(2)
	2.5.4	- (Same) dosage✓/250 mg of progesterone - (Same) period of time for injection✓/injections given between weeks 16 and 20 - (Same) frequency of injections✓/ weekly injections Any **(Mark first TWO only)**	(2)
	2.5.5	- Group B did not receive progesterone✓ - If gestational diabetes develops in group A it would be due to the progesterone treatment✓	(2) **(10)** **[40]**

QUESTION 3

3.1	3.1.1	Sclera✓	(1)
	3.1.2	- Absorbs light rays✓/prevents internal reflection of light in the eye - Blood vessels in part B supply the cells of the eye with oxygen✓/nutrients Any **(Mark first ONE only)**	(1)
	3.1.3	- Part **D** contains photoreceptors✓/cones - therefore the (clearest) image forms✓ if light falls on this part - Part **E** has no photoreceptors✓/rods and cones - therefore, no image✓ will form if light falls on this part	(4)
	3.1.4	(Bi)concave✓ lenses	(1)
	3.1.5	- Biconcave lenses will help to diverge the light✓ before they enter the eye - to focus on the retina✓	(2)
	3.1.6	- It is elastic✓ and can change its shape✓ to focus light rays on the retina **(Mark first ONE only)** (1 x 2)	(2)
	3.1.7	- Radial✓/ dilator muscles - Circular✓/sphincter muscles **(Mark first TWO only)**	(2)
	3.1.8	- Astigmatism✓ - Light is refracted unevenly✓/distorted - forming a blurred image✓	(3) **(16)**
3.2	3.2.1	They stimulate cell elongation✓/cell division **(Mark first ONE only)**	(1)
	3.2.2	- To prevent weeds from competing with crops✓ - for water✓/nutrients/space/sunlight	(2)
	3.2.3	- They may kill other organisms✓ - They may accumulate in ecosystems✓ - They may disrupt ecosystems✓ Any **(Mark first ONE only)**	(1)
	3.2.4	- The application of auxin-based herbicides is less labour intensive✓✓/less time-consuming/less expensive than mechanical removal - Auxin-based herbicides will kill the whole plant but with physical removal only part of the plant may be removed✓✓ Any (1 x 2) **(Mark first ONE only)**	(2)
	3.2.5	- Auxin-based herbicides selectively kill broad leaved plants✓ - and the farmer will lose money✓/the bean crop will fail	(2) **(8)**

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	3.3.1	Sheep and goats✓	(1)
	3.3.2	To trap heat energy/ keep Earth warm enough to sustain life✓ **(Mark first ONE only)**	(1)
	3.3.3	4 623 – 1 826✓(668+684+474) million tonnes = 2 797✓million tonnes / 2 797 000 000 (tonnes)	(2)
	3.3.4	- Landfills✓ - Rice paddies✓ - Waterlogged soil✓/wetlands - Mining of coal✓ - Fossil fuels✓ - Biofuels✓ - Fracking✓ - Sewage✓ - Decomposition✓ - Melting of ice in glaciers✓ Any **(Mark first ONE only)**	(1)
	3.3.5	- More greenhouse gases✓/ carbon dioxide/ methane is released into the atmosphere - Therefore, more heat is trapped✓/causing an enhanced greenhouse effect - leading to an increase in (global) temperatures✓ hence global warming increases Any	(3) **(8)**
3.4	3.4.1	Thermal pollution refers to the change from the normal temperature of an aquatic ecosystem✓	(1)
	3.4.2	- Thermal pollution lowers the oxygen content✓/causes algal bloom/increased number of bacteria in the water - which reduces✓ the quality of the water	(2)
	3.4.3	- The hot water can be stored until it is cooled down✓ before it is released into the river - After cooling down the hot water, it can be re-used to cool down the plant again✓ - Use fans/other technology for cooling down of machinery✓ Any **(Mark first ONE only)**	(1)
	3.4.4	- The warm water may cause fish to die✓/move away - which will cause a loss of income✓ to the fishermen	(2)
	3.4.5	- The biodiversity increased✓ - since no thermal pollution occurred✓	(2) **(8)** **[40]**
		TOTAL SECTION B:	**80**

SECTION C

QUESTION 4

Development of zygote and the formation of placenta and umbilical cord

- The zygote divides by mitosis✓
- to form a (solid) ball of cells✓
- called the morula✓
- which further divides to form a hollow ball of cells✓
- called the blastocyst✓/blastula
- The blastocyst/blastula enters the uterus✓
- It implants in the endometrium✓
- This is called implantation✓

- The outer layer of the embryo becomes a chorion✓ and
- inner layer becomes an amnion✓
- with the amniotic fluid inside✓

- After implantation the chorion develops many finger-like outgrowths✓
- called chorionic villi✓
- The endometrium together with the chorionic villi forms the placenta✓
- The placenta consists of blood rich embryonic and maternal tissues✓

- The umbilical cord develops between the foetus and the placenta✓
- It consists of a hollow tube✓
- that contains the umbilical artery✓
- and the umbilical vein✓

- Up to 8 -12 weeks of development it is called the embryo✓
- When differentiation of tissues into organs occurs✓
- and now is called a foetus✓

Any (17)

Content: 17
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information is relevant to: - Development from the zygote to the formation of the placenta and umbilical cord No irrelevant information	The sequence of the events in the: - Development from the zygote to the formation of the placenta and umbilical cord are in a logical sequence	The following must be included: - Development from the zygote to the formation of the placenta and umbilical cord **(11/17)**
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2022

MARKS: 150

TIME: 2½ hours

This question paper consists of 15 pages.

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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 to D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, e.g. 1.1.10 D.

1.1.1 Which ONE of the following statements is CORRECT for oogenesis in humans?

A One diploid mature ovum is formed
B One haploid mature ovum is formed
C Four diploid mature ova are formed
D Four haploid mature ova are formed

1.1.2 A structure in the eye that contains a high concentration of blood vessels and provides oxygen and nutrients to the retina is the …

A sclera.
B choroid.
C conjunctiva.
D lens.

1.1.3 The vagina …

A transports urine to the outside.
B is the place where the foetus develops.
C produces progesterone.
D acts as a birth canal.

1.1.4 The list below gives the characteristics of some young birds immediately after hatching.

(i) Eyes are open
(ii) Can move around
(iii) Cannot feed themselves
(iv) No feathers

Which ONE of the following combinations represents the characteristics of precocial development?

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

1.1.5 The cornea and the lens are both …

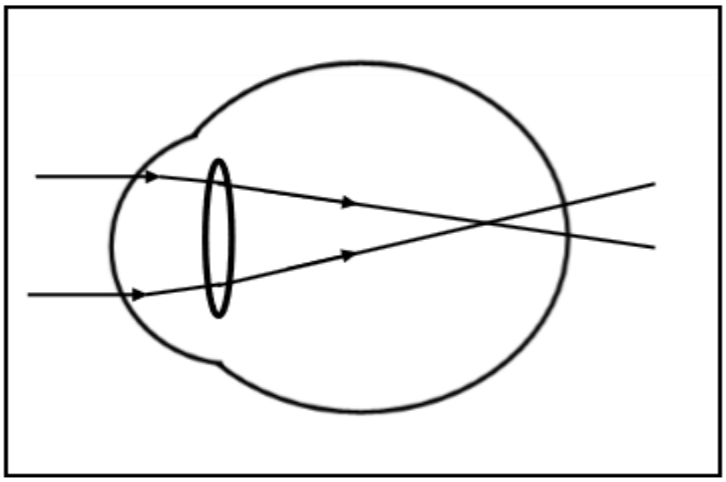
A opaque.
B transparent.
C elastic.
D inelastic.

1.1.6 Which ONE of the following is TRUE for a person who has an underactive thyroid gland?

The TSH levels will be …

A high and the metabolic rate low.
B high and the metabolic rate high.
C low and the metabolic rate low.
D low and the metabolic rate high.

1.1.7 The diagram below represents a visual defect.



Which ONE of the following is the correct treatment of the visual defect shown above?

A Glasses with biconvex lenses
B Glasses with biconcave lenses
C Surgery to replace the cornea
D Surgery to replace the retina

1.1.8 A list of some components of the nervous system is provided below.

(i) Brain
(ii) Cranial nerves
(iii) Spinal nerves
(iv) Spinal cord

Which ONE of the following combinations applies to the central nervous system?

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

1.1.9 Which ONE of the following is the part of the eye with the highest concentration of cones?

A Cornea
B Lens
C Yellow spot
D Iris

(9 x 2) **(18)**

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 1.2.10) in the ANSWER BOOK.

1.2.1 A structure in the ear that absorbs excess pressure waves from the inner ear

1.2.2 The structure in a sperm that contains enzymes

1.2.3 The site of fertilisation in the human female

1.2.4 A visual defect caused by the uneven curvature of the cornea

1.2.5 The nerve that transmits impulses from the eye to the brain

1.2.6 A disease characterised by the degeneration of brain cells and memory loss

1.2.7 The inner layer of the uterus that thickens during the menstrual cycle

1.2.8 A hollow ball of cells that forms during embryonic development

1.2.9 The period of development of secondary sexual characteristics in humans

1.2.10 The type of vision where both eyes are used to focus on an object

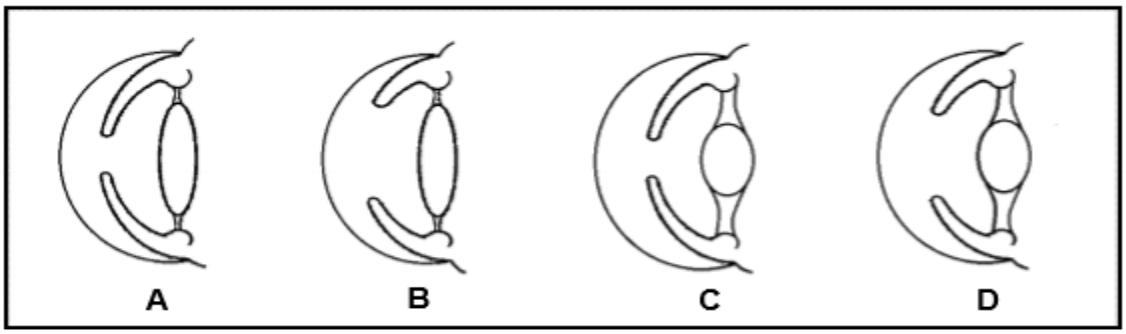
(10 x 1) **(10)**

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	The plant hormone that stimulates the germination of seeds	A: Gibberellins B: Abscisic acid
1.3.2	The part of the brain that connects the left and the right hemispheres	A: Corpus luteum B: Corpus callosum
1.3.3	The liquid found in front of the lens in the eye	A: Vitreous humor B: Aqueous humor

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

1.4 The diagrams below show part of the eye under different conditions.



1.4.1 Name the process that occurs when the:

(a) Curvature of the lens changes to focus on a near or distant object (1)

(b) Pupil size changes to regulate the amount of light entering the eye (1)

1.4.2 Give the LETTERS of TWO diagrams (**A**, **B**, **C** or **D**) that represent the condition of the eye of a person:

(a) In dim light (2)

(b) Focusing on a distant object (2)

1.4.3 Give the LETTERS of TWO diagrams (**A**, **B**, **C** or **D**) that represent the eye of a person whose:

(a) Ciliary muscles are contracted (2)

(b) Radial muscles are relaxed (2)
(10)

1.5 Diagram **1** below represents part of a reflex arc and diagram **2** represents a neuron.

Diagram 1

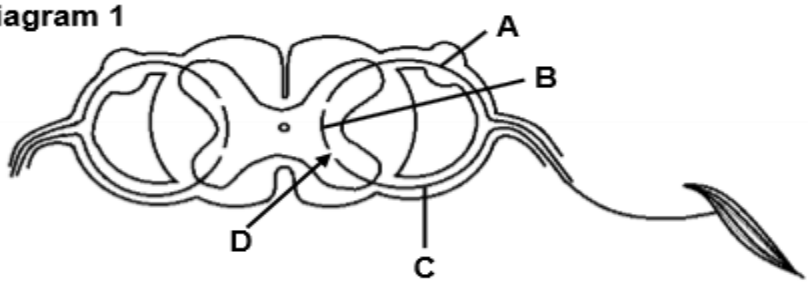
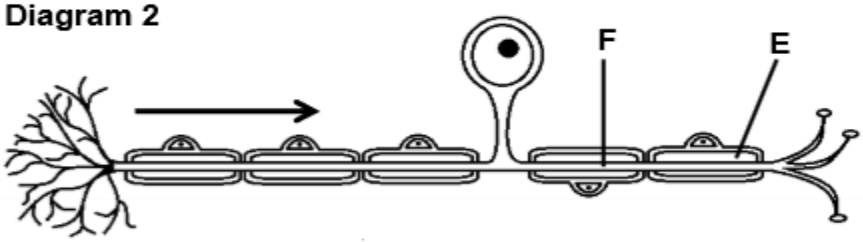


Diagram 2



1.5.1 Identify:

(a) Layer **E** (1)

(b) Structure **F** (1)

1.5.2 Which neuron (**A**, **B** or **C**):

(a) Represents the type of neuron shown in diagram **2** (1)

(b) Is damaged when a person can feel the stimulus but cannot respond to it (1)

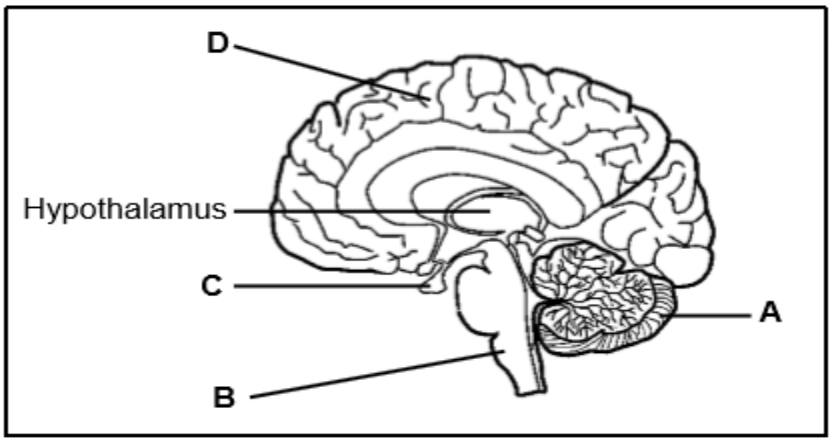
1.5.3 Give the LETTER and NAME of the part that ensures one-directional flow of the impulse. (2)
(6)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below shows part of the human brain.



2.1.1 Identify part **A**. (1)

2.1.2 State TWO functions of part **D**. (2)

2.1.3 Name the hormone secreted by gland **C** that has an effect on:

(a) Long bones (1)

(b) Mammary glands in the breasts (1)

2.1.4 State ONE way in which the brain is protected. (1)

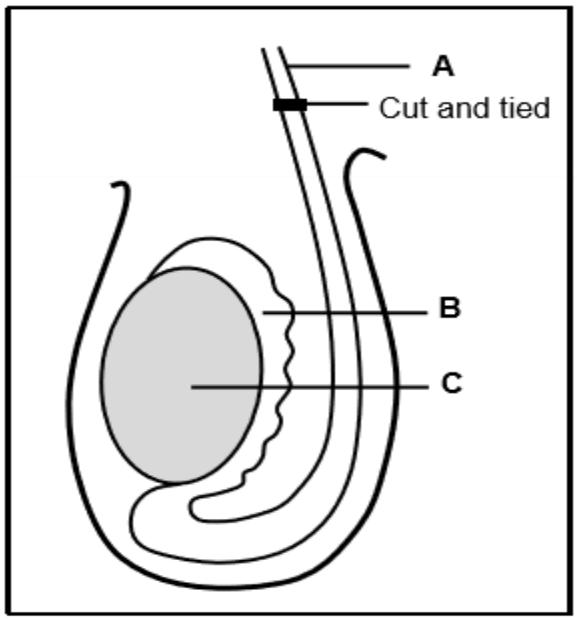
2.1.5 Describe the role of the hypothalamus in thermoregulation. (4)

2.1.6 Part **B** is involved in the homeostatic control of the carbon dioxide concentration in the blood.

(a) State the location of the receptors that are stimulated by an increase in the carbon dioxide concentration in the blood. (1)

(b) Name the TWO effectors that part **B** sends impulses to. (2)
(13)

2.2 The diagram below shows part of the male reproductive system.



2.2.1 Identify part **A**. (1)

2.2.2 State ONE function of part **B**. (1)

2.2.3 During a vasectomy, part **A** is cut and tied as shown in the diagram. Semen will still be released during copulation.

Explain the composition of the semen after a vasectomy. (3)

2.2.4 In some rare cases, males are born with part **C** located inside the body because it failed to descend into the scrotum.

Explain how this condition may affect male fertility. (3)

2.2.5 Describe the process of spermatogenesis. (4)
(12)

2.3 Describe how the developing embryo is protected and nourished in ovoviviparous organisms. **(7)**

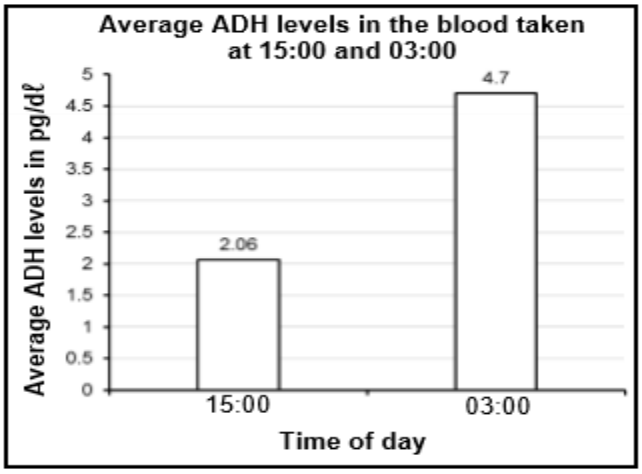
2.4 An investigation was conducted to determine the change in the ADH levels in the blood and the volume of urine produced over a 24-hour period.

The procedure was as follows:

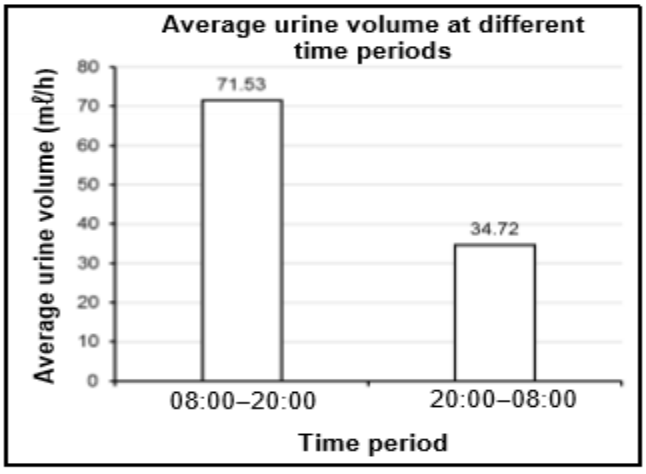
- One healthy adult participated in the investigation.
- The intake of food and liquids of this person was controlled for the duration of the investigation.
- The ADH levels in the blood were measured at 15:00 and 03:00 for 5 days and the average was calculated.
- The volume of urine produced from 08:00 to 20:00 was measured for 5 days and the average was calculated.
- The volume of urine produced from 20:00 to 08:00 was measured for 5 days and the average was calculated.

The results are shown in the graphs below.

GRAPH A



GRAPH B



2.4.1 Calculate the difference between the average volume of urine (mℓ/h) produced during the 2 time periods. Show ALL workings. (2)

2.4.2 Explain how the ADH levels in the blood at 03:00 affects the volume of urine produced between 20:00 and 08:00. (4)

2.4.3 Explain ONE advantage of the high ADH levels at 03:00. (2)

2.4.4 A patient whose renal tubules are impermeable to water, underwent the same investigation.

Explain why the ADH levels are expected to remain high all the time. (3)
(11)

2.5 Read the extract below.

> Some plants contain chemical substances such as alkaloids and cyanogenic glycosides. Alkaloids are bitter-tasting compounds while cyanogenic glycosides are toxic substances.
>
> Caffeine is an example of an alkaloid that occurs in plants like *Coffea arabica* (coffee), *Camelia sinensis* (tea) *and Theobroma cacao* (cocoa). Although harmless to humans, caffeine kills pathogenic fungi.
>
> Nicotine is another example of an alkaloid that is found in tobacco plants.

2.5.1 Name TWO alkaloids that are found in plants. (2)

2.5.2 Explain TWO ways in which caffeine production acts as a defence mechanism in plants. (4)

2.5.3 Name ONE other plant defence mechanism. (1)
(7)
[50]

QUESTION 3

3.1 Describe the role of auxins in phototropism when a plant is exposed to unilateral light. **(5)**

3.2 The FSH test is sometimes used to determine the cause of infertility in females. The levels of FSH usually indicate the number of follicles in the ovaries. If the number of follicles are low or depleted, the pituitary gland will secrete more FSH.

An investigation was conducted to compare the average FSH levels in 4 different age groups.

The procedure was done as follows:

- 1 000 females were asked to participate (250 in each of the four age groups).
- The females were all healthy and not using any hormone-based contraceptives.
- Their blood FSH levels were measured on day 3 of the menstrual cycle for 5 cycles.
- The average FSH levels in their blood were calculated per age group.

The results are shown in the table below.

AGE GROUP	AVERAGE FSH LEVELS
20–32	7,0
33–35	7,8
36–40	8,0
41–50	8,5

3.2.1 State TWO factors, regarding the females, that should have been kept constant during the investigation. (2)

3.2.2 State TWO ways in which the reliability of the results was ensured. (2)

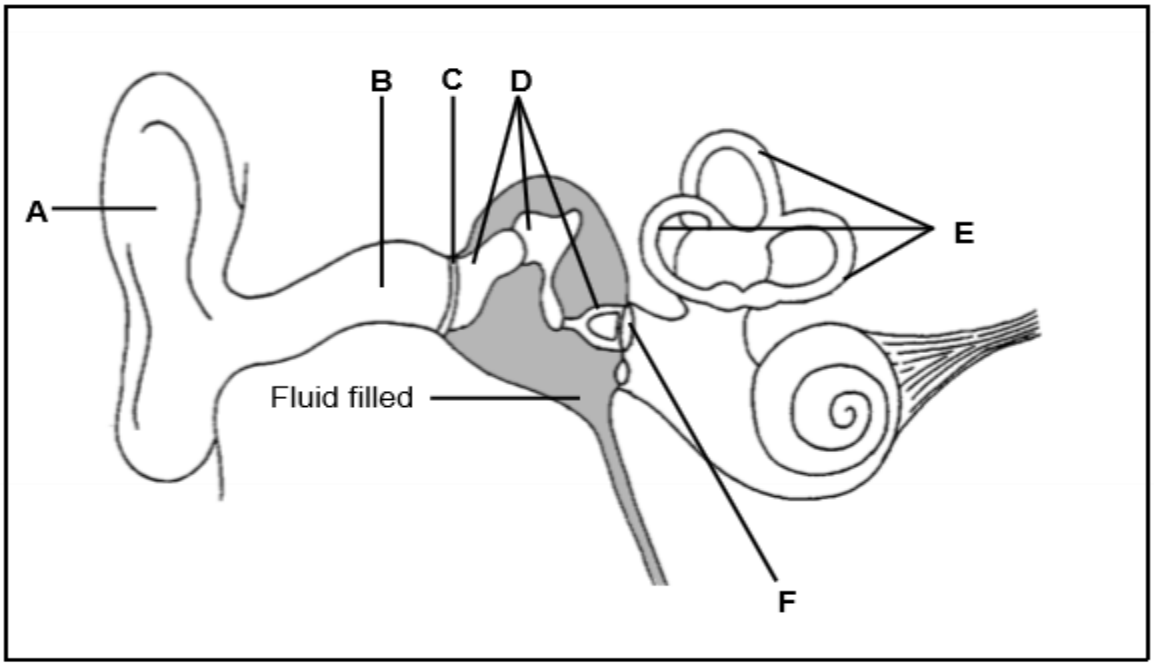
3.2.3 State ONE conclusion that can be drawn from the results. (2)

3.2.4 Explain why the oestrogen levels may remain low in the blood of the females in the 41–50 age group. (3)

3.2.5 Explain why females that were using progesterone-based pills were excluded from the investigation. (3)
(12)

3.3 Describe the development of the placenta and umbilical cord from the time of implantation. **(6)**

3.4 The diagram below represents part of the human ear with a middle-ear infection.



3.4.1 Identify part:

(a) **B** (1)

(b) **D** (1)

3.4.2 State ONE function of part **A**. (1)

3.4.3 Explain how middle-ear infection could affect hearing. (4)

3.4.4 Describe the role of the Eustachian tube. (2)

3.4.5 Name the small device that is used in the treatment of middle-ear infection. (1)

3.4.6 Write down the LETTER of the part where the small device, named in QUESTION 3.4.5, is inserted. (1)

3.4.7 Describe how part **E** is involved in maintaining balance when there is a change in the speed and direction of movement of the head. (4)
(15)

3.5 Type I diabetes mellitus is caused by pancreatic cells which cannot produce insulin.

In type II diabetes mellitus the pancreas does secrete insulin, but the body cells are resistant to the effect of insulin.

To diagnose if a person has type I or type II diabetes mellitus, the following tests may be conducted:

- The blood glucose level is tested after fasting (the person is not allowed to eat or drink for 6 hours before the test). If the blood glucose level is above 126 mg/dℓ, the person is diabetic.
- The person is then given a glucose solution to drink and the blood glucose level is tested after 2 hours.
- The blood is also tested for the presence of GAD antibodies. The presence of GAD antibodies would indicate that the body is destroying the insulin-producing pancreatic cells.
- The levels of C-peptide are measured. This is a substance produced by the same pancreatic cells that produce insulin. If the levels are below 0,3 ng/mℓ in the blood, the person is diabetic.

3.5.1 Name the cells in the pancreas that secrete insulin. (1)

3.5.2 Explain which type (I or II) of diabetes mellitus would be indicated by the:

(a) Presence of GAD antibodies in the blood (3)

(b) C-peptide levels at below 0,3 ng/mℓ (3)

3.5.3 Explain the insulin levels in the blood of a type II diabetic 2 hours after drinking the glucose solution. (3)

3.5.4 Give ONE reason why a person with untreated diabetes mellitus is expected to be tired all the time. (2)

(12)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2022

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 8 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	B✓✓		
	1.1.3	D✓✓		
	1.1.4	C✓✓		
	1.1.5	B✓✓		
	1.1.6	A✓✓		
	1.1.7	B✓✓		
	1.1.8	B✓✓		
	1.1.9	C✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Round window✓/ Fenestra rotunda		
	1.2.2	Acrosome✓		
	1.2.3	Fallopian tube✓		
	1.2.4	Astigmatism✓		
	1.2.5	Optic✓ nerve		
	1.2.6	Alzheimer's✓ disease		
	1.2.7	Endometrium✓		
	1.2.8	Blastula✓/blastocyst		
	1.2.9	Puberty✓		
	1.2.10	Binocular✓ /stereoscopic vision	(10 x 1)	**(10)**
1.3	1.3.1	A only✓✓		
	1.3.2	B only✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Accommodation✓		(1)
		(b) Pupillary mechanism✓/Pupillary reflex		(1)
	1.4.2	(a) B✓and D✓ **(Mark first TWO only)**		(2)
		(b) A✓ and B✓ **(Mark first TWO only)**		(2)
	1.4.3	(a) C✓and D✓ **(Mark first TWO only)**		(2)
		(b) A✓ and C✓ **(Mark first TWO only)**		(2) **(10)**
1.5	1.5.1	(a) Myelin sheath✓		(1)
		(b) Axon✓		(1)
	1.5.2	(a) A✓		(1)
		(b) C✓		(1)
	1.5.3	D✓ Synapse✓		(2) **(6)**
			TOTAL SECTION A:	**50**

SECTION B

QUESTION 2

2.1	2.1.1	Cerebellum✓		(1)
	2.1.2	- Higher thought processes✓/(intelligence/memory/reasoning) - Interpretation of all senses✓ - Controls all voluntary actions✓ **(Mark first TWO only)**	Any	(2)
	2.1.3	(a) Growth hormone✓/GH		(1)
		(b) Prolactin✓		(1)
	2.1.4	- Meninges✓ - Cranium✓ **(Mark first ONE only)**	Any	(1)
	2.1.5	- It receives✓/ interprets impulses - from receptors✓ in the skin and - sends impulses to the blood vessels of the skin✓/ influences blood flow to the skin and - the sweat glands✓/influences sweat secretion		(4)
	2.1.6	(a) Carotid artery✓		(1)
		(b) Heart✓ muscle - Diaphragm✓ - Intercostal muscles✓ } /Breathing muscles✓ **(Mark first TWO only)**	Any	(2) **(13)**
2.2	2.2.1	Vas deferens✓		(1)
	2.2.2	- Sperm storage✓ - Sperm maturation✓ **(Mark first ONE only)**	Any	(1)
	2.2.3	- The semen will not contain sperm✓ because - they are not transported✓ - but will contain all other secretions of the accessory glands✓/ examples thereof - the vasectomy occurred before✓ the accessory glands	Any	(3)
	2.2.4	- The temperature of the testes inside the body will be too high✓ - No/abnormal sperm will be produced✓ - The man will be infertile✓/not able to reproduce		(3)
	2.2.5	- Under the influence of testosterone✓ - diploid cells✓/germinal epithelial cells - in the seminiferous tubules✓/testes - undergo meiosis✓ - to form haploid sperm cells✓	Any	(4) **(12)**

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2.3 **Protection**
- The (amniotic) egg is retained inside the mother's body✓*
- to protect the embryo from predators✓
- The allantois✓ protects the embryo
- by removing waste products✓
- The embryo is protected from shocks✓/sudden changes in temperature/dehydration by the:
  - Chorion✓
  - Amnion✓
  - Amniotic fluid✓ inside the amniotic membrane
  - Shell✓/outer covering
  - Air pocket✓

Compulsory 1* + Any 4 — 5

Nourishment (N)
- The embryo receives nutrients✓
- from the egg yolk✓ in the yolk sac
- and from the albumen✓

Any 2 — 2

(7)

2.4 2.4.1 71.53 – 34.72✓ = 36.81✓ml/h (2)

2.4.2
- The high level of ADH✓ at night
- Increases the permeability of the renal tubules✓/collecting duct/distal convoluted tubules in the kidney
- More water is re-absorbed✓/less water is excreted
- Less urine is produced✓ (4)

2.4.3
- Less urine produced✓/more water is retained
- A person will not need to urinate often✓/ will not be thirsty/ sleep will not be interrupted (2)

2.4.4
- Water will not be reabsorbed from the renal tubules✓
- The volume of water in the blood will be low✓
- The pituitary gland will be stimulated✓
- to release more ADH✓ all the time

Any (3)

(11)

2.5 2.5.1
- Caffeine✓
- Nicotine✓

(2)

(Mark first TWO only)

2.5.2
- The bitter taste✓ will prevent herbivores✓ from feeding on them
- The caffeine will kill pathogenic fungi✓protecting the plants from disease✓/death

Any (2 x 2) (4)

(Mark first TWO only)

2.5.3 Thorns✓ (1)

(Mark first ONE only)

(7)
[50]

QUESTION 3

3.1
- Auxins move away from light✓
- There is a higher concentration of auxins on the dark side of the stem✓
- Growth is stimulated✓ on the dark side which
- grows faster✓
- causing the stem to grow/bend towards the light✓ **(5)**

3.2 3.2.1
- Must have regular menstrual cycles✓
- They must not become pregnant✓
- Diet Any (2)

(Mark first TWO only)

3.2.2
- 250 females per group were used✓/1000 females participated
- Measurement was done for 5 cycles✓ (2)

(Mark first TWO only)

3.2.3 Older groups of women have a higher (average) FSH level than the younger groups✓✓

OR

Younger groups of women have a lower (average) FSH level than the older groups✓✓ (2)

(Mark first ONE only)

3.2.4
- The Graafian/developing follicles secretes oestrogen✓
- but since the number of follicles are low✓/depleted
- less/no oestrogen will be secreted✓ (3)

3.2.5
- A high concentration of progesterone✓
- inhibits the pituitary gland✓/results in reduced FSH secretion
- This will decrease the validity of the investigation✓ Any (3)

(12)

3.3
- After implantation the chorion✓
- develops many finger-like outgrowths✓
- called chorionic villi✓
- The endometrium✓
- together with the chorionic villi forms the placenta✓
- The umbilical artery✓
- and the umbilical vein✓develops
- inside a hollow tube✓
- to form the umbilical cord between the foetus and the placenta✓ Any **(6)**

3.4 3.4.1 (a) Auditory canal✓ (1)

(b) Ossicles✓ (1)

	3.4.2	- Collects the sound waves✓ - Directs the sound waves towards the auditory canal✓ **(Mark first ONE only)**	Any	(1)
	3.4.3	- Part D/the ossicles do not vibrate freely✓ - Fewer/no vibrations will be sent to the oval window✓/inner ear - Fewer/no pressure waves will be set up in the cochlea✓ - The receptors/organ of Corti will be stimulated less✓/not stimulated - The cerebrum is stimulated differently✓/not stimulated - which leads to hearing loss✓	Any	(4)
	3.4.4	- It equalises pressure✓ - on either side of the tympanic membrane✓		(2)
	3.4.5	Grommet✓		(1)
	3.4.6	C✓		(1)
	3.4.7	- The cristae are stimulated✓ - to convert the stimuli to impulses✓ - The impulses are sent to the cerebellum✓ - where they are interpreted✓ - The cerebellum sends impulses to the skeletal muscles✓ to maintain balance	Any	(4) **(15)**
3.5	3.5.1	Islets of Langerhans✓		(1)
	3.5.2	(a) - Type I✓ - No insulin will be produced✓ - The presence of GAD-antibodies indicates that pancreas cells are being destroyed✓		(3)
		(b) - Type I✓ - A lower than normal C-peptide level indicates that the insulin producing cells of the pancreas was destroyed✓ - therefore no insulin will be produced✓		(3)
	3.5.3	- The insulin levels will remain high✓ because - the blood glucose levels remain high✓ - the pancreas will continue secreting insulin✓		(3)
	3.5.4	- The glucose cannot be absorbed into the cells✓ - therefore it cannot be used in cellular respiration✓/ to release energy		(2) **(12)** **[50]**

TOTAL SECTION B: 100
GRAND TOTAL: 150

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Department:
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REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2023

MARKS: 150

TIME: 2½ hours

This question paper consists of 15 pages.

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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 Diabetes mellitus is caused by an …

A oversecretion of glucagon.
B undersecretion of glucagon.
C oversecretion of insulin.
D undersecretion of insulin.

1.1.2 Receptors that are stimulated by the low water levels in the blood are located in the …

A renal tubules.
B hypothalamus.
C pituitary gland.
D carotid artery.

1.1.3 The myelin sheath on a nerve cell …

A provides electrical insulation.
B transports impulses towards the cell body.
C receives impulses from the axon.
D converts stimuli into impulses.

1.1.4 The structure where sperms are temporarily stored is the …

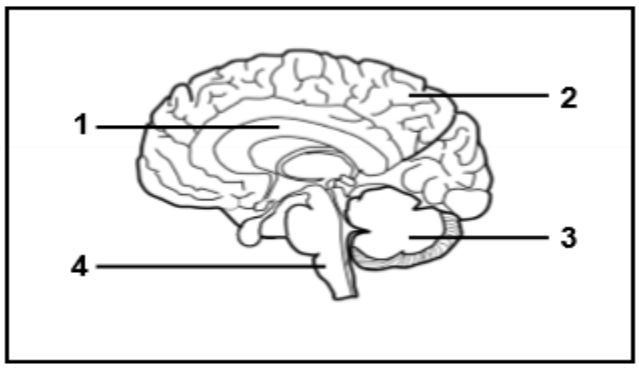
A testis.
B epididymis.
C vas deferens.
D penis.

1.1.5 Which ONE of the following is a function of the amniotic fluid?

A Provides nutrition to the foetus
B Protects the foetus against mechanical injury
C Supplies oxygen to the foetus
D Removes the metabolic waste from the foetus

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QUESTIONS 1.1.6 AND 1.1.7 ARE BASED ON THE DIAGRAM OF THE BRAIN BELOW.



1.1.6 Which ONE of the following represents the corpus callosum?

A 1
B 2
C 3
D 4

1.1.7 Which ONE of the following is the function of part **3**?

A Controls voluntary movements
B Controls involuntary actions
C Coordinates voluntary movements
D Controls all sensations

1.1.8 The placenta is formed by the …

A amniotic fluid and amnion.
B chorionic villi and endometrium.
C amnion and endometrium.
D amniotic fluid and chorionic villi.

1.1.9 An oversecretion of the hormone produced by the thyroid gland may result in a person …

A gaining weight, because of an increased metabolic rate.
B gaining weight, because of a decreased metabolic rate.
C losing weight, because of an increased metabolic rate.
D losing weight, because of a decreased metabolic rate.

1.1.10 The table below shows the average testosterone levels of males of different age groups.

Group	Age (years)	Average testosterone level (n/M)
I	0–10	less than 5
II	11–15	15
III	16–20	19

Which ONE of the following is an explanation for the difference in testosterone levels between the age groups?

Testosterone levels are higher in …

A Group **I** than Group **III** due to the start of puberty.
B Group **II** than Group **I** due to the start of puberty.
C Group **III** than Group **I** because it is needed to inhibit the growth of long bones.
D Group **I** than Group **II** because it is needed to inhibit the growth of long bones. (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 process of maintaining a constant internal environment in the human body

1.2.2 The organelles found in large quantities in the neck region of a sperm cell

1.2.3 The disease characterised by the degeneration of brain tissue, leading to memory loss

1.2.4 The layer in the eye that is richly supplied with blood vessels

1.2.5 The type of development in birds in which the young is born fully developed and able to move and feed itself

1.2.6 Groups of cells in the pancreas that secrete insulin and glucagon

1.2.7 The structure in the sperm that contains enzymes to dissolve the outer layer of the ovum

1.2.8 A blood vessel that transports carbon dioxide from the foetus to the placenta

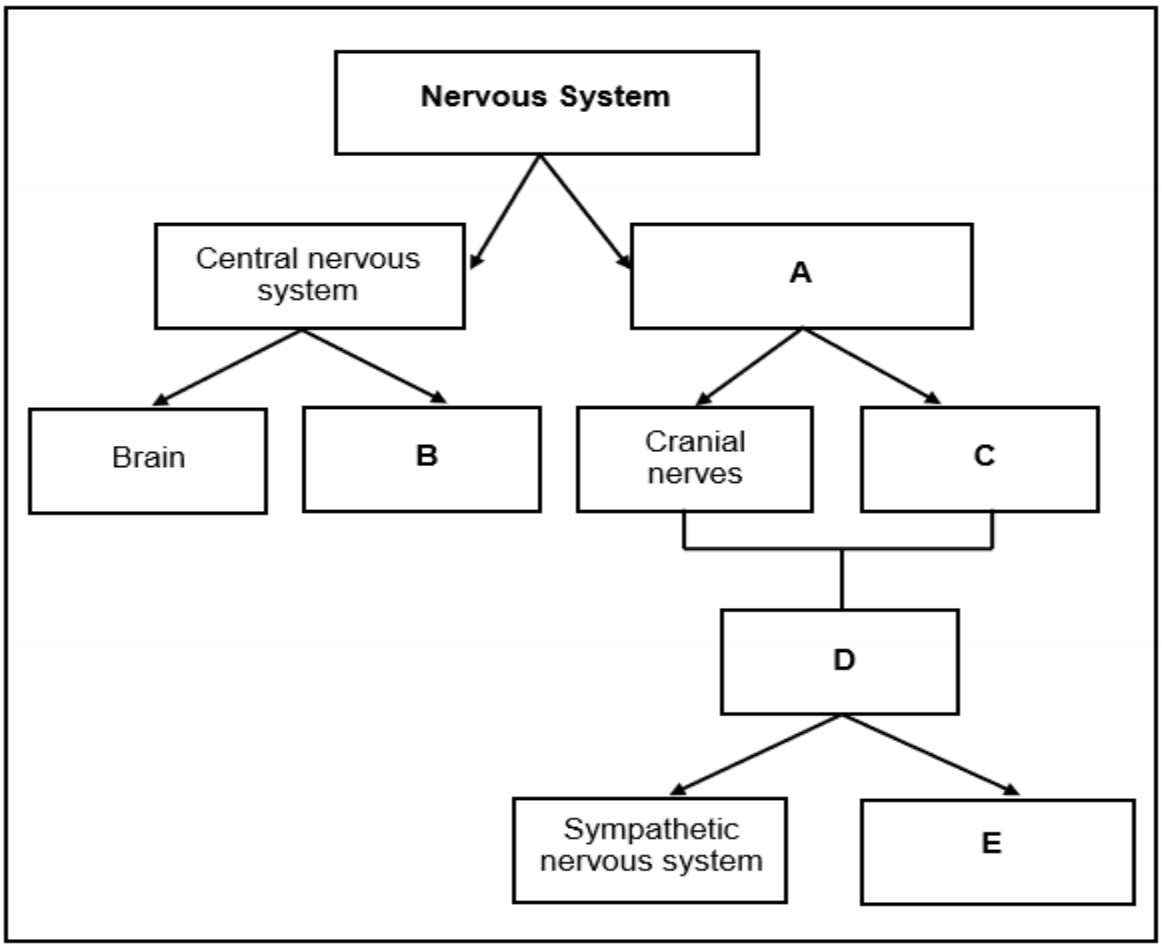
(8 x 1) **(8)**

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	An extra-embryonic membrane found in the amniotic egg	A: Chorion B: Allantois
1.3.2	A structure in the ear that absorbs excess pressure waves from the cochlea	A: Pinna B: Auditory canal
1.3.3	A structure that transports semen out of the body	A: Scrotum B: Urethra

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

1.4 The flow diagram below represents the components of the nervous system.



1.4.1 Identify the component of the nervous system represented by:

(a) **A** (1)

(b) **D** (1)

1.4.2 Name the type of nerves found at **C**. (1)

1.4.3 Give the LETTER and NAME of the component that slows down the heart rate when an emergency situation has passed. (2)

1.4.4 Name the nerve cells that make up nervous tissue. (1)

1.4.5 State TWO ways in which the brain is protected. (2)
(8)

1.5 The diagrams below show parts of the middle and inner ear.

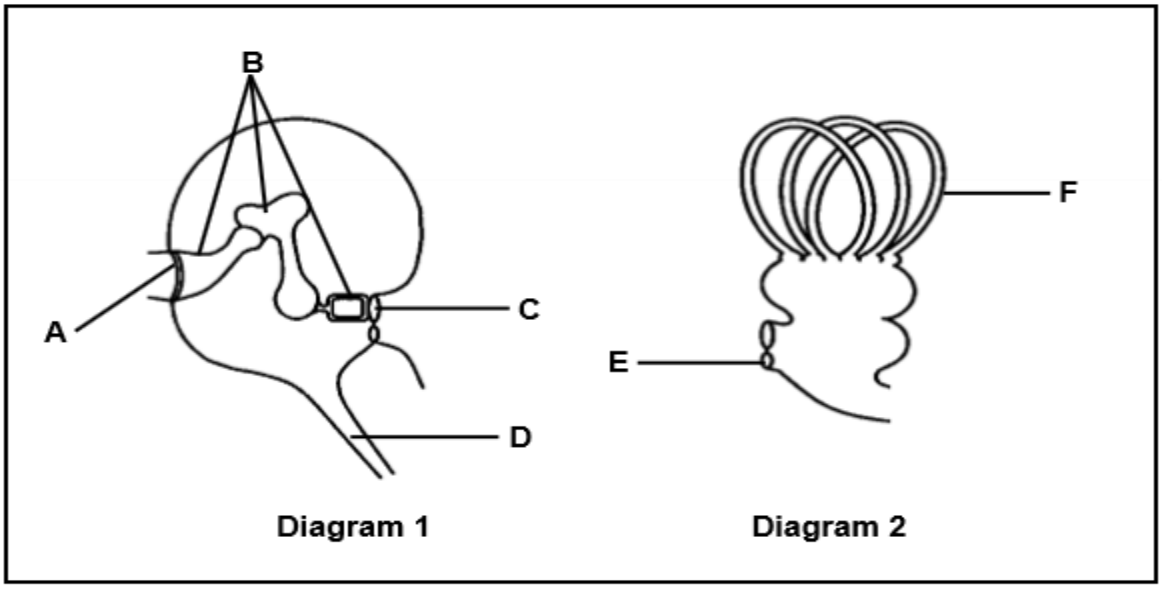


Diagram 1 **Diagram 2**

1.5.1 Identify part **F**. (1)

1.5.2 Give the collective term for bones **B**. (1)

1.5.3 Give the LETTER and NAME of the structure that:

(a) Equalises pressure between the outer and middle ear (2)

(b) Creates pressure waves in the inner ear (2)

1.5.4 Name the receptors that are stimulated by a change in the:

(a) Position of the head (1)

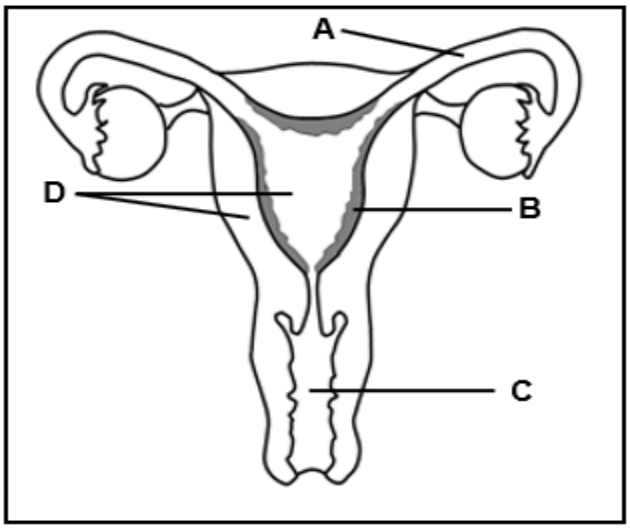
(b) Direction and speed of movement of the head (1)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents the female reproductive system.



2.1.1 Identify part **B**. (1)

2.1.2 Name the process that takes place in part **A** that leads to zygote formation. (1)

2.1.3 Describe the process named in QUESTION 2.1.2. (1)

2.1.4 Describe the development of the zygote until implantation occurs. (4)

2.1.5 Explain TWO ways in which part **D** is structurally suited for gestation. (4)

2.1.6 Describe how the secretion of the prostate gland provides protection for the sperm from the conditions in part **C**. (2)
(13)

2.2 Read the extract below.

PLASTIC LINKED TO FEMALE INFERTILITY

Several studies indicate that bisphenol A (BPA), a chemical used in the production of many household plastic products, may be linked to female infertility (inability to get pregnant naturally and to deliver a healthy baby). BPA can be ingested or absorbed through the skin when using plastic products.

BPA seems to interfere with the normal secretion of FSH by the pituitary gland and is linked to abnormal menstrual cycles and reduced implantation rates. These studies also show a link between high BPA levels and a decrease in the development and maturation of ovarian follicles.

2.2.1 State ONE function of FSH. (1)

2.2.2 Name ONE other hormone in females that is secreted by the pituitary gland during the menstrual cycle. (1)

2.2.3 Explain how an undersecretion of the hormone in QUESTION 2.2.2 may lead to infertility. (2)

2.2.4 Explain why a decrease in the maturation of ovarian follicles may lead to reduced implantation rates. (5)
(9)

2.3 Describe the process of *spermatogenesis*. **(4)**

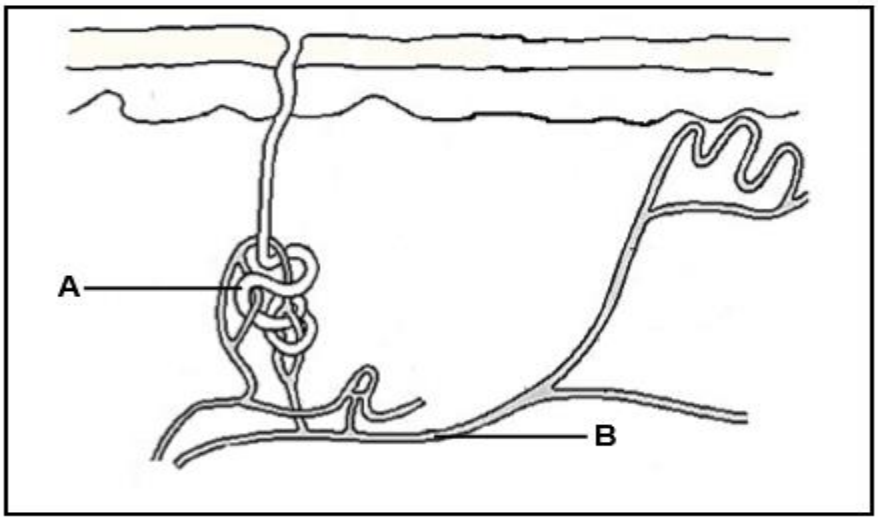
2.4 Frogs can survive in water and on land. Most frogs, however, need water for reproduction. During the breeding season, male and female frogs release millions of gametes into the water.

2.4.1 Name the type of fertilisation described above. (1)

2.4.2 Explain why millions of gametes are released. (3)

2.4.3 State why the reproduction in frogs is an example of ovipary. (1)
(5)

2.5 The diagram below shows parts of the skin that are involved in thermoregulation.



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

2.5.2 Describe the role of skin receptors in thermoregulation. (2)

2.5.3 Explain why structure **B** dilates on a hot day. (2)
(6)

2.6 Workers in some factories are constantly exposed to loud noise for long periods. This can destroy the hair cells in the organ of Corti and damage the auditory nerve, resulting in hearing loss.

A survey was conducted in a developing country from 2014 to 2018, to establish the number of factory workers who suffered from hearing loss.

The results are shown in the table below.

Year	Number of factory workers with hearing loss
2014	85 000
2015	100 000
2016	115 000
2017	120 000
2018	130 000

2.6.1 Name the structure in the ear where the organ of Corti is located. (1)

2.6.2 Calculate the percentage increase in the number of factory workers with hearing loss between 2014 and 2018. Show ALL workings. (3)

2.6.3 Suggest ONE reason for the increase in the number of factory workers with hearing loss caused by exposure to loud noise in this country. (1)

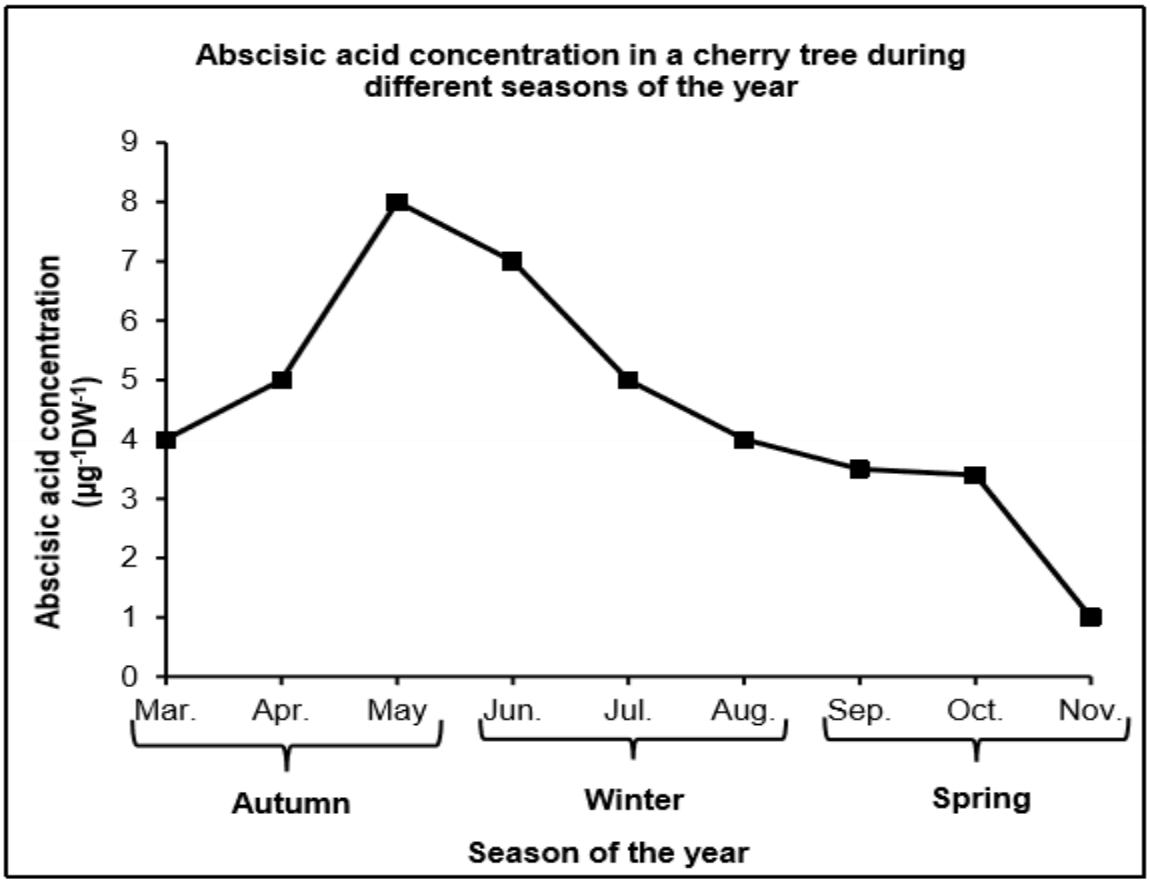
2.6.4 Explain why damage to the auditory nerve may result in hearing loss. (2)

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

QUESTION 3

3.1 The graph below shows the concentration of abscisic acid in a cherry tree during different seasons of the year.

This tree species loses all its leaves in autumn and goes into a state of dormancy during the winter months.



3.1.1 During which month was the abscisic acid concentration the lowest? (1)

3.1.2 Explain the trend of the graph from March to May. (3)

3.1.3 Suggest ONE reason for the dormancy in cherry trees during the winter months. (2)
(6)

3.2 Geotropism refers to the movement of a part of a plant in response to gravity. This tropism is controlled by auxins.

3.2.1 Describe the role of auxins in roots. (3)

3.2.2 When a plant is placed horizontally, with light coming from all directions, the auxins will accumulate on the lower side of both the stem and the roots.

Explain the difference in the response of the stem and the roots after a few days. (4)
(7)

3.3 Hyperaldosteronism is a disorder caused by the oversecretion of aldosterone and has been linked to high blood pressure in humans.

Scientists investigated the influence of increased aldosterone levels on blood pressure.

The procedure was done as follows:

- 1 688 healthy volunteers, aged 55, participated in the investigation.
- The participants' blood pressure was measured and recorded before the start of the investigation.
- The participants were injected with a dose of aldosterone in the morning and their blood pressure was measured every hour for 12 hours.
- This procedure was followed over four days for each individual and the average blood pressure was calculated.
- All participants followed the same diet during the period of the investigation.

3.3.1 Name the gland that secretes aldosterone. (1)

3.3.2 Identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.3.3 Give TWO reasons why the results of the investigation may be considered reliable. (2)

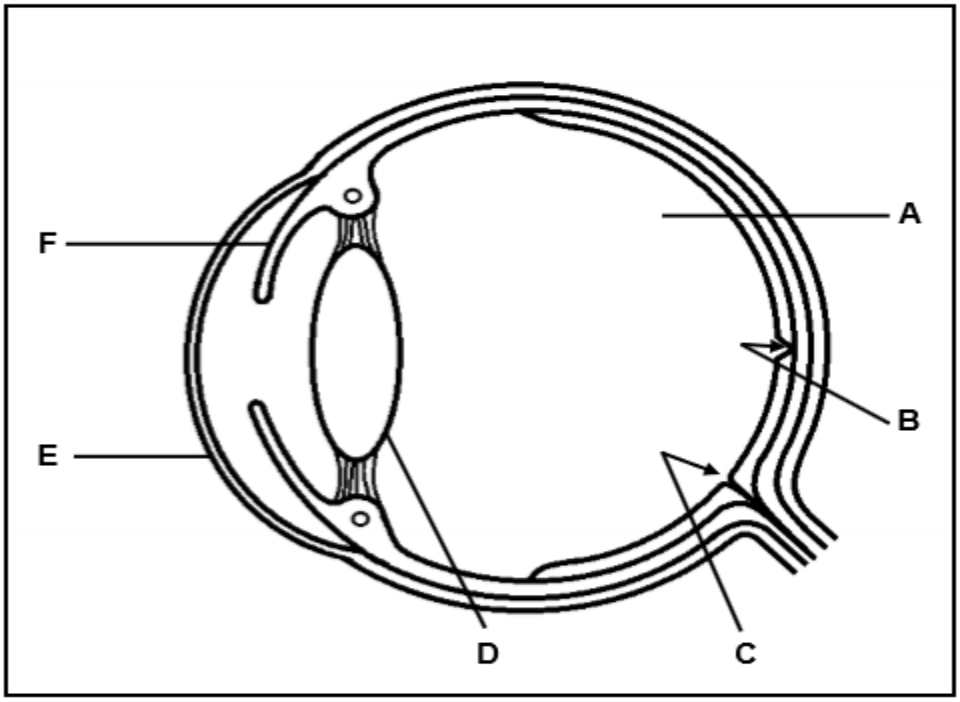
3.3.4 Explain TWO reasons why it was important for the participants to follow the same diet during the investigation. (4)

3.3.5 Explain why the participants' blood pressure was measured before the start of the investigation. (2)

3.3.6 Explain why the levels of salt in the urine of participants is expected to decrease after being injected with aldosterone. (3)
(14)

3.4 Describe how the secretion of adrenalin causes increased energy production in an emergency situation. **(8)**

3.5 The diagram below represents the human eye.



3.5.1 Identify structure **F**. (1)

3.5.2 State TWO functions of fluid **A**. (2)

3.5.3 Describe the structural difference between area **B** and area **C**. (2)

3.5.4 Name the visual defect that occurs when the curvature of part **E** is uneven. (1)

3.5.5 Explain how the sight of a person will be affected if cataracts developed in part **D**. (3)

3.5.6 Describe the process of accommodation that takes place when an object is less than 6 metres away from the eye. (6)
(15)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

2023

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 9 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	D✓✓		
	1.1.2	B✓✓		
	1.1.3	A✓✓		
	1.1.4	B✓✓		
	1.1.5	B✓✓		
	1.1.6	A✓✓		
	1.1.7	C✓✓		
	1.1.8	B✓✓		
	1.1.9	C✓✓		
	1.1.10	B✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Homeostasis✓		
	1.2.2	Mitochondria✓		
	1.2.3	Alzheimer's✓ disease /dementia		
	1.2.4	Choroid✓		
	1.2.5	Precocial✓ development		
	1.2.6	Islets of Langerhans✓		
	1.2.7	Acrosome✓		
	1.2.8	Umbilical artery✓	(8 x 1)	**(8)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	None✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Peripheral✓ nervous system		(1)
		(b) Autonomic nervous system✓		(1)
	1.4.2	Spinal✓ nerves		(1)
	1.4.3	E✓ - Parasympathetic nervous system✓		(2)
	1.4.4	Neurons✓		(1)
	1.4.5	- Meninges✓ - Cranium✓/bone tissue - Cerebrospinal fluid✓ **(Mark first TWO only)**	Any	(2) **(8)**
1.5	1.5.1	Semi-circular canals✓		(1)
	1.5.2	Ossicles✓		(1)
	1.5.3	(a) D✓ - Eustachian tube✓		(2)
		(b) C✓ - Oval window✓		(2)
	1.5.4	(a) Maculae✓		(1)
		(b) Cristae✓		(1) **(8)**
			TOTAL SECTION A:	**50**

SECTION B

QUESTION 2

	2.1.1	Endometrium✓		(1)
	2.1.2	Fertilisation✓		(1)
	2.1.3	The (nucleus of the) sperm fuses with (the nucleus of) the ovum✓		(1)
	2.1.4	- Zygote divides by mitosis✓ - to form a (solid) ball of cells✓ - called the morula✓ - which develops into a hollow ball of cells✓ - called the blastula✓/blastocyst	Any	(4)
	2.1.5	- It is muscular✓ to protect the foetus from mechanical injury✓/to allow for parturition/birth - It is flexible✓/can expand to accommodate the growing foetus✓ - It is hollow✓ to accommodate the growing foetus✓ - The thickened endometrium✓ allows for implantation✓ /survival of the embryo **(Mark first TWO only)**	Any (2 x 2)	(4)
	2.1.6	- The secretion is alkaline✓ which - neutralises the acidic conditions✓ of the vagina		(2) **(13)**
2.2	2.2.1	- Stimulates the development of ovarian follicles✓ - Initiates puberty✓ **(Mark first ONE only)**	Any	(1)
	2.2.2	- LH✓/Luteinising Hormone		(1)
	2.2.3	- LH stimulates ovulation✓ - therefore, ovulation will not take place✓ - There will be no ovum to fertilise✓	Any	(2)
	2.2.4	- A Graafian follicle is not formed✓ - Since the Graafian follicle secretes oestrogen✓ - oestrogen levels will be reduced✓ therefore - the endometrium will not develop✓/ thicken - and no implantation can take place✓ **OR** - There is no ovum produced✓/a Graafian follicle is not formed - Ovulation does not occur✓ - No fertilisation✓ occurs and - a zygote is not formed✓ - and no implantation can take place✓		(5) **(9)**

2.3
- Under the influence of testosterone✓
- diploid cells✓/germinal epithelium cells
- in the seminiferous tubules✓of the testis
- undergo meiosis✓ to form
- haploid sperm✓ Any **(4)**

2.4 2.4.1 External✓ fertilisation (1)

2.4.2
- To increase the chances of fertilisation✓
- since the gametes may be lost✓/not reach one another due to predation✓/water currents

OR

- To produce more zygotes✓/offspring
- since many will be lost✓
- because they are preyed on✓/washed away/dry out (3)

2.4.3 The embryos develop inside an egg, outside the female's body✓ (1)
(5)

2.5 2.5.1
- It has a duct✓
- The secretion is released externally✓/not released into blood
- It secretes sweat✓/It does not secrete a hormone Any (2)

(Mark first TWO only)

2.5.2
- They receive stimuli✓ from the environment
- and convert them to nerve impulses✓ (2)

2.5.3
- More blood flows to the surface of the skin✓ to allow more heat to be lost✓

OR

- More blood flows to the sweat glands✓ to increase the production of sweat✓ (2)

(6)

2.6 2.6.1 Cochlea✓ (1)

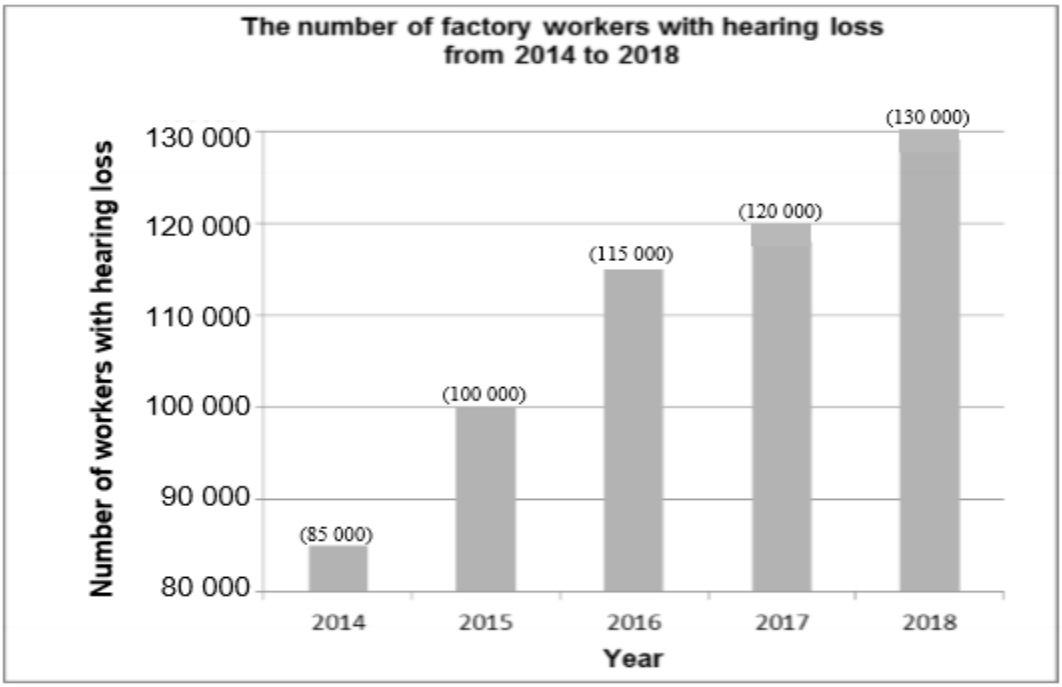
2.6.2 $\left[\frac{(130\,000 - 85\,000)}{85\,000}\right]$✓ x 100✓ = 52,94✓% (3)

2.6.3
- More factories✓ were built increase in supply & demand
- More workers✓ were employed
- Extended exposure to loud sounds✓
- Lack of precautionary measures✓ Any (1)

(Mark first ONE only)

2.6.4
- The impulse will not be transmitted to the cerebrum✓
- and will not be interpreted✓ (2)

2.6.5



Criteria for marking graph:

Criteria	Mark allocation
Type: Bar graph is drawn (T)	1
Caption of the graph includes both variables (C)	1
Correct labels on X-axis and Y-axis (L)	1
Correct scale for Y-axis Equal width of bars and spaces (S)	1
Plotting: (P) 1- 4 co-ordinates are plotted correctly All 5 co-ordinates are plotted correctly	1 2

(6)
(13)
[50]

Histogram or line graph drawn
- Lose marks for type of graph and for scale

Transposed axes:
- Can get full credit if axes labels are also swapped and bars are horizontal
- If labels are *not* corresponding, then lose marks for labels and scale
- Check that the plotting is correct for the given labels

QUESTION 3

3.1	3.1.1	November✓	(1)
	3.1.2	- The concentration of abscisic acid increases✓ - To stimulate the abscission✓/falling of leaves - To prepare the tree for dormancy✓	(3)
	3.1.3	- Less sunlight✓/ less water/ cold conditions therefore - Decreased photosynthesis✓/ reduced transpiration/ lower energy demand/ low growth rate Any (1 x 2) **(Mark first ONE only)**	(2) **(6)**
3.2	3.2.1	- Auxins promote the development of roots✓ - It brings about (general) root growth✓ causing their downward✓growth/positive geotropism	(3)
	3.2.2	- In the stem, the auxins stimulate growth✓ on the lower side causing the stem to grow/bend upwards✓ - In the root, the auxins inhibit growth✓ on the lower side causing the root to grow/bend downwards✓	(4) **(7)**
3.3	3.3.1	Adrenal✓ gland	(1)
	3.3.2	(a) Aldosterone level✓/ increased aldosterone level	(1)
		(b) Blood pressure✓	(1)
	3.3.3	- 1 688 volunteers were used✓ - The procedure was done 4 times for each individual✓ **(Mark first TWO only)**	(2)
	3.3.4	- All factors should be kept constant✓/there should be only one independent variable to ensure the validity✓ of the investigation - Dietary factors✓/examples can also influence the blood pressure✓ (2 x 2) **(Mark first TWO only)**	(4)
	3.3.5	To compare the blood pressure before and after the administration of aldosterone✓✓	(2)
	3.3.6	- The high aldosterone✓ level - will increase the permeability of the renal tubules✓ for salt - More salt will be reabsorbed✓	(3) **(14)**

3.4
- Adrenalin causes glycogen to be converted to glucose✓ which
- increases the blood glucose level✓
- The breathing muscles are stimulated✓
- to increase the rate and depth of breathing✓
- The heart muscle is stimulated✓
- to pump faster✓
- There is also an increase in blood pressure✓
- increasing the transport of oxygen and glucose✓
- The rate of cellular respiration is increased✓ Any **(8)**

3.5

3.5.1 Iris✓ (1)

3.5.2
- Helps to maintain the shape of the eye✓
- Plays a role in refraction of light✓
- Allows the transmission of light✓
- Prevents desiccation✓ of structures in the eye
- Holds the retina in position✓
- Nourishment✓ of the eye
- Prevents mechanical injury✓ in the eye (2)

Any
(Mark first TWO only)

3.5.3
- Area B contains (a high concentration of) photoreceptors✓/ cones (2)
- Area C contains no photoreceptors✓/ no rods & cones

3.5.4 (1)

Astigmatism✓

3.5.5
- Because the lens will become cloudy✓/opaque
- no/less light will enter the eye✓ (3)
- causing no sight ✓/weak sight

3.5.6
- The ciliary muscle contracts✓
- The ciliary body moves closer to the lens✓
- The suspensory ligaments slacken✓
- Tension on the lens decreases✓
- The lens becomes more convex✓/rounded
- Light rays are refracted more✓ (6)
- To focus the light on the retina✓ Any **(15)**

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2015

MARKS: 150

TIME: 2½ hours

This question paper consists of 17 pages.

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GAUTENG

SECTION A

QUESTION 1

1.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 Which ONE of the following processes is responsible for the production of male gametes?

A Spermatogenesis
B Oogenesis
C Ejaculation
D Ovulation

1.1.2 The part of the central nervous system that protects the human body from serious injuries when a person steps barefoot on a thorn is the ...

A cerebellum.
B medulla oblongata.
C spinal cord.
D cerebrum.

1.1.3 When a person runs a race, sweating helps to ...

A regulate the amount of salts in the body.
B control the amount of glucose in the body.
C cool the body through evaporation.
D regulate the amount of water in the body.

1.1.4 Which ONE of the following is the correct sequence in which impulses are transmitted in a reflex action?

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

1.1.5 Which ONE of the following is a function of adrenalin?

A Lowering blood pressure
B Promoting the conversion of glucose to glycogen
C Increasing skeletal muscle tone
D Causing the blood vessels of the skin to dilate

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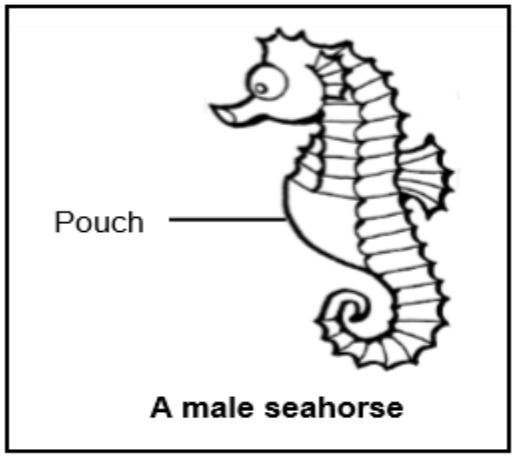
1.1.6 The following structures are part of the male reproductive system:

(i) Scrotum
(ii) Prostate gland
(iii) Seminal vesicles
(iv) Penis
(v) Testes

Which ONE of the following combinations of structures produces semen?

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

1.1.7 In seahorses the female deposits the eggs into a pouch in the male's body. The male then secretes sperm into the pouch. Fertilisation takes place in the pouch. The fertilised eggs develop in the pouch.



A male seahorse

What type of fertilisation and reproductive strategy does this represent?

A External fertilisation and vivipary
B Internal fertilisation and vivipary
C External fertilisation and ovipary
D Internal fertilisation and ovipary

QUESTIONS 1.1.8 AND 1.1.9 REFER TO THE INVESTIGATION BELOW.

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

The procedure was as follows:

- Fifty adult volunteers were used.
- Their reaction times were measured at the beginning of the investigation.
- They were each given alcohol to drink.
- Their reaction times were measured again after 30 minutes.

1.1.8 What is the independent variable in the investigation above?

A Number of volunteers
B Time after drinking alcohol
C Reaction time
D Alcohol in the body

1.1.9 The following factors were considered during the investigation:

(i) Age of the volunteers
(ii) Number of volunteers
(iii) Intake of alcohol
(iv) Tool used to measure reaction time

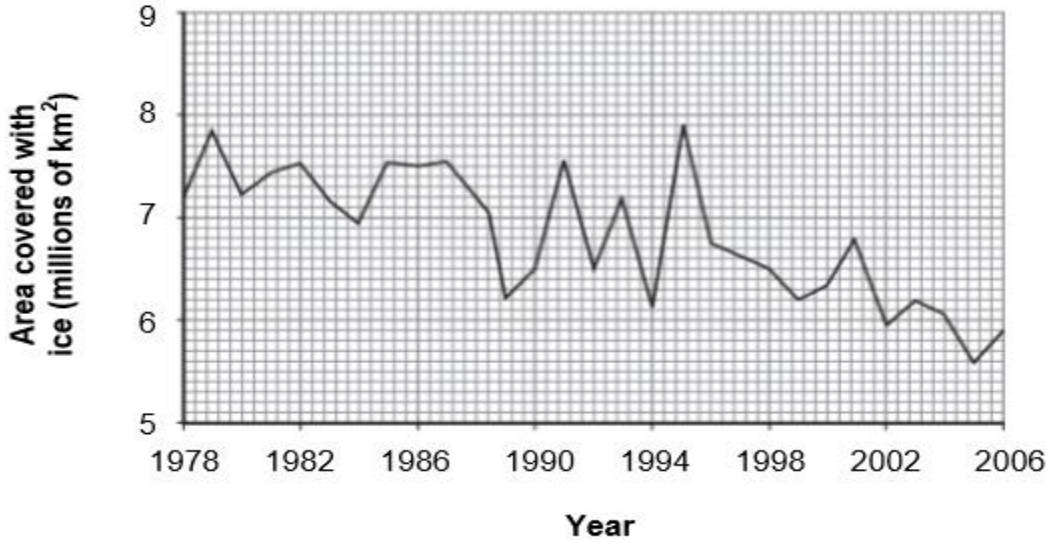
Which ONE of the following combinations of factors will affect the validity of the investigation?

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

1.1.10 Rising temperatures on Earth, as a result of the enhanced greenhouse effect, have led to the melting of ice in glaciers.

The graph below shows the results of an investigation that measured changes in the size of an area covered with ice in the Arctic region between 1978 and 2006.

Graph showing changes in the size of an area covered with ice in the Arctic region between 1978 and 2006



[Adapted from nsidc.org]

The difference between the size of the area covered with ice in 1978 and the size of the area covered with ice in 1998 is ... million km^2.

A 1,3
B 7,2
C 0,7
D 5,9

(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 1.2.7) in the ANSWER BOOK.

1.2.1 The part of the brain that controls the heart rate

1.2.2 The maintenance of a constant internal environment in the body within certain limits

1.2.3 The plant growth hormone that promotes seed dormancy

1.2.4 A collective name for the membranes that protect the brain

1.2.5 A hormone that regulates the salt concentration in human blood

1.2.6 A layer in the atmosphere that is damaged by chlorofluorocarbons (CFCs)

1.2.7 A hormone that stimulates the maturation of sperm (7 x 1) **(7)**

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 1.3.5) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	Requires the production of a large number of gametes to ensure survival of the species	A: External fertilisation B: Internal fertilisation
1.3.2	A type of development in birds where the young are incapable of moving and feeding themselves	A: Precocial development B: Altricial development
1.3.3	A plant defence mechanism against pathogens	A: Chemicals B: Thorns
1.3.4	A gland which produces substances that are transported to target organs by ducts	A: Endocrine gland B: Exocrine gland
1.3.5	Used by plants to reduce the chances of being fed upon by herbivores	A: Chemicals B: Thorns

(5 x 2) **(10)**

1.4 Each diagram below represents parts of the human eye.

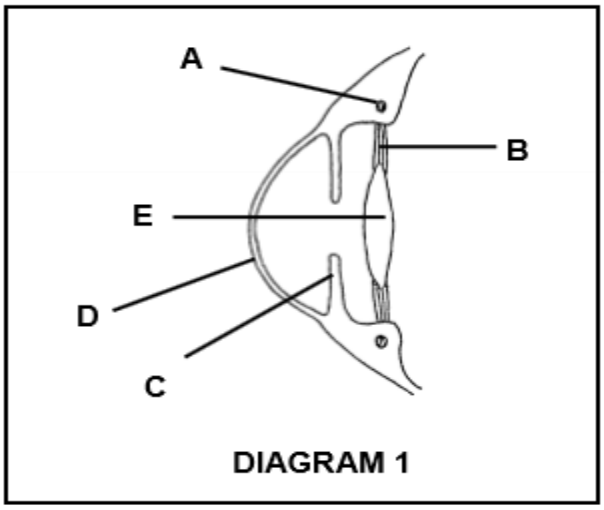


DIAGRAM 1

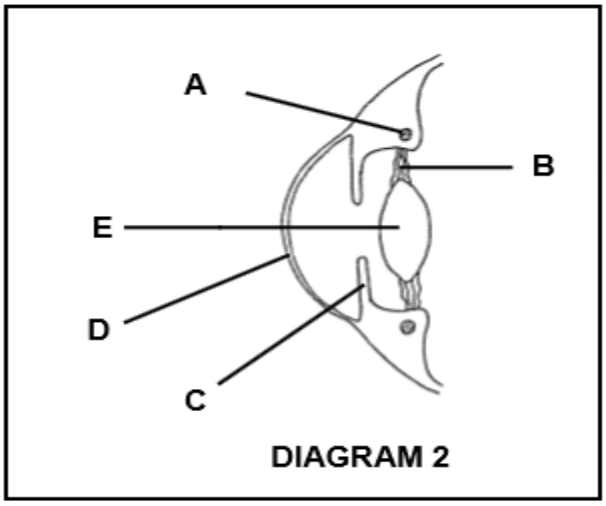


DIAGRAM 2

1.4.1 Give the LETTER and NAME of the part that:

(a) Contracts to change the shape of the lens (2)

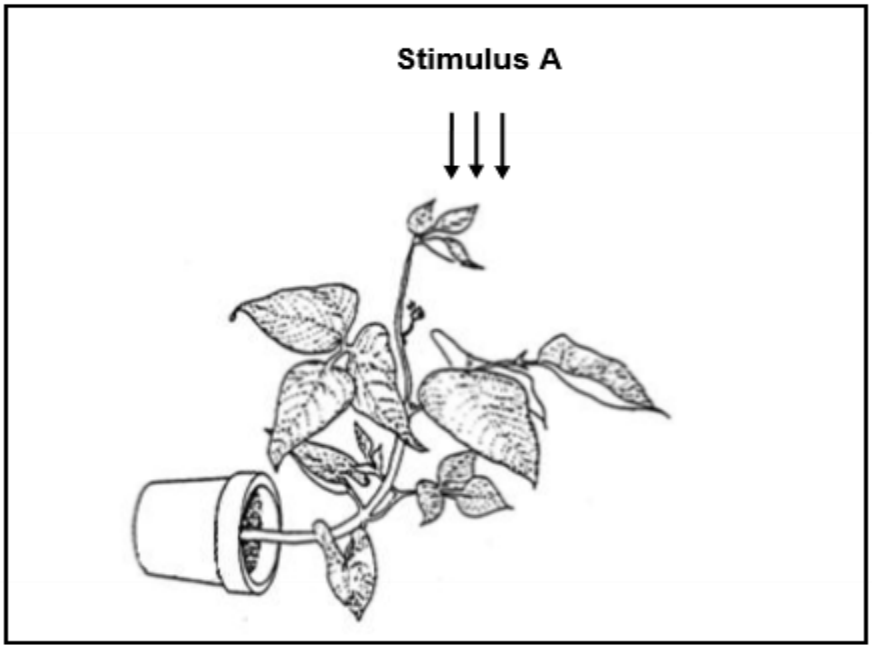
(b) Controls the amount of light that enters the eye (2)

(c) Is protected by the conjunctiva (2)

1.4.2 Study DIAGRAM **1** and DIAGRAM **2**. What process is responsible for the change in the shape of the part **E**? (1)

1.4.3 Which diagram (**1** or **2**) represents the state of the eye when a person is reading a book? (1)
(8)

1.5 The diagram below shows the growth movement of a part of a plant towards a stimulus.



1.5.1 What growth movement is represented in the diagram? (1)

1.5.2 Identify the stimulus labelled **A**. (1)

1.5.3 Name the growth hormone that is responsible for the growth movement named in QUESTION 1.5.1. (1)

1.5.4 Will a high concentration of the growth hormone named in QUESTION 1.5.3 **stimulate** or **inhibit** growth in the roots? (1)

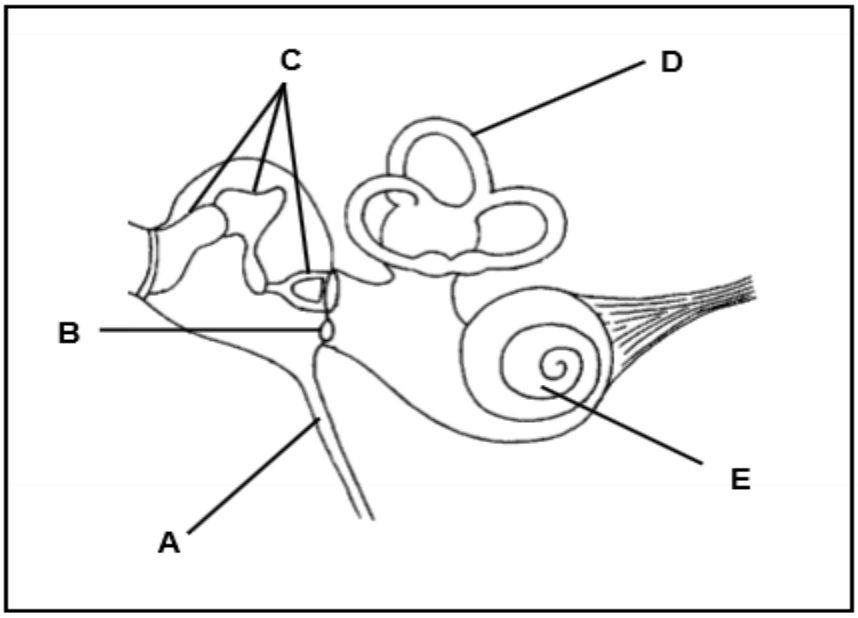
1.5.5 Name the phenomenon where the buds at the tip of the plant regulate the growth of the lateral branches. (1)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a part of the human ear.



2.1.1 Identify part:

(a) **A** (1)

(b) **B** (1)

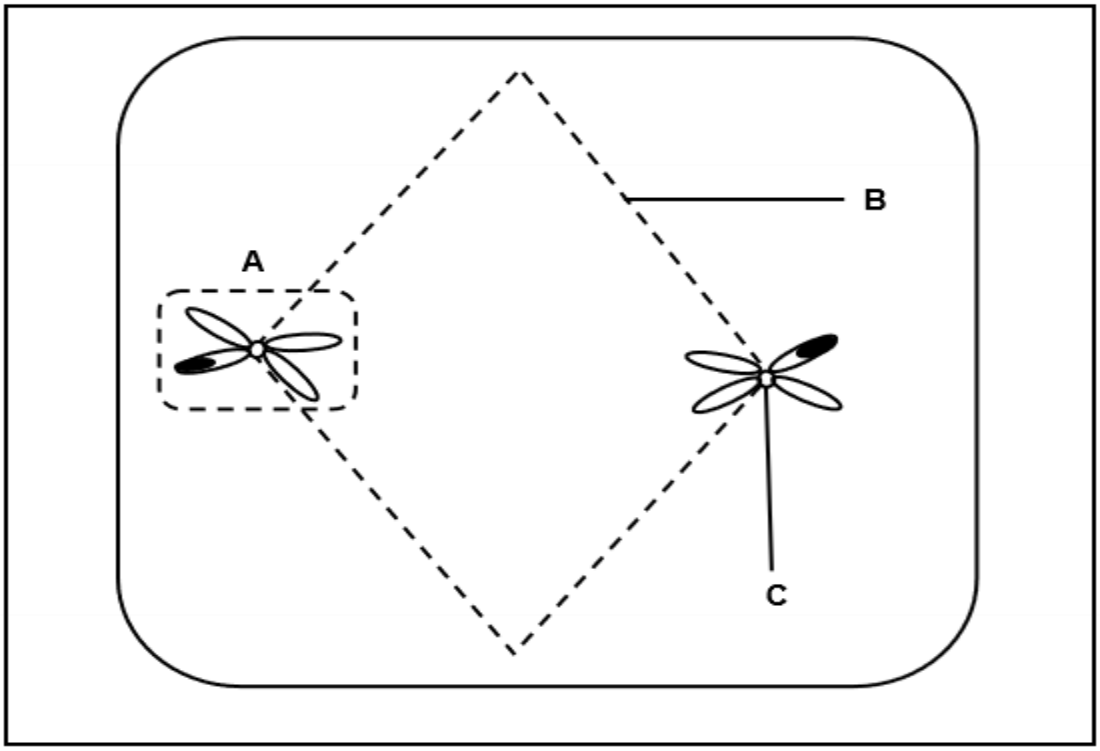
(c) **E** (1)

2.1.2 Explain the result if part **A** is blocked. (4)

2.1.3 Describe how part **D**, the semi-circular canals, plays a role in maintaining balance when the body changes speed and direction. (5)
(12)

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2.2 The diagram below illustrates a phase in meiosis.



2.2.1 Identify part:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

2.2.2 Identify the phase illustrated above. (1)

2.2.3 Give a reason for your answer to QUESTION 2.2.2. (2)

2.2.4 Draw a diagram of the cell above as it would appear during **anaphase I**. (4)
(10)

2.3 An investigation was conducted to determine the diameter of a healthy follicle in a human ovary during the menstrual cycle.

A sample consisting of 50 women aged between 20 and 25, with regular menstrual cycles, was used for this investigation.

The average changes in the follicle diameters of all 50 women during their menstrual cycles were measured and recorded.

2.3.1 Name TWO steps that were considered during the planning of this investigation. (2)

2.3.2 The following results were obtained from the investigation.

DAYS WHEN FOLLICLES WERE MEASURED	AVERAGE FOLLICLE DIAMETERS OF THE 50 WOMEN (mm)
5	6,9
10	13,3
13	18,8
14	22,0
20	3,4
25	2,6

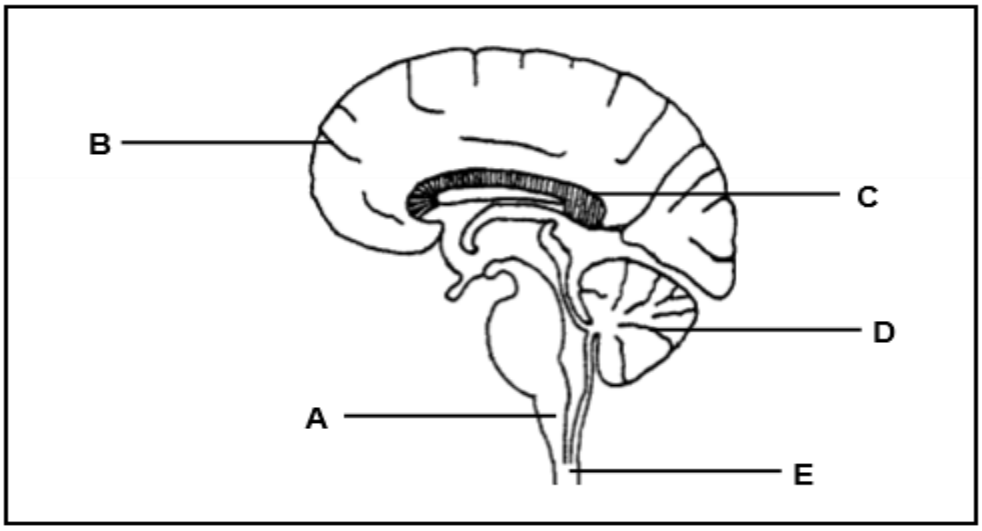
[Adapted from *Journal of Reproduction and Fertilisation*,1983]

Use the results and explain:

(a) The changes in the follicle diameters from day 14 to day 25 (3)

(b) How the results would probably differ if all 50 women used contraceptive pills that contained a high level of progesterone (3)
(8)

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



2.4.1 Identify part:

(a) **A** (1)

(b) **C** (1)

(c) **D** (1)

2.4.2 State THREE functions of part **B**. (3)
(6)

2.5 Describe the structure and the functioning of the autonomic nervous system. **(4)**
[40]

QUESTION 3

3.1 Describe how the human body restores the carbon dioxide concentration in the blood when it rises above normal levels. **(6)**

3.2 An investigation was conducted to compare the glucose concentration in the blood of two people, Mo and Thabiso, before and after ingesting glucose.

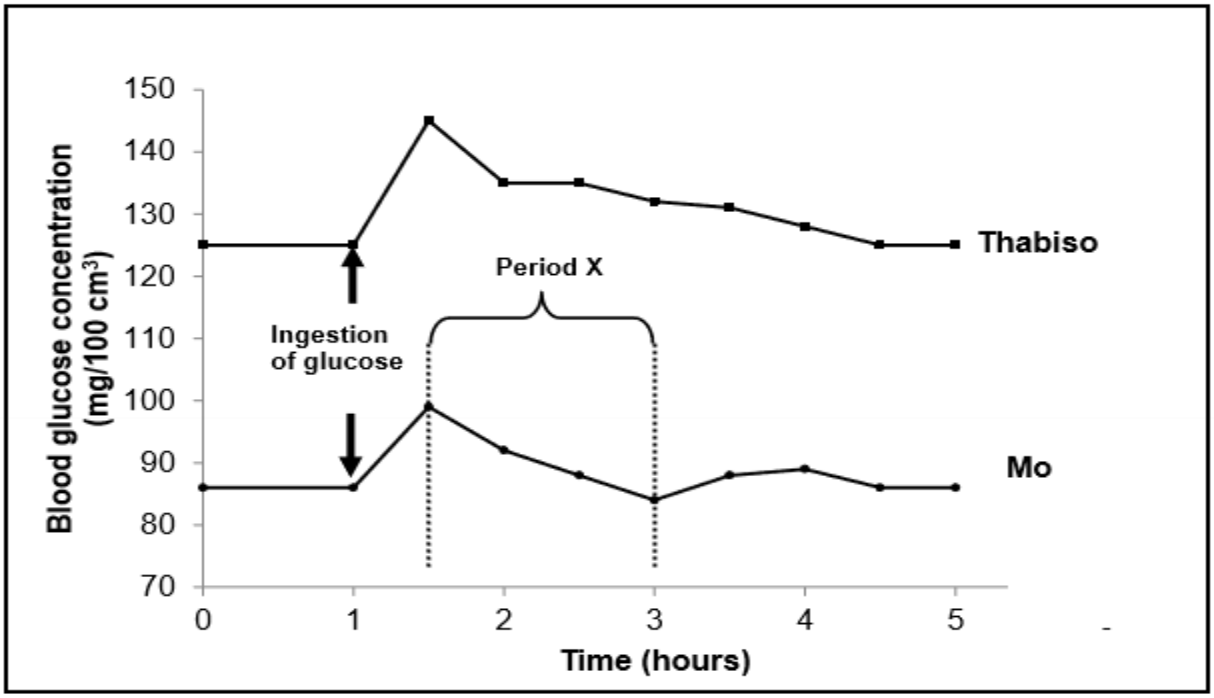
The following procedure was followed:

- The glucose concentration in their blood was measured at the start of the investigation and again 1 hour into the investigation.
- One hour into the investigation each of them was given 50 mℓ of a glucose solution to drink.
- For the next 4 hours after ingesting the glucose solution the glucose concentration in their blood was measured every 30 minutes.

The results are shown in the graph below.

The **arrows** indicate when they drank the glucose solution.

NOTE: The normal glucose concentration in blood is between 80 and 120 mg/100 cm^3.



3.2.1 Provide a suitable title for this graph. (2)

3.2.2 By how much did Thabiso's blood glucose concentration level increase (in mg/100 cm^3) after drinking the glucose solution? Show ALL working. (2)

3.2.3 How long did it take Mo's blood glucose concentration level to return to its original level after ingesting the glucose solution? (1)

3.2.4 (a) Who (Thabiso or Mo) has diabetes mellitus? (1)

(b) Give ONE observable reason for your answer to QUESTION 3.2.4(a). (1)

3.2.5 Explain the changes in Mo's glucose level during period **X**. (4)
(11)

3.3 Read the extract below.

HUNTING WILDLIFE FOR FOOD

An organisation, Trade Records Analysis of Fauna and Flora in Commerce (TRAFFIC), did an investigation to find out about the extent of the illegal killing of wildlife for use as bush-meat (meat from wildlife) and the influence of this on the environment.

The organisation reported that the illegal killing of wildlife, both for trade and consumption, had been on the increase in many African countries during the past two years. It also reported that some species, such as impala, were preferred to other species of wildlife.

One of the organisation's recommendations was that the hunting of wildlife should be legalised. This would enable governments in these countries to control the number of animals being hunted and also to restrict the age of animals that may be hunted. It also recommended that only those animals that were very old and weak in a population should be hunted.

[Adapted from an article 'Wildlife Under Siege', *Endangered Wildlife*, 2000]

3.3.1 What is the illegal hunting and killing of animals called? (1)

3.3.2 State ONE way in which humans destroy wildlife habitats. (1)

3.3.3 Give TWO reasons for the increase in the illegal killing of wildlife. (2)

3.3.4 Explain how the increase in the killing of wildlife will influence the environment. (3)

3.3.5 Explain why the organisation recommended that only very old and weak animals in a population should be killed if hunting is legalised. (3)
(10)

3.4 Read the extract below.

FOOD SECURITY IN SOUTH AFRICA

One of the challenges in South Africa is access to food by the poor. In 2009 Statistics SA conducted a survey to determine the percentage of households in each province that had access to food.

The results are shown in the table below:

PROVINCE	HOUSEHOLDS THAT HAVE ACCESS TO FOOD (%)
Western Cape	85
Eastern Cape	79
Mpumalanga	79
Free State	67
Northern Cape	75
North West	79
KwaZulu-Natal	77
Limpopo	88
Gauteng	82

South Africa seems to have adequate food access in urban areas, but the same cannot be said of households in rural areas. In rural areas prices of staple foods (e.g. maize and rice) are usually higher than in urban areas.

Increasing agriculture is the key to food security and poverty alleviation. The majority of people living in rural areas have access to land, but more still needs to be done to make household farming (growing crops for family use only) in these areas more efficient.

[Adapted from *Food Security*, Department of Agriculture, Forestry and Fisheries, March 2011]

3.4.1 What is meant by *food security*? (2)

3.4.2 Suggest ONE reason why food prices in rural areas are usually higher than food prices in urban areas. (1)

3.4.3 State TWO ways in which household farming could reduce poverty. (2)

3.4.4 Suggest TWO ways in which the Department of Agriculture can improve farming in the rural areas. (2)

3.4.5 DRAW a bar graph to compare access to food in the following three provinces, namely Limpopo, Northern Cape and Free State. (6)
(13)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Explain the structural suitability of the sperm cell for its function and describe its involvement in the formation of a zygote and the development of this zygote until implantation.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2015

MEMORANDUM

MARKS: 150

This memorandum consists of 12 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	A✓✓		
	1.1.2	C✓✓		
	1.1.3	C✓✓		
	1.1.4	A✓✓		
	1.1.5	C✓✓		
	1.1.6	C✓✓		
	1.1.7	C✓✓		
	1.1.8	D✓✓		
	1.1.9	B✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Medulla oblongata✓		
	1.2.2	Homeostasis✓		
	1.2.3	Abscisic acid✓/ABA		
	1.2.4	Meninges✓		
	1.2.5	Aldosterone✓		
	1.2.6	Ozone✓/O_3		
	1.2.7	Testosterone✓/FSH/LH		**(7)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	B only✓✓		
	1.3.3	A only✓✓		
	1.3.4	B only✓✓		
	1.3.5	Both A and B✓✓	(5 x 2)	**(10)**
1.4	1.4.1	(a) A✓ - ciliary muscle✓		(2)
		(b) C✓ - iris✓		(2)
		(c) D✓ - cornea✓		(2)
	1.4.2	Accommodation✓		(1)
	1.4.3	Diagram 2✓		(1) **(8)**
1.5	1.5.1	Phototropism✓		(1)
	1.5.2	Light✓/Sunlight/Radiant energy		(1)
	1.5.3	Auxins✓/ IAA/ Indole acetic acid		(1)
	1.5.4	Inhibit ✓		(1)
	1.5.5	Apical dominance✓		(1) **(5)**

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

2.1 2.1.1 (a) Eustachian tube✓ (1)

(b) Round window✓ (1)

(c) Cochlea✓ (1)

2.1.2
- Air will not be taken in✓/released
- to equalise pressure✓
- on both sides of the tympanic membrane✓
- Tympanic membrane/ ossicles may not vibrate freely✓
- This may lead to the tympanic membrane bursting✓and
- therefore could lead to hearing loss✓/deafness/ pain (Any 4) (4)

2.1.3 Changes in the direction and speed of movement:

- Causes the endolymph to move✓ in part D/semi-circular canals
- The cristae✓
- found in the ampulla ✓are stimulated
- and converts the stimulus into an impulse✓
- which is transmitted via the auditory nerve✓/ vestibular nerve
- to the cerebellum✓
- from which impulses are transmitted via motor neurons✓
- to the skeletal muscles✓/effector to restore balance of the body

(Any 5) (5)
(12)

2.2 2.2.1 (a) Chromosome✓ (1)

(b) Spindle fibre✓ (1)

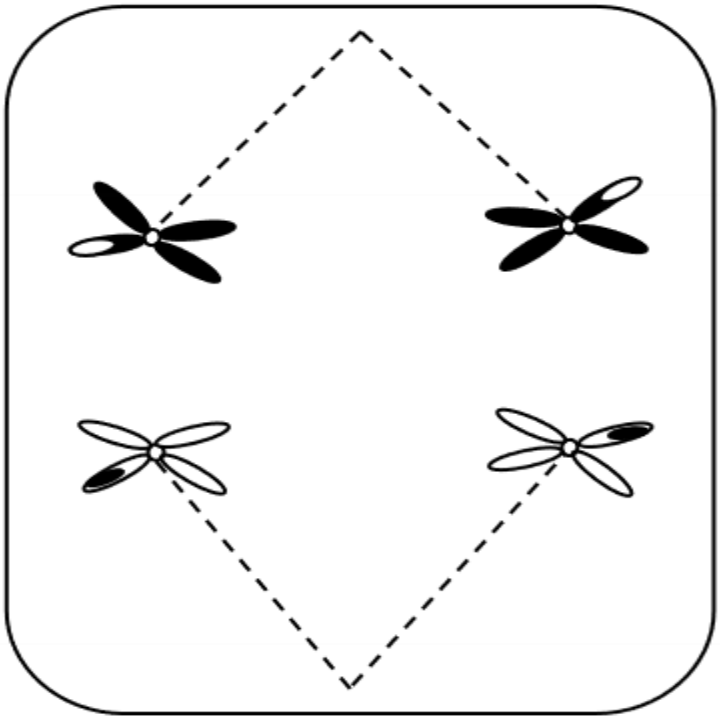
(c) Centromere✓ (1)

2.2.2 Metaphase II✓ (1)

2.2.3
- Chromosomes lying independently✓/singly
- at the equator✓ (2)

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2.2.4



Mark allocation:

C - Shows **4** chromosomes✓✓ (not chromatids)
S - Shows separation✓ of genetic material
D - Correct variation shown in the chromosomes✓(shading on the chromosomes must be complementary)
(Use the letters for marking process) (4)
(10)

2.3 2.3.1
- Seek permission✓/ethical clearance
- Deciding on the sample size✓
- Deciding on the equipment for measuring✓
- Deciding on the age-group of the participants✓
- Deciding on using women with regular menstrual cycles✓
- Deciding on how to record the results✓
- Decide on the duration✓
- Learning how to use the equipment✓ (Any 2) (2)

(MARK FIRST TWO ONLY)

2.3.2 (a)
- The follicles decreased in size✓
- as ovulation had taken place✓
- The resulting corpus luteum became smaller✓
- because fertilisation did not take place✓ (Any 3) (3)

(b)
- The production of FSH✓
- will be inhibited✓
- which will stop/inhibit the development/growth of a follicle✓
- therefore the follicle size will remain the same✓ (Any 3) (3)

(8)

2.4 2.4.1 (a) Medulla oblongata✓ (1)

(b) Corpus callosum✓ (1)

(c) Cerebellum✓ (1)

2.4.2
- Controls all voluntary activities✓/example
- It contains centres that receives and interprets all the sensations✓/example
- It is the seat of higher mental functions✓/example
- Influences emotional behaviour/ example (Any 3) (3)

(MARK FIRST THREE ONLY) **(6)**

2.5
- Every organ and gland is controlled by two sets of nerves✓/double innervations
- that act antagonistically✓
- to control involuntary events✓/brings about homeostasis
- Sympathetic✓nerves
- generally stimulates a response✓/example
- Parasympathetic✓nerves
- generally inhibits a response✓/example (Any 4) **(4)**

[40]

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QUESTION 3

3.1
- Receptor cells✓
- in the carotid artery✓/aorta are stimulated
- to send impulses to the medulla oblongata✓ in the brain
- which then **stimulates the heart**✓
- to beat faster✓
- and the breathing muscles ✓/example
- to contract more actively✓
- This increases the rate/ depth of breathing✓
- More CO_2 is taken to and exhaled from the lungs✓returning the CO_2 level in the blood to normal (Any 6) **(6)**

3.2 3.2.1 Comparison of the blood glucose level of two people✓ over 5 hours✓/before and after ingesting glucose (2)

3.2.2 (145 – 125)✓
(Accept numbers in range 144 -146 for the first value and 124 -126 for the second value)

= 20✓ mg/100 cm^3 (2)
(Accept answer according to the values given by learner)

3.2.3 Accept any answer from 1,7 to 1,9✓ hours /102 – 114minutes/ 1h42min – 1h54min (1)

3.2.4 (a) Thabiso✓ (1)

(b)
- His glucose level is higher than the normal range✓
- It takes longer for his glucose level to come down to its original level✓ (Any 1) (1)

(MARK FIRST ONE ONLY)

3.2.5
- When his glucose level is high✓/ 99/98mg/100cm^3
- insulin✓is secreted into the blood
- to convert excess glucose into glycogen ✓ in the liver
- and to stimulate the cells to absorb more glucose✓
- thus decreasing the blood glucose level✓ (Any 4) (4)

(11)

3.3 3.3.1 Poaching✓ (1)

3.3.2
- Deforestation✓
- Urbanisation✓
- Mining ✓
- Agriculture✓
- Veld fires✓
- Building✓
- Pollution✓
- Introduction of alien species✓ (Any 1) (1)

(MARK FIRST ONE ONLY)

3.3.3
- Increasing human population✓
- Increasing unemployment✓/poverty
- Increased prices of bush-meat✓/greed
- Increased demand✓
- Poor protection of wildlife✓ (Any 2) (2)

(MARK FIRST TWO ONLY)

3.3.4
- Disturbs the ecosystem✓
- because food chains are affected✓
- leading to the extinction of some species✓ in the ecosystem
- and will eventually lead to loss of biodiversity✓ (Any 3) (3)

3.3.5
- Very old animals have passed the reproductive stage in their lives✓/old animals are at the end of lifespan
- therefore may not significantly influence the size of the population✓
- Weak animals have a short lifespan✓
- and will not contribute to the survival of the population✓
- Killing old and weak animals may prevent a population from exceeding carrying capacity✓
- Genes causing weakness will be removed from the gene pool✓ (Any 3) (3)

(10)

3.4 3.4.1
- Food security refers to the access✓
- of adequate✓/safe/nutritious food
- to all people at all times✓ (Any 2) (2)

3.4.2
- Price is added to cover the cost of transportation✓ over long distances
- No competition✓ between dealers in rural areas
- Decrease demand✓ for goods in rural areas (Any 1) (1)

(MARK FIRST ONE ONLY)

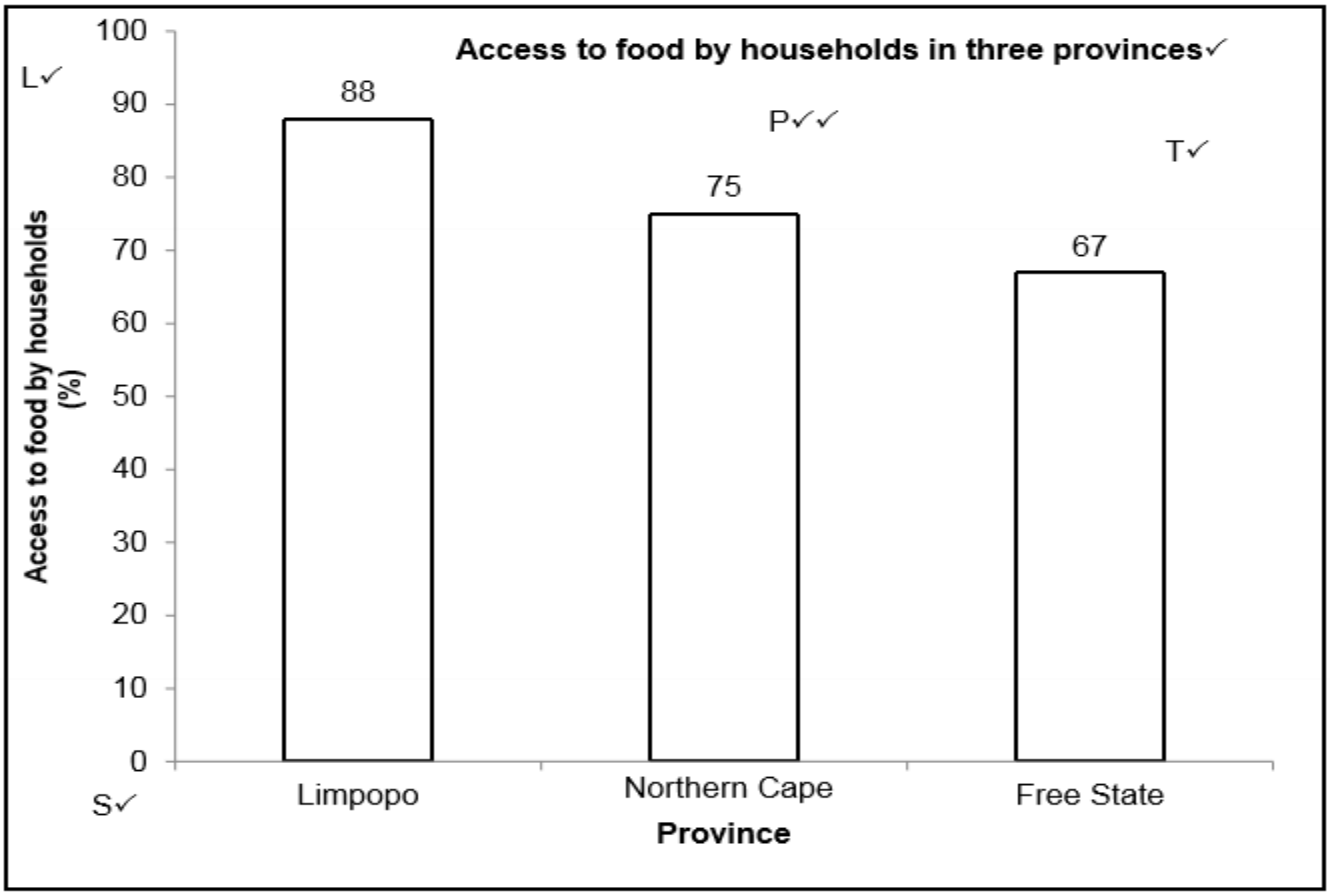
3.4.3
- Decreased need to buy food✓
- Selling of excess produce to earn some money✓ (2)

(MARK FIRST TWO ONLY)

3.4.4
- Making people aware of the benefits of farming✓
- Providing resources✓/example
- Developing skills for farming✓
- Providing incentives✓ to encourage farming (Any 2) (2)

(MARK FIRST TWO ONLY)

3.4.5



Mark allocation of the graph

Criteria	Mark Allocation
Bar graph drawn (T)	1
Title of graph	1
Correct scale for X-axis (equal width and spacing of the bars) and Y-axis (S)	1
Correct label and unit for X-axis and Y-axis (L)	1
Plotting of the bars (P)	0: No bars plotted correctly 1: 1 to 2 bars plotted correctly 2: All 3 bars plotted correctly

NOTE:
If a line graph is drawn – marks will be **awarded** for the 'title and label for X and Y axes' only
If a histogram is drawn – marks will be **lost** for the 'type of graph and correct scale' only

(6)
(13)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Structural suitability of the sperm cell for internal fertilisation

- The front of the head of the sperm cell contains an acrosome✓/vesicle which carries enzymes to dissolve a path into the ovum✓
- Nucleus of the sperm✓ carries genetic material of the male✓/ haploid number of chromosomes
- The middle piece contains mitochondria✓ which release energy✓ so that sperms could swim
- The presence of a long tail✓ enables sperm cells to swim✓ towards the ovum
- The contents of the sperm cell such as the cytoplasm is reduced✓/condensed making the sperm light for efficient movement✓ (Any 3 x 2) (6)

Fertilisation

- In the Fallopian tubes✓
- one sperm cell makes contact with the ovum's membrane✓
- The nucleus of the sperm enters the ovum✓
- Then the ovum membrane becomes impenetrable✓to other sperms
- The nucleus of the sperm fuses✓
- with the nucleus of the ovum✓ } OR sperm fuses with an ovum✓
- to form a diploid✓ zygote
- This is called fertilisation✓ (Any 5) (5)

Events after fertilisation until implantation

- The zygote divides by mitosis✓many times
- to form an embryo✓
- It first consists of a ball of cells✓
- called the morula✓
- which then develops into a hollow ball of cells✓
- called the blastula✓/blastocyst
- It embeds itself into the uterus lining✓/endometrium
- using chorionic villi✓ (Any 6) (6)

Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
Only information regarding: - The structural suitability of the sperm cell - Events during fertilisation - Events after fertilisation until implantation No irrelevant information.	All structures are related to the respective functions of the sperm cell. The sequence of events in fertilisation and post fertilisation until implantation is in the correct order.	At least the following points should be included: - The structural suitability of the sperm cell **(4/6)** - Events during fertilisation **(3/5)** - Events after fertilisation until implantation **(4/6)**
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2016

MARKS: 150

TIME: 2½ hours

This question paper consists of 19 pages.

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SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Write down the question number (1.1.1 to 1.1.10), choose the answer and make a cross (X) over the letter (A to D) of your choice in the ANSWER BOOK.

EXAMPLE:

1.1.11 | A | B | C | ~~D~~ |

1.1.1 The part of the brain that receives nerve impulses from the semi-circular canals is the …

A cerebrum.
B cerebellum.
C hypothalamus.
D medulla oblongata.

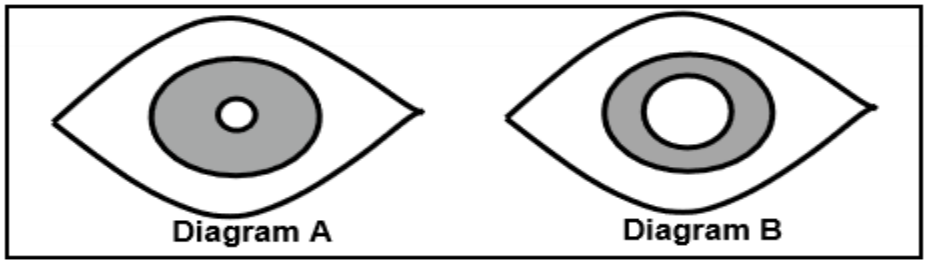
1.1.2 A light stimulus is converted into a nerve impulse in the …

A iris.
B retina.
C optic nerve.
D sclera.

1.1.3 A human somatic cell has …

A 46 autosomes and 2 gonosomes.
B 2 autosomes and 44 gonosomes.
C 44 autosomes and 2 gonosomes.
D 23 autosomes and 23 gonosomes.

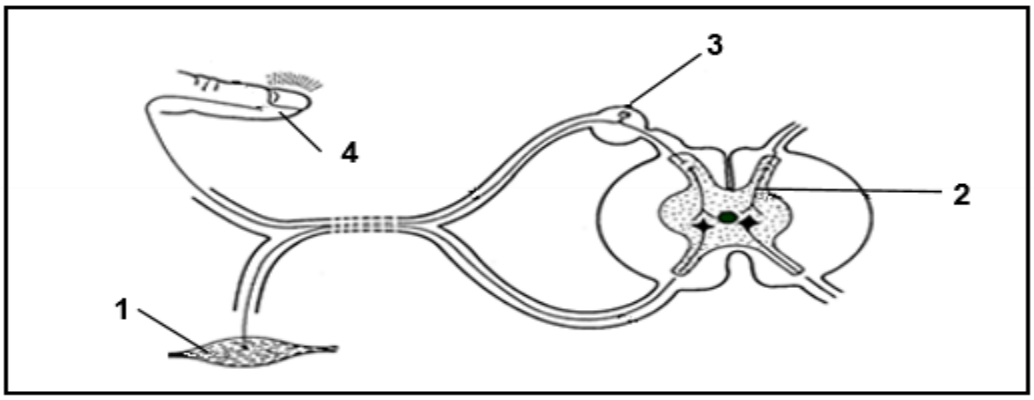
1.1.4 Which ONE of the following statements is CORRECT regarding the eyes represented in the diagrams below?



A Diagram **A** is looking at an object closer than 6 metres, while diagram **B** is looking at an object further than 6 metres.
B Diagram **A** is looking at an object further than 6 metres, while diagram **B** is looking at an object closer than 6 metres.
C The eye in diagram **A** is in dim light and the eye in diagram **B** is in bright light.
D The eye in diagram **A** is in bright light and the eye in diagram **B** is in dim light.

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1.1.5 The diagram below shows a reflex arc.



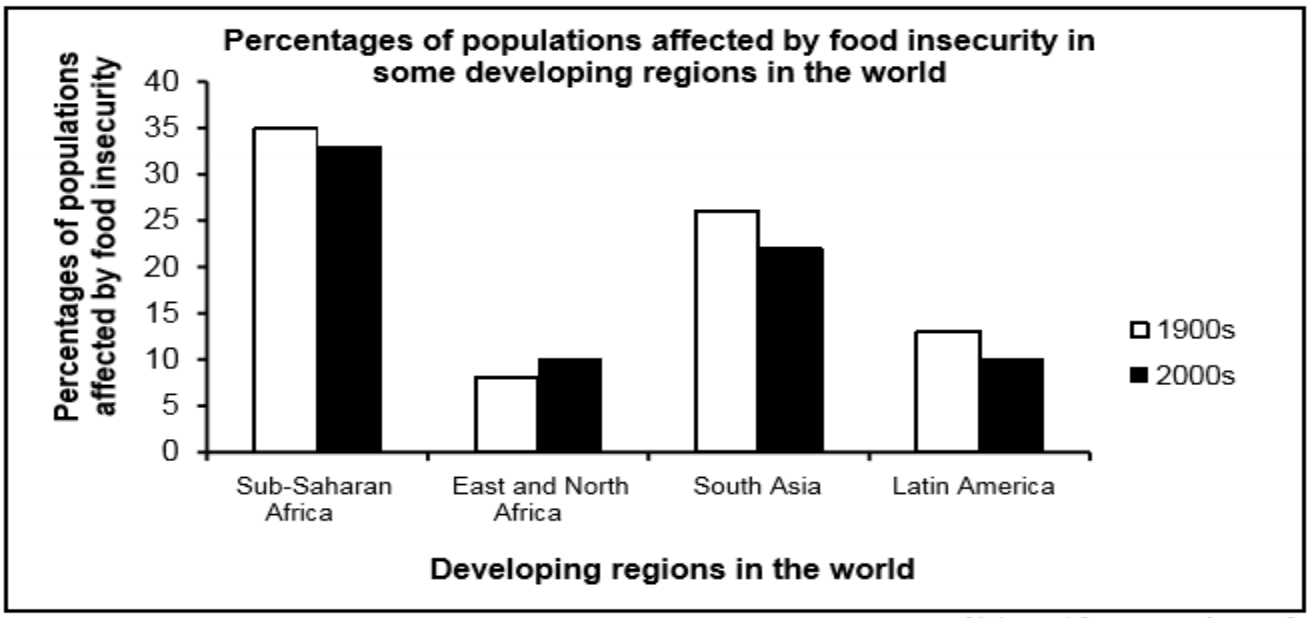
Which part represents the effector?

A 4
B 1
C 3
D 2

1.1.6 A person with middle-ear infection is usually advised not to fly in an aeroplane because the …

A maculae in the semi-circular canals are unable to receive the stimulus.
B round window is unable to absorb sound waves, leading to echoes.
C Eustachian tube is unable to equalise the pressure on either side of the tympanic membrane.
D optic nerve will be damaged, leading to hearing loss.

1.1.7 The graph below shows the percentages of populations affected by food insecurity in some developing regions in the world.



[Adapted from www.fao.org]

Which ONE of the above regions does NOT show improvement in its food security for the period shown?

A Latin America
B Sub-Saharan Africa
C East and North Africa
D South Asia

QUESTIONS 1.1.8 AND 1.1.9 REFER TO THE INVESTIGATION BELOW.

A scientist did an investigation on a healthy individual to determine the effect of drinking water on urine production.

The participant was requested not to eat or drink for four hours before the investigation began. The investigation was conducted over a period of three days.

The procedure was as follows:

- On day 1 the participant was given 600 mℓ of water to drink.
- On day 2 the participant was given 800 mℓ of water to drink.
- On day 3 the participant was given 1 000 mℓ of water to drink.
- For each day the amount of urine produced by the participant was measured and recorded over the next four hours, and an average was calculated.

1.1.8 Which ONE of the following CORRECTLY indicates the dependent and the independent variables?

	INDEPENDENT VARIABLE	DEPENDENT VARIABLE
A	The amount of urine produced	Time in hours
B	The amount of water drunk	The amount of urine produced
C	The amount of urine produced	The amount of water drunk
D	The people participating	Time in hours

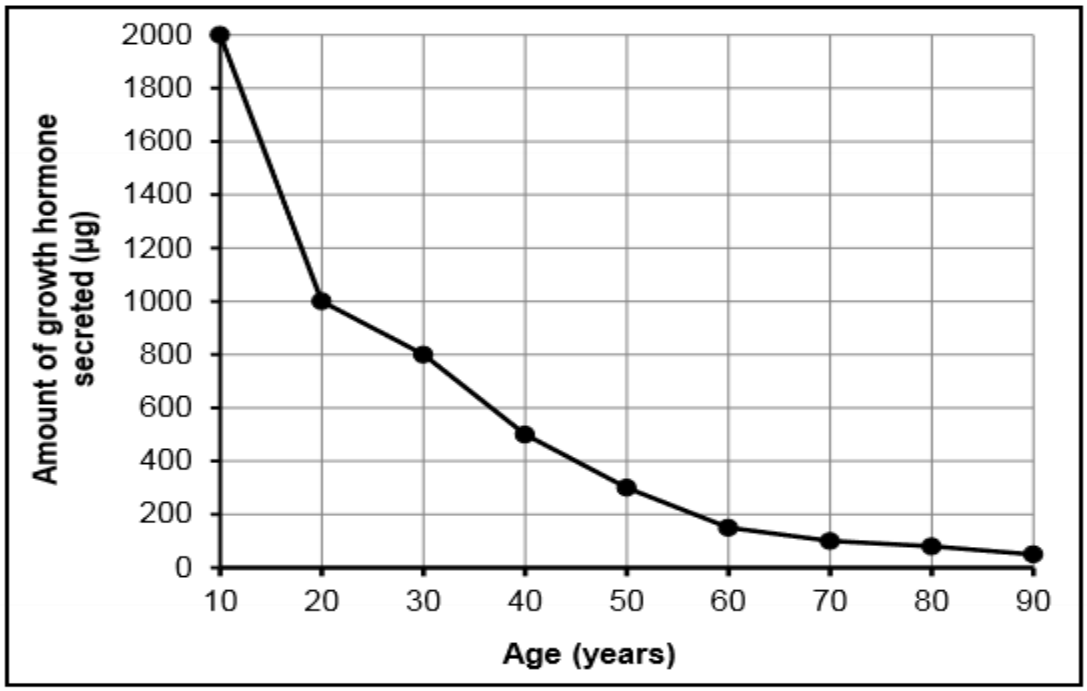
1.1.9 The list below contains some steps taken before and during the investigation.

(i) Permission was obtained to participate in the investigation.
(ii) The measuring tool to be used was decided upon.
(iii) Water was given to the participant to drink.
(iv) The amount of urine produced was measured.

Which of the steps above can be considered as part of the planning steps before conducting the investigation?

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

1.1.10 The graph below shows the relationship between the production of growth hormone and age.



A general conclusion that can be drawn from the results is that …

A growth hormone is not secreted after the age of 50 years.
B the amount of growth hormone secreted decreases with age.
C the amount of growth hormone secreted increases with age.
D the amount of growth hormone secreted remains stable over time. (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 1.2.8) in the ANSWER BOOK.

1.2.1 The phase in the cell cycle when DNA replication occurs

1.2.2 The part of the peripheral nervous system that controls involuntary actions

1.2.3 A plant hormone that causes leaves to fall off trees in autumn

1.2.4 Measurement of the total amount of carbon dioxide emissions of an individual per year

1.2.5 The division of the cytoplasm through the constriction of the cell membrane at the end of cell division

1.2.6 The structure in the amniotic egg that stores wastes

1.2.7 The inner lining of the uterus where implantation of the embryo occurs

1.2.8 Part of the female reproductive system where fertilisation occurs

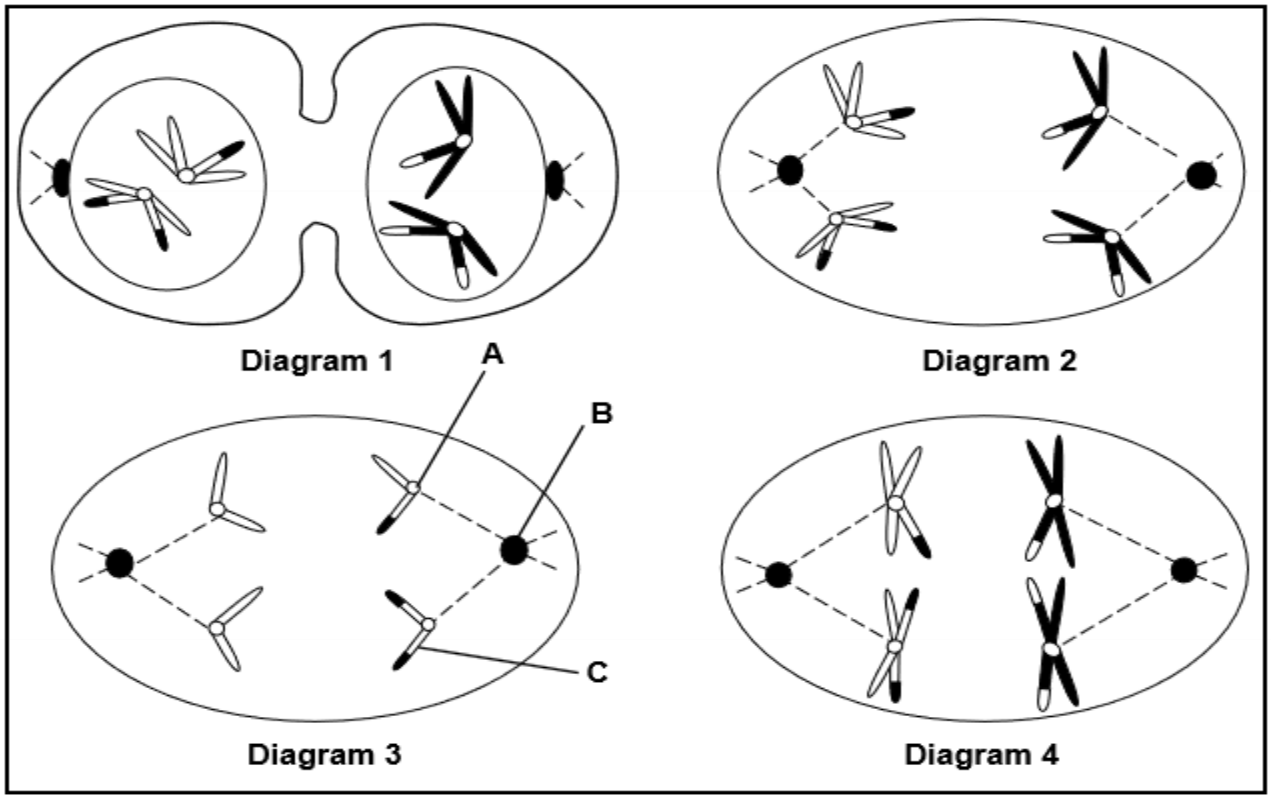
(8 x 1) **(8)**

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	Female frogs lay eggs in water and the males spray sperm onto the eggs.	A: Vivipary B: Ovovivipary
1.3.2	The phase of meiosis when independent assortment occurs	A: Anaphase II B: Metaphase I
1.3.3	The type of development in vertebrates where the young are well developed and able to move at birth	A: Precocial development B: Altricial development

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

1.4 The diagrams below represent some phases of meiosis in an animal cell.



1.4.1 Identify the following parts in Diagram 3:

(a) **A** (1)

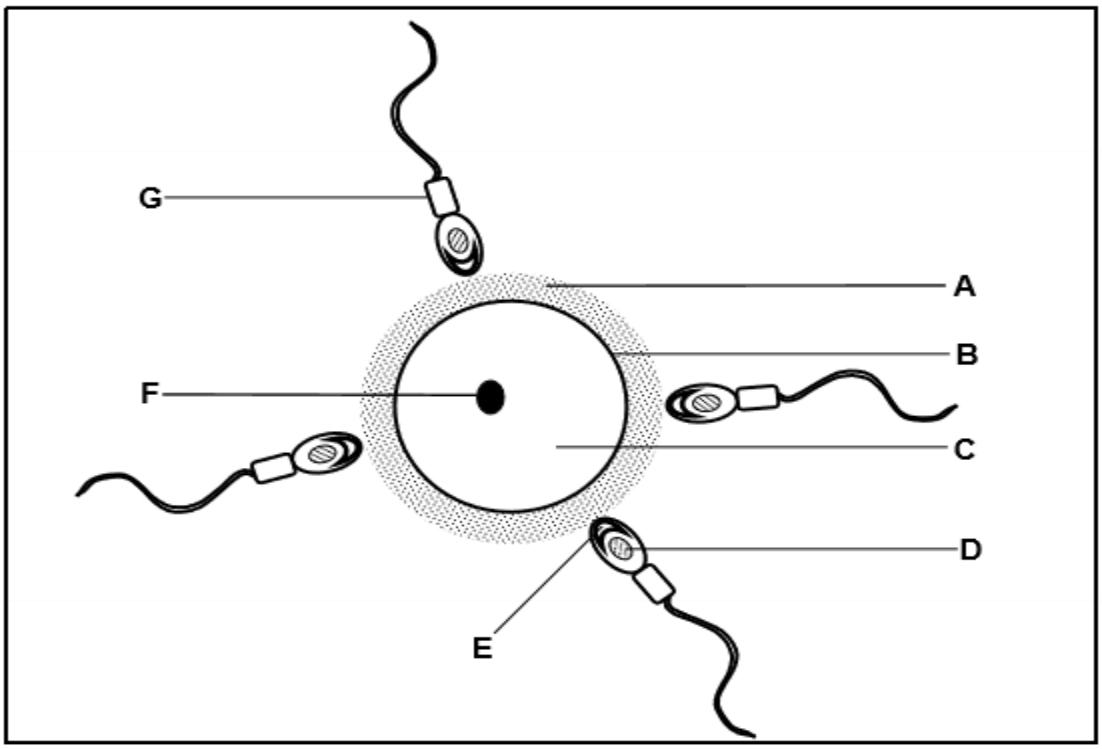
(b) **B** (1)

(c) **C** (1)

1.4.2 Using the diagram NUMBERS (1, 2, 3, 4) showing some of the phases, arrange the diagrams above in the sequence as they occur during meiosis. (2)

1.4.3 How many chromosomes were in the cell before meiosis began? (1)
(6)

1.5 The schematic diagram below shows a human ovum that is about to be fertilised. The diagram is not drawn to scale.



1.5.1 Identify part:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

(d) **F** (1)

1.5.2 Give the LETTER and NAME of the part that:

(a) Contains the mitochondria (2)

(b) Contains enzymes required to penetrate the ovum (2)

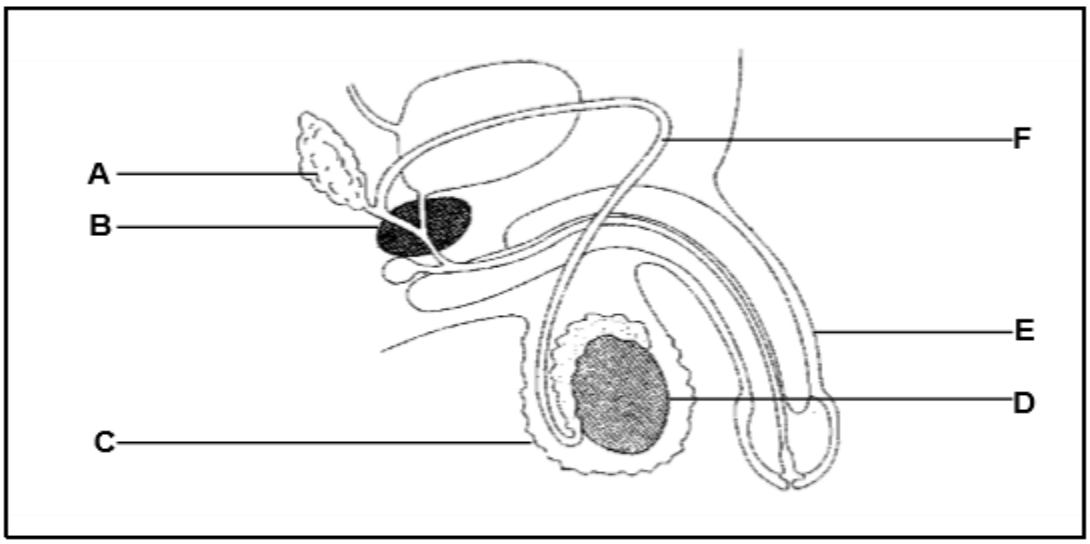
(c) Will enter the ovum during fertilisation (2)
(10)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents the human male reproductive system.



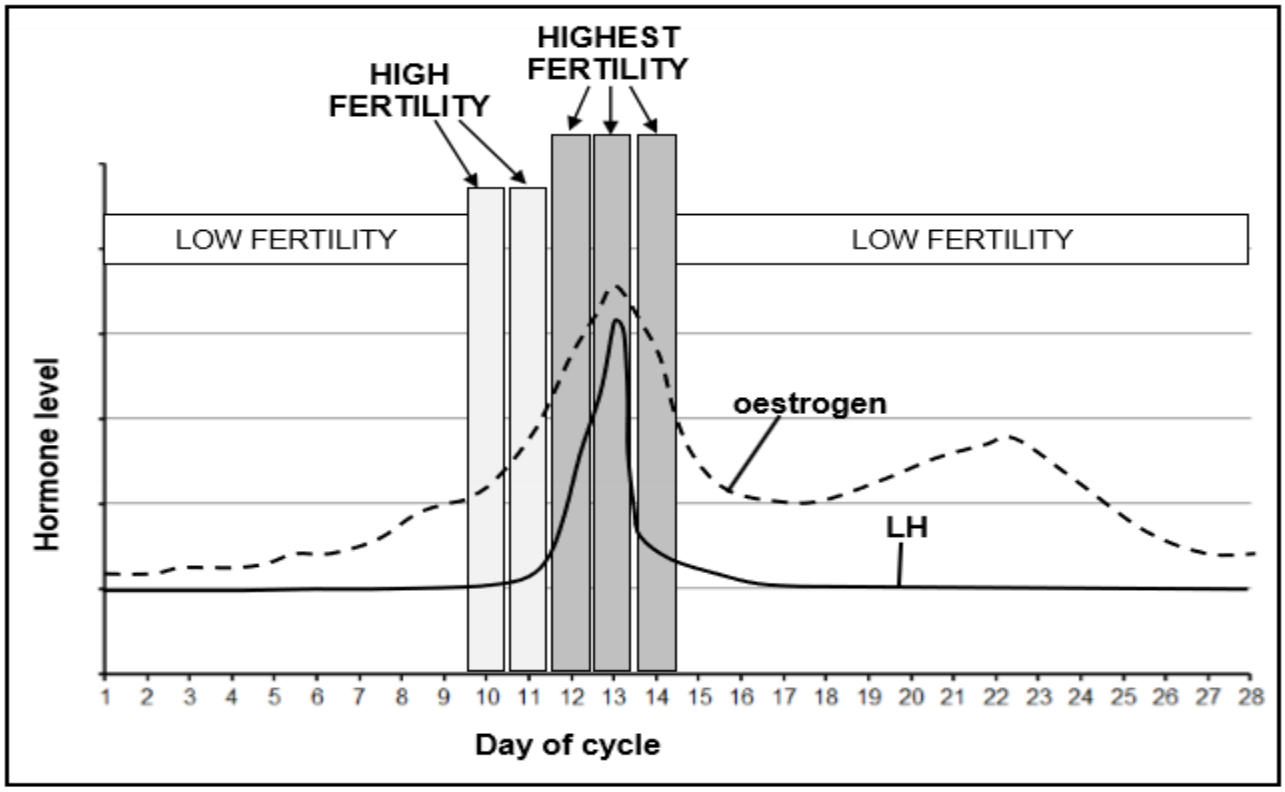
2.1.1 Identify part **A**. (1)

2.1.2 Write down the LETTERS only of TWO parts that contribute to the formation of semen. (2)

2.1.3 Explain the consequence on human reproduction if a male wears tight-fitting underwear all the time. (3)
(6)

2.2 A fertility monitor measures the concentration of oestrogen and luteinising hormone (LH) in a woman's urine. A fertile period is the time when the ovum is ready to be fertilised.

The graph below appears on the information sheet that is provided with the fertility monitor.



[Adapted from http://www.amazon.co.uk]

2.2.1 Name the gland that secretes LH. (1)

2.2.2 Explain why the fertility monitor measures the concentration of LH. (2)

2.2.3 Explain why some women would use a fertility monitor. (2)

2.2.4 What evidence in the graph indicates that a healthy follicle is developing in the ovary during the first half of the cycle? (2)

2.2.5 If a woman using the fertility monitor finds that her LH level peaks on day 17, between which days does she experience the 'highest fertility'? (2)

2.2.6 Explain why the fertility monitor does not measure the progesterone level in the blood to predict fertile days. (3)
(12)

2.3 An investigation was carried out to determine the effect of caffeine on body temperature and pulse rate. A group of 200 men participated in the investigation.

The procedure was as follows:

- At the start of the investigation each man's body temperature was measured, and the average of all the participants was calculated.
- Also, at the start of the investigation each man's pulse rate was measured, and the average of all the participants was calculated.
- The men each drank 100 mℓ of an energy drink containing the same amount of caffeine.
- Their body temperature was then measured every 15 minutes for a period of 1 hour, and an average of all the participants was calculated.
- Also, their pulse rate was then measured every 15 minutes for a period of 1 hour, and the average of all the participants was calculated.
- All the participants were seated during the period of investigation.

The table below shows the results of the investigation.

TIME (minutes)	AVERAGE TEMPERATURE (°C)	AVERAGE PULSE RATE (BPM)
0	36,6	76
15	37,4	91
30	38	95
45	37,8	89
60	37,4	89

[Adapted from www.meliordiscovery.com and http://homeostasiseleishabiology.weebly.com]

2.3.1 Describe the effect that caffeine had on body temperature and pulse rate after 15 minutes. (2)

2.3.2 How long after drinking the energy drink did the caffeine have its maximum effect? (1)

2.3.3 Caffeine causes vasoconstriction and an increase in metabolism.

Explain how these effects contribute to the temperature change that occurred. (4)

2.3.4 State TWO factors that were kept constant during this investigation. (2)
(9)

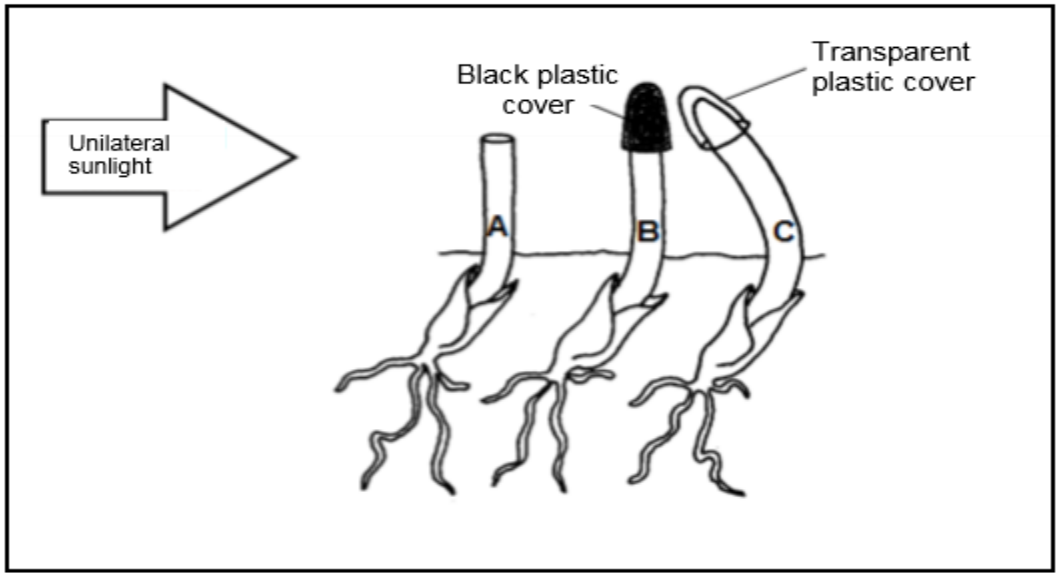
2.4 Describe how the blood glucose level in the human body is returned to normal when the glucose level decreases to below normal. **(4)**

2.5 The diagram below shows the results of an investigation carried out to determine the effect of auxins on the growth of coleoptiles (young shoots).

The procedure was as follows:

- Three coleoptiles were used.
- Coleoptile **A** had its apical bud removed.
- Coleoptile **B** had its apical bud covered with a black plastic cover.
- Coleoptile **C** had its apical bud covered with a transparent plastic cover.
- All three coleoptiles (**A**, **B** and **C**) were then exposed to unilateral sunlight.

The diagram below shows the results of the investigation.



2.5.1 Explain the results obtained, as shown by coleoptile:

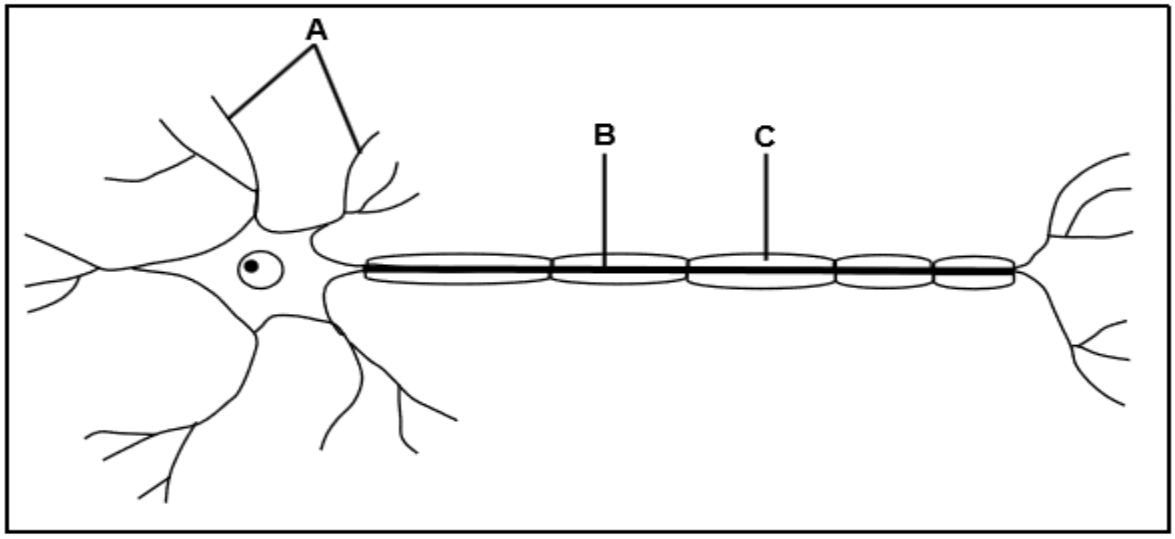
(a) **B** (3)

(b) **C** (4)

2.5.2 Explain why lateral branches will develop in coleoptile **A**. (2)
(9)
[40]

QUESTION 3

3.1 The diagram below represents a neuron in a human.



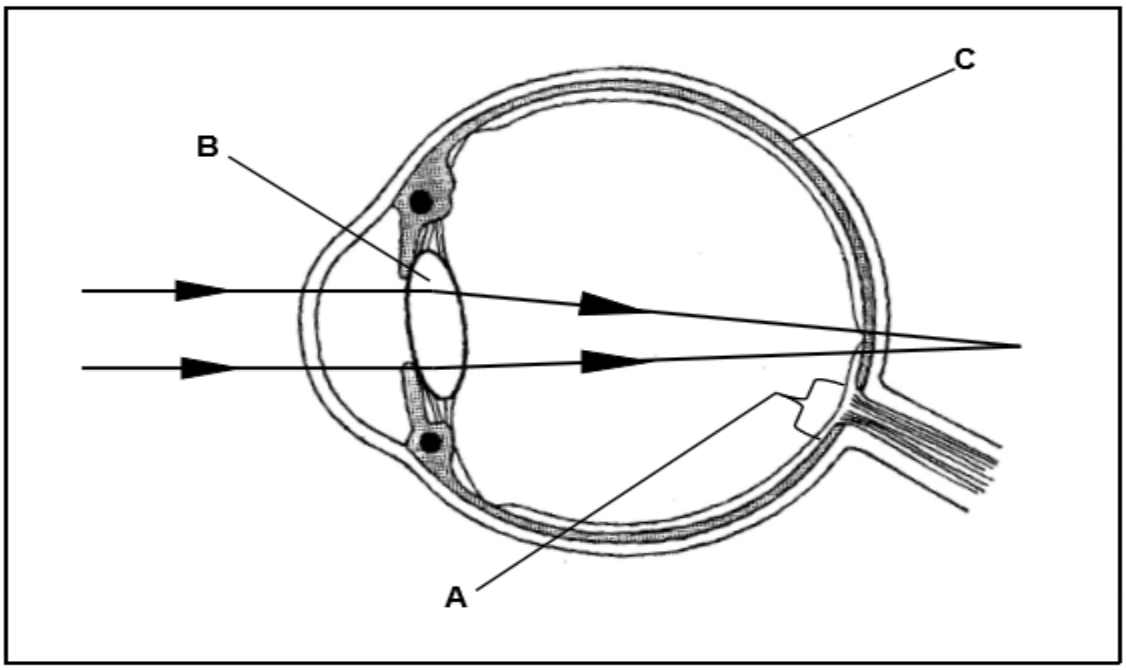
3.1.1 Identify the type of neuron represented in the diagram. (1)

3.1.2 State ONE function of part **B**. (1)

3.1.3 Explain the role of part **C** in the functioning of the neuron. (2)

3.1.4 Explain the consequence for a reflex action if the neuron shown in the diagram is damaged. (2)
(6)

3.2 The diagram below illustrates how light refracted in the human eye leads to a visual defect.



3.2.1 Identify part:

(a) **B** (1)

(b) **C** (1)

3.2.2 Name the visual defect that is illustrated in the diagram. (1)

3.2.3 Describe the consequences of the visual defect in your answer to QUESTION 3.2.2. (2)

3.2.4 Explain the consequences if the light rays were to fall on part **A**. (3)

3.2.5 Explain TWO ways in which the lens is structurally suited to perform its function. (4)
(12)

3.3 Read the extract about GMOs below.

> Some fruits are usually harvested when they reach maturity and then undergo rapid ripening during storage and transportation. Others have to be harvested only when they are fully ripened.
>
> Normally farmers pick their produce while it is still green. However, fruits harvested prematurely (too early) tend to be poor in taste and their quality decreases as they are refrigerated and transported over long distances.
>
> A strategy used nowadays is to genetically modify the fruit trees by introducing a gene from another organism that delays the ripening process.
>
> [Adapted from www.ncbe.reading.ac.uk]

3.3.1 According to the extract, state TWO disadvantages for farmers if they pick their produce prematurely. (2)

3.3.2 Explain why the growth of these GM fruit trees will economically benefit the:

(a) Consumer (2)

(b) Farmer (2)

3.3.3 State TWO factors that, due to climatic changes, have a negative effect on food security. (2)
(8)

3.4 Read the extract below, which provides information on gasohol.

> Petrol is a fuel produced from crude oil. When petrol is burnt in engines it releases pollutants and greenhouse gases into the atmosphere. Since the early 1970s there has been a shortage of crude oil causing an 'oil crisis'.
>
> Petrol releases 34,8 megajoules of energy per litre.
>
> Gasohol is a mixture of 10% ethanol and 90% petrol. It can be used in most car engines without making any changes to the engine. It releases 23,5 megajoules of energy per litre. Gasohol is used in several countries. The use of gasohol can reduce carbon monoxide emissions by 20% to 30%. It can also decrease greenhouse gas emissions by an estimated 2% compared to using regular petrol. Ethanol evaporates easily and can increase certain atmospheric pollutants in warmer weather.
>
> The ethanol in gasohol is often obtained by fermenting sugar cane or maize. Ethanol made from maize is expensive and energy-intensive to produce. It is also important that the percentage ethanol should be correct, because if it is too high, it can damage rubber seals and paint on vehicles.
>
> [Adapted from www.wikipedia.org and www.encyclopedia.com]

3.4.1 State TWO advantages of using gasohol rather than petrol. (2)

3.4.2 Calculate the difference in the energy (in megajoules) released by petrol compared to that of gasohol. Show ALL working. (2)

3.4.3 Explain why the use of gasohol is regarded as a solution to the 'oil crisis'. (2)

3.4.4 Explain why it is better to use gasohol in countries with colder climates. (3)

3.4.5 Suggest ONE reason why food products such as sugar cane and maize should NOT be used to produce fuel. (1)
(10)

3.5 Describe how thermal pollution can impact on the quality of water and biodiversity. **(4)**
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

While walking in the bush Paul hears a sound which he thinks is the roar of a lion. He immediately runs to safety.

Describe how he hears the sound and describe the role of adrenalin to ensure that his muscles are able to function efficiently while he runs away.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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GRADE 12

LIFE SCIENCES P1

NOVEMBER 2016

MEMORANDUM

MARKS: 150

This memorandum consists of 9 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	B✓✓		
	1.1.3	C✓✓		
	1.1.4	D✓✓		
	1.1.5	B✓✓		
	1.1.6	C✓✓		
	1.1.7	C✓✓		
	1.1.8	B✓✓		
	1.1.9	B✓✓		
	1.1.10	B✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Interphase✓		
	1.2.2	Autonomic✓ nervous system		
	1.2.3	Abscisic acid✓		
	1.2.4	Carbon footprint✓		
	1.2.5	Cytokinesis✓		
	1.2.6	Allantois✓		
	1.2.7	Endometrium✓		
	1.2.8	Fallopian tube✓/oviduct		**(8)**
1.3	1.3.1	None✓✓		(2)
	1.3.2	A only✓✓/B only		(2)
	1.3.3	A only✓✓		(2)
				(6)
1.4	1.4.1	(a) Centromere✓		(1)
		(b) Centriole✓		(1)
		(c) Chromatid✓/daughter chromosome		(1)
	1.4.2	4 → 2→ 1→ 3✓✓		(2)
	1.4.3	4✓		(1)
				(6)
1.5	1.5.1	(a) Jelly✓ layer/zona pellucida		(1)
		(b) Cell membrane✓/plasma-lemma/plasma membrane		(1)
		(c) Cytoplasm✓/cytosol		(1)
		(d) Nucleus✓		(1)
	1.5.2	(a) G✓ - Middle piece✓/neck **OR** C✓ - Cytoplasm✓		(2)
		(b) E✓ - Acrosome✓		(2)
		(c) D✓ - Nucleus✓		(2)
				(10)
			TOTAL SECTION A:	**50**

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SECTION B

QUESTION 2

2.1	2.1.1	Seminal vesicles✓		(1)
	2.1.2	A✓ B✓ D✓ **(Mark first TWO only)**	Any	(2)
	2.1.3	- Fertility is reduced✓ - because the temperature is always high✓ - This will lead to production of abnormal sperm✓/fewer sperm are formed/proteins in the cells that form the sperm will denature **OR** - Fertility is reduced✓ - because pressure is increased✓/reducing circulation of blood - This will lead to production of abnormal sperm✓/fewer sperm are formed		(3) **(6)**
2.2	2.2.1	Pituitary✓ gland/hypophysis		(1)
	2.2.2	- High levels of LH✓ - stimulates ovulation✓		(2)
	2.2.3	- To monitor their fertile periods✓ - to prevent pregnancy✓/to increase chances of falling pregnant		(2)
	2.2.4	- Oestrogen✓ - levels rise✓		(2)
	2.2.5	Between 16 and 18✓✓		(2)
	2.2.6	- Progesterone only rises✓ - after ovulation✓ - This shows that the fertility period has already passed✓/when fertility is low		(3) **(12)**

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2.3 2.3.1
- Body temperature increases✓
- Pulse rate increases✓

OR

Both increase✓✓ (2)

2.3.2 30✓ minutes (1)

2.3.3 **Vasoconstriction**
- Less blood reaches the surface of the skin✓
- and less heat is lost✓

OR
- Less blood reaches the sweat glands✓
- and less heat is lost✓ Any 1 x 2

Increase in metabolism
- An increase in metabolism results in an increase in respiration✓
- which generates more heat✓ (4)

2.3.4
- Amount of energy drink✓
- Length of time when measurements were taken✓
- Amount of caffeine in the energy drink✓
- Type of energy drink✓
- The level of activity of all participants✓
- Gender✓/only men

(Mark first TWO only) Any (2)
(9)

2.4
- The pancreas✓/Islets of Langerhans is stimulated
- to secrete glucagon✓ into the blood
- which stimulates the liver✓/muscles
- to convert glycogen into glucose✓
- The glucose level in the blood now increases✓ and returns to normal Any **(4)**

2.5 2.5.1 (a)
- The shoot grows straight up✓
- The tip of the shoot does not receive any light✓
- The auxins remain evenly distributed in the tip✓
- All parts of the shoot are equally stimulated to grow✓ Any (3)

(b)
- The shoot bends towards the light✓/stimulus/shows positive phototropism
- because it is exposed to unilateral light✓
- The auxins in the tip move away from the lighted✓/to the darker side of the shoot/are destroyed on the lighted side
- The cells on the darker side are stimulated to grow✓/elongate
- Growth is inhibited in cells on the lighted side✓ Any (4)

2.5.2
- Since the apical bud was removed no auxins are produced✓ in the tip
- therefore no apical dominance✓/growth of the lateral buds/branches is not inhibited (2)

(9)
[40]

QUESTION 3

	3.1.1	Motor✓/multi-polar /efferent	(1)
	3.1.2	- Transmits impulse away from the cell body✓ - Transmits impulse to effector✓ **(Mark first ONE only)** Any	(1)
	3.1.3	- Insulates✓ the neuron - causing it to conduct impulse faster✓/prevent a short circuit	(2)
	3.1.4	- There will not be a response✓ to the particular stimulus - Nerve impulse will not be carried to the effector✓/muscle/gland	(2) **(6)**
3.2	3.2.1	(a) Lens✓ (b) Choroid✓	(1) (1)
	3.2.2	Long-sightedness✓/hyperopia/hypermetropia	(1)
	3.2.3	- Cannot see nearby objects clearly✓ - causing the image to be blurred✓	(2)
	3.2.4	- No image will be formed✓/cannot see the object - No receptors✓ present - Light will not be converted into an impulse✓	(3)
	3.2.5	- Lens is elastic✓ therefore can change shape✓/convexity/allow for accommodation - Lens is transparent✓ to allow light rays to pass through✓ - Lens is biconvex✓ to refract light rays✓ **(Mark first TWO only)** (Any 2 x 2)	(4) **(12)**
3.3	3.3.1	- Poor taste✓ - Low quality✓ **(Mark first TWO only)**	(2)
	3.3.2	(a) - More fruit will be available✓/for longer periods/longer shelf life - Making it cheaper✓ (b) - The farmer will sell more fruit✓/less fruit will go to waste from spoilage/ have better quality fruit/no need for refrigeration - And therefore make a bigger profit✓	(2) (2)

3.3.3
- droughts✓
- floods✓
- rising sea levels✓
- high temperature✓
- low temperatures✓
- desertification✓
- veldfires✓
- extreme wind✓
- (Any TWO different examples of extreme weather)

(Mark first TWO only) Any (2)
(8)

3.4 3.4.1
- It can reduce CO/carbon monoxide emissions✓ by 20% to 30%
- It can reduce greenhouse gas emissions✓ by 2% over regular petrol

(2)
(Mark first TWO only)

3.4.2 34,8 – 23,5✓ = 11,3✓ megajoules (2)

3.4.3
- Reduces the amount of crude oil✓ required to make petrol✓

OR
- Gasohol is produced from sugarcane✓/maize which is easily available✓ Any 1 x 2 (2)

3.4.4
- In cooler climates ethanol, will evaporate more slowly✓
- Less fuel is lost✓
- Less pollution is released into the atmosphere✓ (3)

3.4.5
- There will be less food available✓ for people to eat/reduces food security
- Maize and sugarcane will be in demand✓/prices will increase
- It is energy intensive to produce✓
- Gasohol is expensive (1)

(Mark first ONE only) **(10)**

3.5 Water quality

- Results in less oxygen✓/ more carbon dioxide /algal bloom/ eutrophication/ increase in bacteria/death and decomposition of organisms
- Decreasing the quality of the water✓

Biodiversity

- Organisms die✓
- therefore reducing biodiversity✓

(4)
[40]

SECTION C

QUESTION 4

Hearing

- Pinna traps/directs the sound waves✓
- into the ear canal✓/meatus
- This causes the tympanic membrane to vibrate✓
- The vibration is transmitted to the auditory ossicles✓
- The ossicles amplify the vibration✓
- and transmit it to the oval window✓
- The oval window vibrates✓
- creating waves✓
- in the fluid/endolymph of the cochlea✓
- which stimulates the Organ of Corti✓
- to convert the wave into an impulse✓
- The impulse travels along the auditory nerve✓
- to the cerebrum✓ where it is interpreted as the roar of the lion

Max 10

Role of Adrenalin

- More adrenalin is secreted✓
- Adrenalin increases muscle tone✓
- And causes the liver/muscles to convert glycogen into glucose✓
- The heart rate increases✓
- so that the muscles receive more glucose✓
- and oxygen✓
- needed for cellular respiration✓
- to provide the energy✓ for the muscles to contract efficiently
- The rate of breathing increases✓
- and the depth of breathing increases✓
- to exhale carbon dioxide from the muscles faster✓
- and inhale oxygen faster✓
- Constriction of blood vessels to the gut✓/skin
- and dilation of blood vessels to the vital organs✓/brain/muscles
- allowing more blood to be supplied to vital organs✓/brain/muscles

Max 7
Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay
All the information provided is relevant to hearing and how adrenalin ensures that muscles function efficiently There is no irrelevant information	All the information regarding hearing and how adrenalin ensures that muscles function efficiently is arranged in a logical manner	At least the following marks should be obtained for each of the following: - Hearing (**7/10**) - How adrenalin ensures that muscles function efficiently (**4/7**)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2017

MARKS: 150

TIME: 2½ hours

This question paper consists of 15 pages.

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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 to D) next to the question number (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 higher thought processes is the …

A cerebellum.
B medulla oblongata.
C hypothalamus.
D cerebrum.

1.1.2 The central nervous system is made up of the …

A cranial and spinal nerves.
B brain and spinal cord.
C sympathetic and parasympathetic nerves.
D autonomic and peripheral nervous systems.

1.1.3 Which ONE of the following is the dark-coloured layer of the eye, which is rich in blood vessels?

A Conjunctiva
B Sclera
C Cornea
D Choroid

1.1.4 Which ONE of the following parts of the eye contains the photoreceptors?

A Retina
B Iris
C Sclera
D Vitreous humour

1.1.5 Which structures in the eye are responsible for the refraction of light?

A Pupil and iris
B Blind spot and yellow spot
C Cornea and lens
D Sclera and suspensory ligaments

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1.1.6 Which ONE of the following occurs when you look up from reading a book on a clear, sunny day to focus on a mountain more than 100 metres away?

A Radial muscles of the iris contract.
B Pupil becomes dilated.
C Ciliary muscles relax.
D Lens becomes more convex.

1.1.7 Which ONE of the following pathways represents a reflex arc?

A Muscle → Spinal cord → Brain
B Effectors → Spinal cord → Receptor
C Receptor → Spinal cord → Brain
D Receptor → Spinal cord → Muscle

1.1.8 After exercising in a gymnasium people often go into a steam room to relax their muscles. The average temperature in a steam room is 41 °C and the humidity is between 80% and 100%.

Which ONE of the following explains why people are advised NOT to stay in a steam room for longer than 15 minutes?

A Increased sweating will cause overcooling.
B Sweat will not evaporate causing overheating.
C Vasoconstriction will lower sweat production.
D Heat receptors in the skin will be damaged.

1.1.9 A tumour in the hypothalamus of the brain of a patient caused a condition called diabetes insipidus. Below are some of the patient's symptoms:

- Dehydration
- Production of large quantities of dilute urine

Which ONE of the following is the most likely effect of the tumour?

A Increased secretion of TSH
B Decreased secretion of ADH
C Increased reabsorption of water in the kidneys
D Increased permeability of the collecting ducts in the kidney to water

1.1.10 Contraceptive pills which prevent pregnancy are likely to contain …

A high levels of FSH and progesterone.
B high levels of LH and oestrogen.
C high levels of only FSH.
D high levels of only 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 A type of fertilisation in which the nucleus of a sperm fuses with the nucleus of an ovum outside the body of the female

1.2.2 The point where two chromatids overlap during prophase I

1.2.3 A hormone which regulates the salt balance in the human body

1.2.4 The maintenance of a constant internal environment in the human body within certain limits

1.2.5 A type of egg where the embryo develops inside a fluid-filled sac which is surrounded by a shell

1.2.6 A hormone that stimulates the development of the corpus luteum

1.2.7 A disorder of the eye caused by the curvature of the lens or cornea being uneven, resulting in distorted images

1.2.8 The structure that connects the left and right hemispheres of the brain, allowing communication between them

1.2.9 The nerve that carries impulses from the retina to the brain

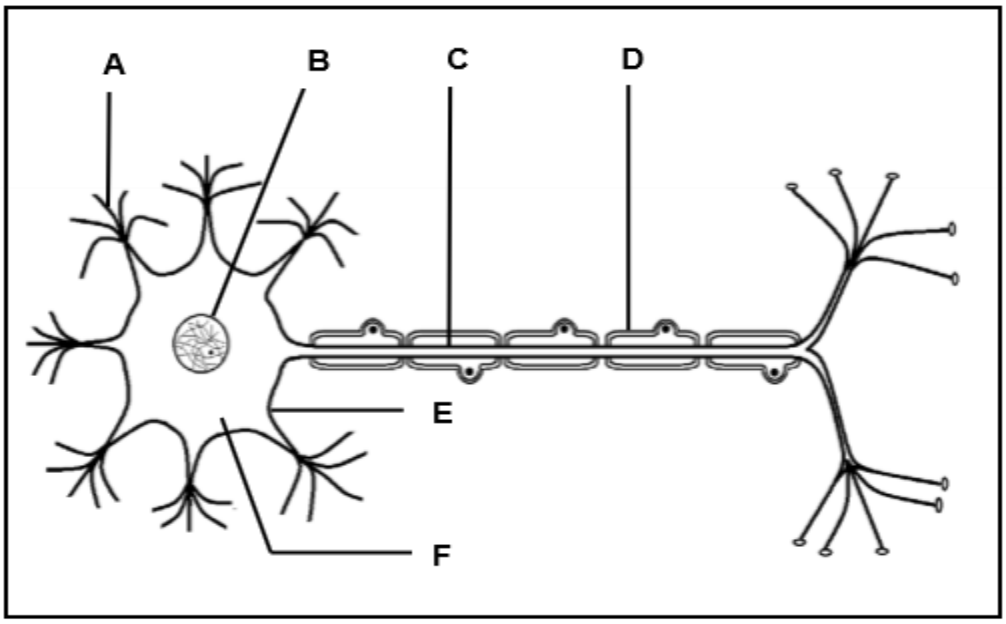
1.2.10 Collective name for the membranes that protect the brain and spinal cord (10 x 1) **(10)**

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	Reduces greenhouse gases in the atmosphere	A: Landfill sites B: Deforestation
1.3.2	Reproductive strategy in birds where hatchlings are helpless and unable to move and feed themselves	A: Precocial B: Altricial
1.3.3	Type of reproduction in vertebrates where the foetus is attached to and develops inside the uterus	A: Vivipary B: Ovovivipary

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

1.4 The diagram below represents the structure of a neuron.



1.4.1 Name the type of neuron in the diagram above. (1)

1.4.2 Identify part:

(a) **B** (1)

(b) **F** (1)

(c) **A** (1)

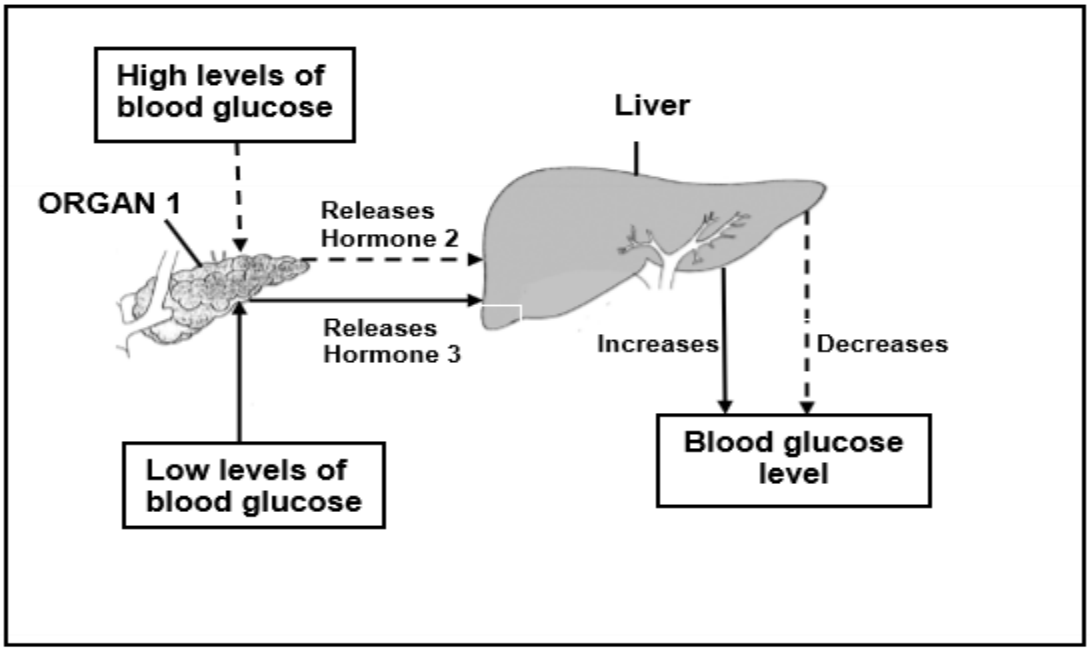
1.4.3 Give the LETTER and NAME of the part that:

(a) Transmits impulses away from the cell body (2)

(b) Insulates and speeds up the transmission of impulses (2)

1.4.4 Name the condition caused by the progressive degradation of part **D**. (1)
(9)

1.5 Study the flow diagram below.



Identify:

1.5.1 Organ **1** (1)

1.5.2 Hormone **2** (1)

1.5.3 Hormone **3** (1)

1.5.4 The disorder caused when organ **1** fails to release sufficient amounts of hormone **2** (1)

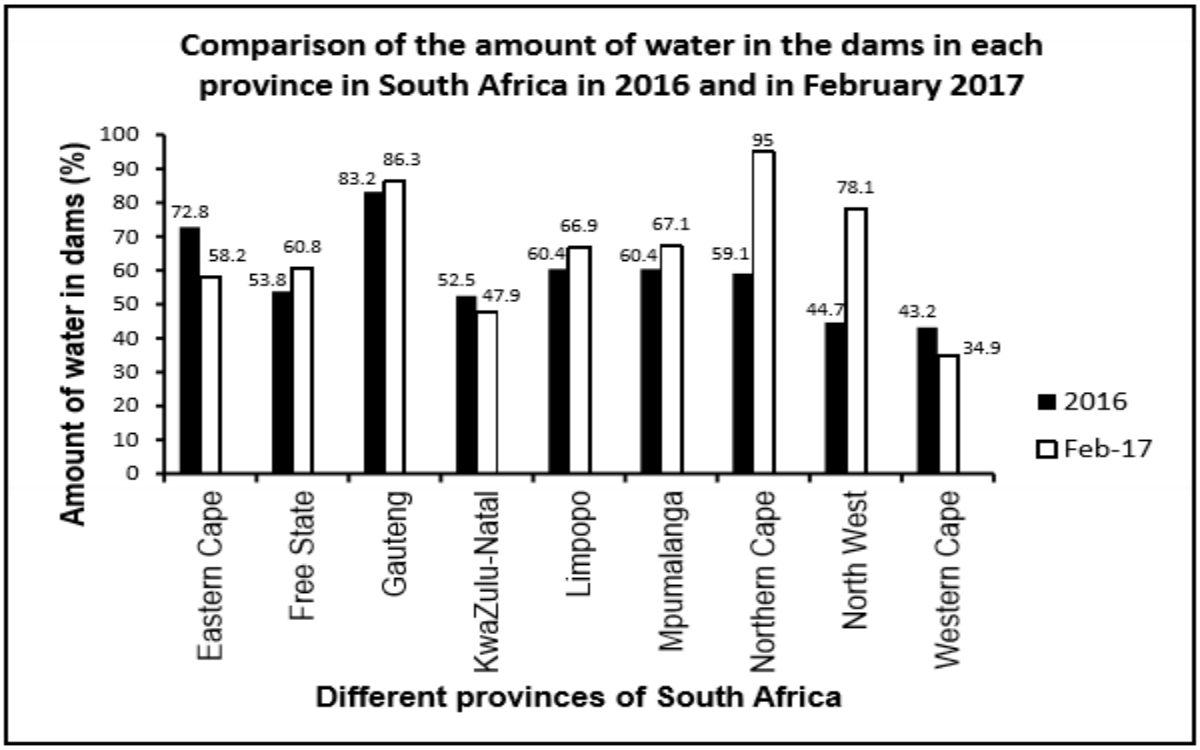
1.5.5 The mechanism that controls the levels of glucose in the body (1)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The graph below indicates the amount of water in the dams in each province shown as a percentage of the capacity of the dams. The information shows the amount of water in 2016 and at the end of February 2017.



2.1.1 Which province had the **most** water in their dams in February 2017? (1)

2.1.2 Which province had the **greatest decrease** in the amount of water from 2016 to February 2017? (1)

2.1.3 The amount of water in the dams of North West increased by 33,4% from 2016 to February 2017. Calculate the percentage increase this represents in comparison to the amount of water in 2016. (3)

2.1.4 Which TWO provinces had the **lowest** amount of water in their dams in February 2017? (2)

2.1.5 Explain TWO possible strategies, other than water restrictions, that the provincial governments of the provinces named in QUESTION 2.1.4 could implement to reduce the water shortages. (4)

2.1.6 Explain TWO ways in which the building of dams could have a negative effect on the environment. (4)
(15)

2.2 Read the extract below.

INVASION OF *SPODOPTERA FRUGIPERDA* (ARMY WORM) THREATENS FOOD SECURITY IN SOUTH AFRICA

A crop-destroying caterpillar species (commonly known as the army worm) endemic to North and South America is spreading rapidly in Africa, including South Africa and is raising concerns about food security.

Different opinions exist on how the army worm reached Africa. The eggs may have arrived in maize imports or high altitude winds may have helped the moths to cross the Atlantic Ocean.

Specific pesticides have been identified to help combat the army worm.

2.2.1 Define *food security*. (2)

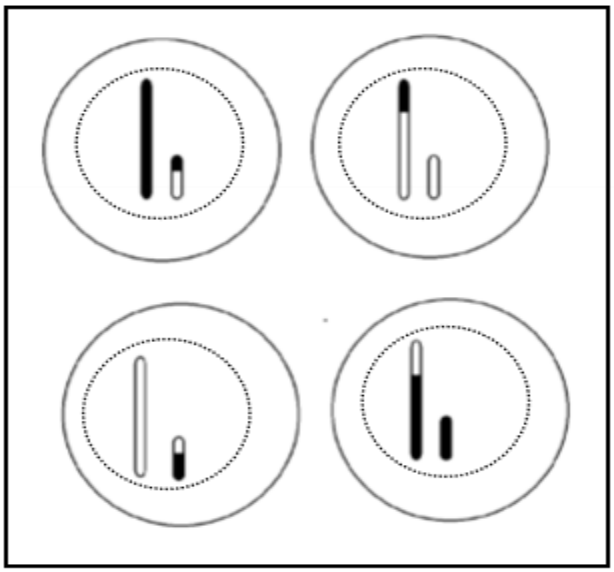
2.2.2 Give ONE phrase in the extract which implies that the army worm is an alien species on the African continent. (1)

2.2.3 According to the passage, state TWO ways in which the army worm could have been introduced into Africa. (2)

2.2.4 Refer to the passage and name the type of control (mechanical, biological or chemical) used currently to fight the spreading of the army worm. (1)

2.2.5 Explain ONE way in which the army worm could have a negative influence on the economy of South Africa. (2)
(8)

2.3 Study the diagram of a phase during meiosis below.



2.3.1 Identify the phase in the diagram above. (1)

2.3.2 Give TWO visible reasons for your answer to QUESTION 2.3.1. (2)

2.3.3 How many chromosomes:

(a) Are present in EACH cell in the diagram (1)

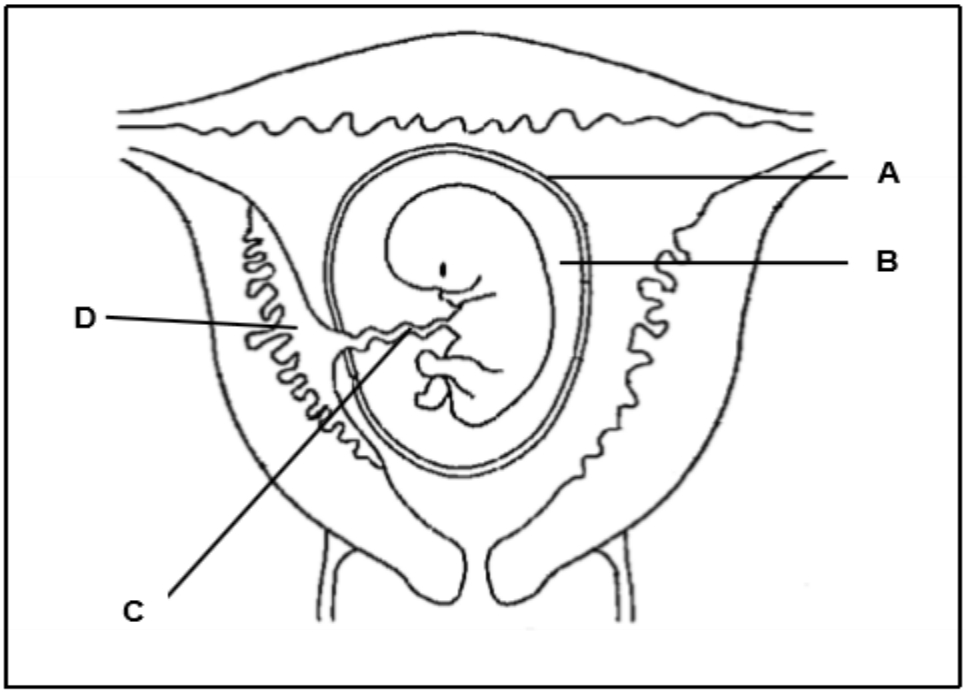
(b) Were present in the original cell at the start of meiosis (1)

2.3.4 The cells in the diagram are NOT identical.

(a) Name TWO processes during meiosis that lead to the cells being different from one another. (2)

(b) Explain the significance to a species of the cells being different from one another. (3)
(10)

2.4 The diagram below represents a developing foetus in a human body.



2.4.1 Identify:

(a) **A** (1)

(b) **C** (1)

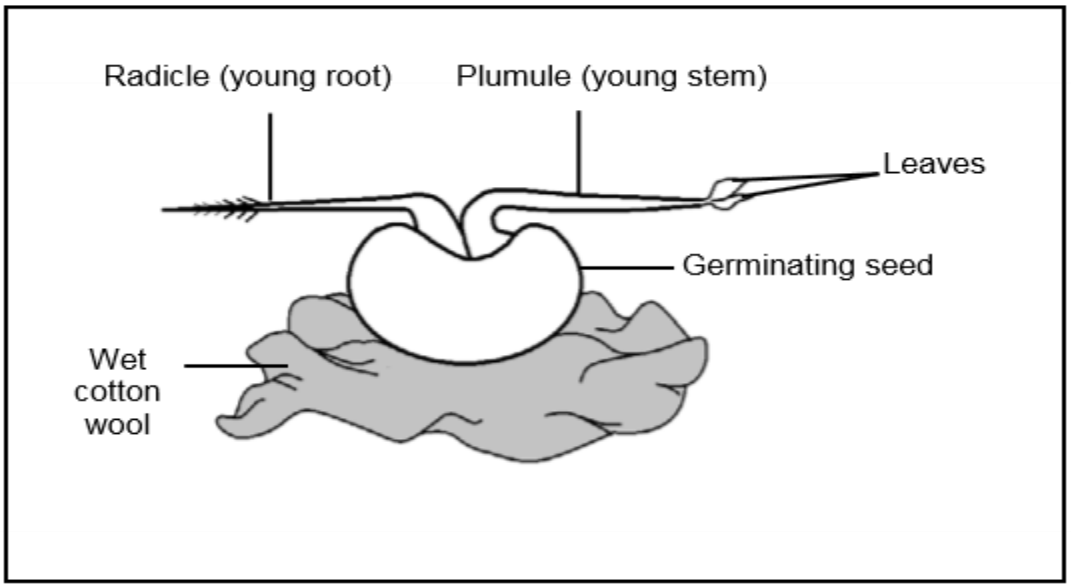
2.4.2 State TWO functions of the fluid in part **B**. (2)

2.4.3 Name ONE system in the baby's body that takes over the function of part **D** once the baby is born. (1)

2.4.4 Explain ONE negative impact on foetal development if part **D** is reduced significantly. (2)
(7)
[40]

QUESTION 3

3.1 The diagram below represents a germinating seed. Assume that the radicle and plumule were exposed to uniform light from all directions.



3.1.1 Define *tropism*. (2)

3.1.2 Draw a labelled diagram to show the position of the radicle and plumule in the seedling one week later. (4)
(6)

3.2 Auxins influence the growth of stems and roots.

3.2.1 State where auxins are produced in a plant. (1)

3.2.2 Describe the effect of auxins on a plant stem that is exposed to unilateral light. (4)
(5)

3.3 An investigation was conducted to determine the effect of different amounts of thyroxin on metabolic rate.

The procedure was as follows:

- Nine healthy adult male rats were used.
- They were divided into three groups of three rats each: **A**, **B** and **C**.
- All three groups were kept in the same environment in three separate cages.
- Each group received the same amount of water.
- Each group was given a different diet.
- Their initial mass was taken.
- Three weeks later the mass was taken again.
- Their oxygen consumption was also measured.

DIET **X**: Food containing all the essential nutrients
DIET **Y**: Food containing all the essential nutrients and an extract of thyroxin
DIET **Z**: Food containing all the essential nutrients and a chemical that inhibits the effect of thyroxin

The table below shows the results of the investigation.

GROUP	DIET	AVERAGE MASS OF RATS (g)		AVERAGE OXYGEN CONSUMPTION (mℓ/kg/min)
		INITIAL	AFTER THREE WEEKS	
A	**X**	319	321	4,0
B	**?**	320	309	10,0
C	**?**	318	340	2,7

NOTE: Group **A** was given DIET **X**.

3.3.1 Name the group(s) (**A**, **B** or **C**) in which the average mass of the rats increased. (2)

3.3.2 For this investigation state the:

(a) Independent variable (1)

(b) Dependent variable and how it was measured (2)

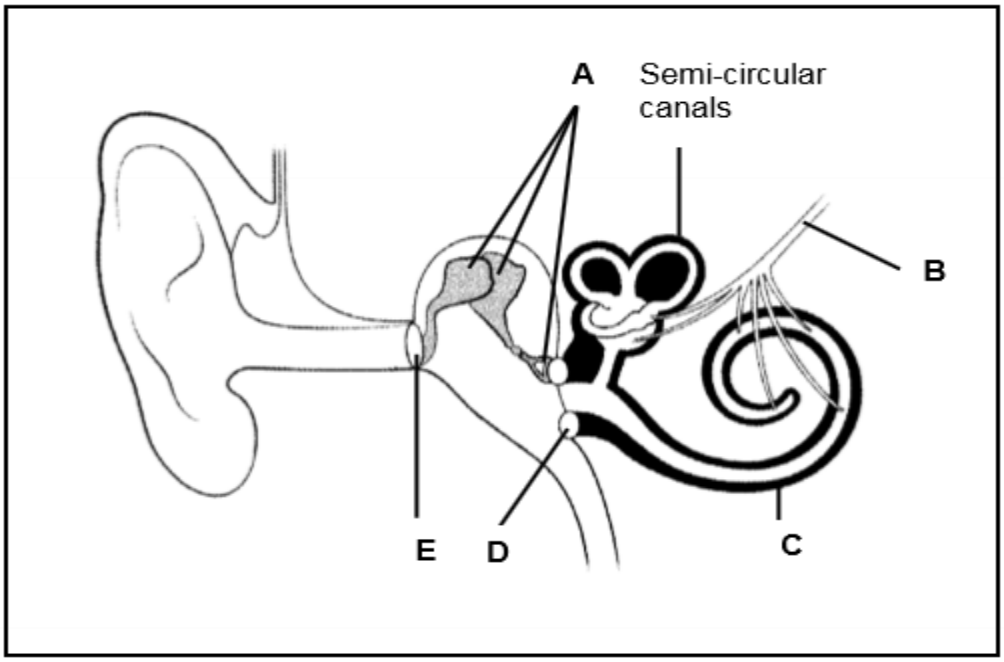
3.3.3 Arrange the diets (**X**, **Y** and **Z**) in order of increasing amounts of thyroxin that would be found in the rats after they were given these diets. (2)

3.3.4 Which group (**B** or **C**) was given diet **Y**? (1)

3.3.5 Refer to changes in mass and oxygen consumption of the rats in the table above. Explain your answer to QUESTION 3.3.4. (5)

3.3.6 State THREE ways in which the validity of this investigation could be increased. (3)
(16)

3.4 Study the diagram of the human ear below.



3.4.1 Identify:

(a) **B** (1)

(b) **D** (1)

3.4.2 Which part of the brain will receive impulses from part **C**? (1)

3.4.3 Describe the role of the semi-circular canals in maintaining balance. (5)

3.4.4 Describe how an increased production of mucus in the nose and throat may lead to the bursting of part **E**. (3)

3.4.5 Explain why fusion of the structures at **A** may lead to hearing loss. (2)
(13)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Sperm is produced, transported and then combined with secretions from the accessory glands to form semen. The semen is then transferred into the body of the female where it meets the ovum.

Describe all the processes referred to in the statement above and explain THREE structural adaptations of the sperm for fertilisation.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
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NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2017

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 11 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	D✓✓		
	1.1.2	B✓✓		
	1.1.3	D✓✓		
	1.1.4	A✓✓		
	1.1.5	C✓✓		
	1.1.6	C✓✓		
	1.1.7	D✓✓		
	1.1.8	B✓✓		
	1.1.9	B✓✓		
	1.1.10	D✓✓	(10 x 2)	**(20)**
1.2	1.2.1	External✓fertilisation		
	1.2.2	Chiasma✓		
	1.2.3	Aldosterone✓		
	1.2.4	Homeostasis✓		
	1.2.5	Amniotic✓egg		
	1.2.6	Luteinising hormone✓/LH		
	1.2.7	Astigmatism✓		
	1.2.8	Corpus callosum✓		
	1.2.9	Optic✓nerve		
	1.2.10	Meninges✓		**(10)**
1.3	1.3.1	None✓✓		(2)
	1.3.2	B only✓✓		(2)
	1.3.3	A only✓✓		(2)
			(3 x 2)	**(6)**
1.4	1.4.1	Motor✓ neuron		(1)
	1.4.2	(a) Nucleus✓/nuclear membrane		(1)
		(b) Cytoplasm✓		(1)
		(c) Dendrite✓		(1)
	1.4.3	(a) C✓- Axon✓		(2)
		(b) D✓- Myelin sheath✓		(2)
	1.4.4	Multiple sclerosis✓		(1)
				(9)
1.5	1.5.1	Pancreas✓		(1)
	1.5.2	Insulin✓		(1)
	1.5.3	Glucagon✓		(1)
	1.5.4	Diabetes✓mellitus		(1)
	1.5.5	Negative feedback✓		(1)
				(5)
			TOTAL SECTION A:	**50**

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SECTION B

QUESTION 2

2.1 2.1.1 Northern Cape✓ (1)

2.1.2 Eastern Cape✓ (1)

2.1.3 74,72 OR 74,7 OR 75✓✓✓% (3)

OR (if candidate does not have above answer)

$\frac{33,4/(78,1-44,7)✓}{44,7}$ x 100✓ Max (2)

2.1.4
- Western Cape✓ and
- Kwazulu-Natal✓ (2)

(MARK FIRST TWO ONLY)

2.1.5
- Research alternative methods✓/e.g.desalinate seawater/cloud seeding to supplement the normal water supplies✓
- Fix/maintain all waterworks✓/pipe systems to prevent water loss by leaking✓
- Locate aquifers✓/boreholes/underground water to provide additional water sources✓
- Penalise people who are using too much water✓ to prevent them from wasting water✓
- Remove alien plants✓in the catchment area of the dam to ensure that more water reaches the dams✓
- Increase awareness✓ to encourage wise water use✓
- Offer water tanks at a reduced price✓ to create additional source of water✓
- Recycle grey water✓ to provide additional water sources✓
- Build dams✓ to store water✓ (Any 2 x 2) (4)

(MARK FIRST TWO ONLY)

2.1.6
- Habitats are destroyed✓ which will lead to a loss in biodiversity✓
- When flood gates are opened flooding may occur in the areas downstream from the dam✓ resulting in erosion✓/loss of top soil/loss of lives/loss of biodiversity
- The river downstream from the dam will receive less water✓ which may have a negative impact on aquatic ecosystems✓/lead to biodiversity loss
- Wall blocks fish migration✓ decreasing spawning✓/reproduction/survival
- Dam wall restricts movement of organisms✓ affecting food chains/webs✓ (Any 2 x 2) (4)

(MARK FIRST TWO ONLY) **(15)**

2.2 2.2.1
- Food security refers to the access by all people✓
- at all times✓
- to adequate✓/safe/nutritious food (Any 2) (2)

2.2.2
- 'endemic to North and South America'✓
- 'the armyworm reached Africa'✓
- 'Invasion of *Spodoptera*'✓ (Any 1) (1)

(MARK FIRST ONE ONLY)

2.2.3
- Maize imports✓
- High altitude wind streams✓

OR

- Eggs✓
- Moths✓

(MARK FIRST TWO ONLY) (2)

2.2.4 Chemical✓control (1)

2.2.5
- The armyworm may lead to crop failure✓/food shortages that will mean financial/job losses✓for farmers
- Food shortages✓/maize will have to be imported that will cause increase in food prices✓
- Using pesticides could adversely influence other crops✓ that will cause increase in food prices✓
- Using pesticides is expensive✓and will lead to increased food prices✓ (Any 1 x 2) (2)

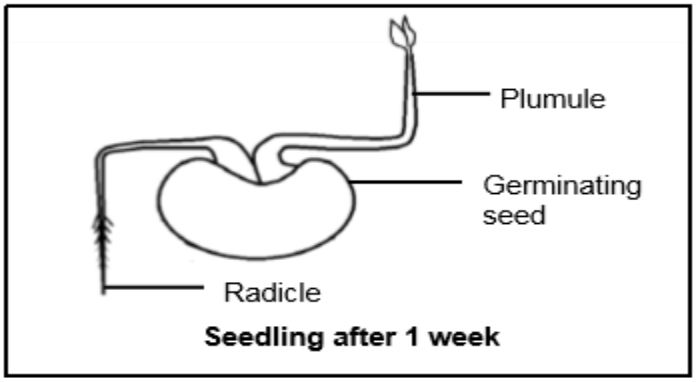
(MARK FIRST ONE ONLY) **(8)**

2.3	2.3.1	Telophase II✓	(1)
	2.3.2	- There are 4 cells✓ - Each cell contains only a single set of un-replicated✓/single stranded chromosomes **(MARK FIRST TWO ONLY)**	(2)
	2.3.3	(a) Two/2✓	(1)
		(b) Four✓/4/2 pairs	(1)
	2.3.4	(a) - Crossing over✓ - Random arrangement✓of chromosomes on the equator **(MARK FIRST TWO ONLY)**	(2)
		(b) - The gametes that form will be genetically different✓ - leading to variation in the offspring✓/increasing the gene pool - This increases a species chances of survival✓	(3) **(10)**
2.4	2.4.1	(a) Chorion✓/Amnion	(1)
		(b) Umbilical cord✓	(1)
	2.4.2	- Protects the foetus from shock✓/Acts as a shock absorber - Protects the foetus from drying out✓ - Protects the foetus from temperature changes✓ - Allows free movement of the foetus✓ (Any 2) **(MARK FIRST TWO ONLY)**	(2)
	2.4.3	- Gaseous exchange system✓ - Excretory system✓ - Digestive system✓ (Any 1) **(MARK FIRST ONE ONLY)**	(1)
	2.4.4	- The foetus will receive less nutrients✓ and therefore have a lower birth mass✓/physical under-development/mental under-development - The foetus will receive less oxygen✓ and therefore have a lower birth mass✓/physical under-development/mental under-development - Waste will accumulate✓ and it will affect the functioning of the foetus✓ (A **(MARK FIRST ONE ONLY)**	(2) **(7)** **[40]**

QUESTION 3

3.1 3.1.1 - The growth of a plant✓/part of a plant
- in response to a stimulus✓ (2)

3.1.2



Seedling after 1 week

Checklist for marking the diagram:

Caption	(1)
Correct drawing: Radicle growing downwards Plumule growing upwards	 (1) (1)
ONE correct label: Plumule/radicle/germinating seed	(1)
Total	**(4)**

(4)
(6)

3.2 3.2.1 Tip of the stem✓/tip of root/apical meristem/terminal bud/apical bud (1)

3.2.2 - The stem grows✓✓/bends
- towards the light✓✓ (4)
(5)

3.3 3.3.1 - Group A✓
- Group C✓ (2)

3.3.2 (a) Amount of Thyroxin✓ (1)

(b) Metabolic rate✓
By measuring the **change in mass✓/consumption of oxygen** (2)

3.3.3 Z, X, Y ✓✓ (2)

	3.3.4	Group B✓	(1)
	3.3.5	- The mass of the rats decreased✓/changed from 320 g to 309 g - since body fat is used✓/ less fat is stored - The oxygen consumption was the highest✓/(10ml/kg/min) - indicating an increased rate of metabolism✓/respiration - which is caused by the higher thyroxin concentration✓ - Diet Y is the only diet that contained thyroxin✓/ group B receives thyroxin through diet Y (Any 5)	(5)
	3.3.6	- The age of the rats must be the same✓ - All the rats must receive the same amount of food✓ - Food must be given at the same time✓ - The rats must be of the same species✓/genetically similar - Use the same instrument to measure mass✓ - The same person must take the measurements✓ - Use identical cages✓ (Any 3) **(MARK FIRST THREE ONLY)**	(3) **(16)**
3.4	3.4.1	(a) Auditory nerve✓	(1)
		(b) Round window✓/Fenestra rotunda	(1)
	3.4.2	Cerebrum✓	(1)
	3.4.3	- The cristae✓in the semi-circular canals - are stimulated by changes in speed and direction✓ - when the endolymph moves✓ - The cristae convert the stimuli to nerve impulses✓ - The nerve impulses are transported along the auditory nerve✓ - to the cerebellum✓to be interpreted - Impulses sent to muscles✓ to restore balance (Any 5)	(5)
	3.4.4	- The mucus will block the opening of the Eustachian tube✓ - Air cannot enter or leave✓the middle ear - to equalise pressure✓/causing imbalance in pressure **OR** - Mucus may move through the Eustachian tube✓ - causing pressure in the middle ear✓ - pushing on the tympanic membrane✓/part E	(3)
	3.4.5	- The ossicles/structures at A will not be able to vibrate✓ - and hence no vibrations will be passed to the inner ear✓/cochlea will not be stimulated/no amplification	(2) **(13)** **[40]**
		TOTAL SECTION B:	**80**

SECTION C

QUESTION 4

Spermatogenesis✓ (S)
- Takes place under the influence of testosterone✓
- in the seminiferous tubules✓/testis
- Diploid cells✓/germinal epithelium
- undergo meiosis✓
- to form haploid sperm cells✓ (Any 4) (4)

Formation and transport of semen (T)
- Sperm mature✓/are temporarily stored
- in the epididymis✓
- During ejaculation✓
- sperm move into the vas deferens✓
- As it passes the seminal vesicles✓,
- prostate gland✓ and
- Cowper's glands✓
- fluids are added that provide nutrition,✓
- promote the movement✓ of the sperm
- and neutralise the acids ✓ produced in the vagina
- The semen passes through the urethra✓
- of the penis✓
- into the vagina✓
- during copulation✓
- and swims up the Fallopian tube✓where it meets the ovum (Any 7) (7)

Structural suitability of the sperm cell for fertilisation (A)
- The acrosome✓
- contains enzymes to dissolve a path into the ovum✓

- Nucleus of the sperm✓
- carries genetic material of the male✓/haploid number of chromosomes

- Many mitochondria✓in the middle piece
- release energy✓ so that sperms could swim

- The presence of a tail✓
- enables sperm cells to swim✓ towards the ovum

- The contents of the sperm cell such as the cytoplasm is reduced✓/condensed
- making the sperm light for efficient movement✓

- Sperm is streamlined✓
- to allow for easier movement✓
  (MARK FIRST THREE ONLY) (Any 3 x 2) (6)

Content (17)
Synthesis (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance (R)	Logical sequence (L)	Comprehensive (C)
All information provided is relevant to the question	Ideas arranged in a logical/cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All information relevant to - Spermatogenesis - Formation and transport of semen - Structural suitability of sperm. There is no irrelevant information	The information on - Spermatogenesis - Formation and transport of semen and - Structural suitability of sperm is in a logical sequence	The following must be included: - Spermatogenesis (2/4) - Formation and transport semen (5/7) - Structural suitability of sperm (4/6)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2018

MARKS: 150

TIME: 2½ hours

This question paper consists of 19 pages.

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

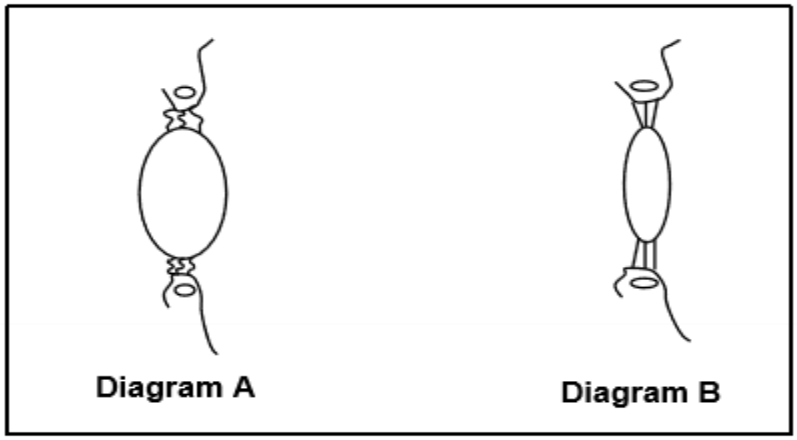
1.1.1 Which of the following are hormones that directly stimulate the development of the endometrium?

A FSH and LH
B Progesterone and oestrogen
C FSH and progesterone
D LH and oestrogen

1.1.2 A function of the iris of the eye is to …

A refract light to form a clear image.
B control the amount of light that enters the eye.
C convert the light stimuli into impulses.
D prevent reflection of light within the eye.

1.1.3 Diagram **A** and diagram **B** below represent the same part of the same human eye under different conditions.



Which diagram, with a corresponding reason, represents a person looking at an object 10 metres away?

A Diagram **A** because the suspensory ligaments are taut/tight and the lens is less convex
B Diagram **A** because the lens is more convex and the suspensory ligaments are slack
C Diagram **B** because the lens is more convex and the suspensory ligaments are slack
D Diagram **B** because the suspensory ligaments are taut/tight and the lens is less convex

1.1.4 Which of the following are plant growth hormones?

A Prolactin and abscisic acid
B Abscisic acid and glucagon
C Gibberellins and abscisic acid
D ADH and gibberellins

1.1.5 A function of the placenta is to …

A transport waste from mother to foetus.
B form the chorion.
C secrete progesterone.
D secrete the fluid that surrounds the foetus.

1.1.6 Which ONE of the following will lead to a decrease in water quality?

A Eutrophication
B Use of aquifers
C Maintaining wetlands
D Drought

1.1.7 A chemical used in laboratories prevents spindle fibres from forming in cells undergoing meiosis. As a result meiosis cannot start on the completion of interphase.

In an investigation, this chemical was added to cells in the anthers of the flowers of rice plants. Each cell in the anther has 24 chromosomes.

What is the expected number of chromosomes in each cell at the end of the investigation?

A 12 replicated chromosomes
B 24 replicated chromosomes
C 24 unreplicated chromosomes
D 48 unreplicated chromosomes

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1.1.8 A scientist designed an investigation to test the following:

Eating more salt will decrease urine production and increase water consumption.

The table below shows the results of the investigation.

AMOUNT OF SALT CONSUMED (g)	VOLUME OF URINE PRODUCED (mℓ)	AMOUNT OF WATER CONSUMED (mℓ)
3	1 803	2 800
6	1 800	2 700
9	1 805	2 600
12	1 802	2 500
15	1 801	2 400

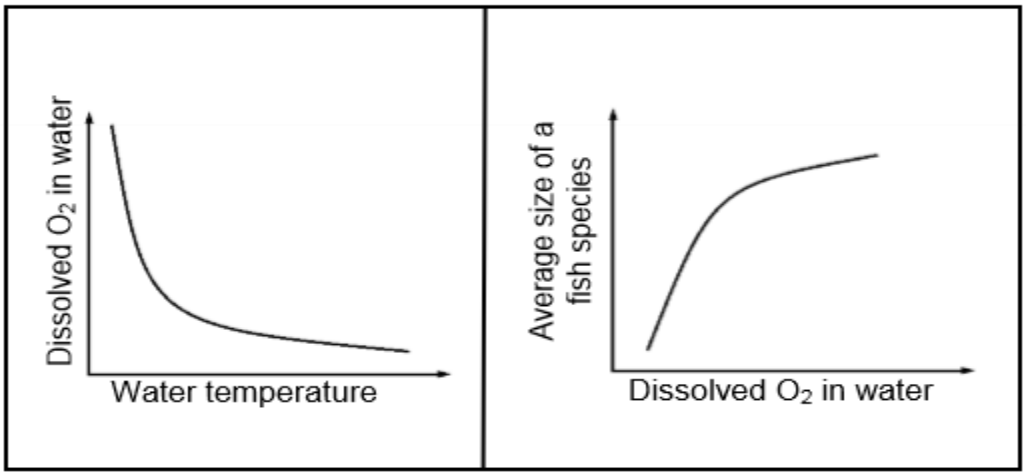
A possible conclusion from the results above is that eating more salt …

A decreases urine production and increases the amount of water consumed.
B increases urine production and decreases the amount of water consumed.
C has little effect on urine production and decreases the amount of water consumed.
D has little effect on urine production and increases the amount of water consumed.

1.1.9 An advantage of internal fertilisation is that …

A sperm and ova are protected within the female's body.
B there is better parental care.
C more gametes will be produced.
D the foetus receives food directly from the mother.

1.1.10 The graphs below represent the results of an investigation to determine if there is a possible relationship between temperature and the dissolved oxygen content of water and fish size.



Which ONE of the following is a possible interpretation based on information from both graphs?

A There will be no relationship between water temperature and fish size.
B As the temperature of the water increases, the amount of dissolved oxygen will increase.
C The average size of the fish will decrease as the temperature of the water increases.
D The amount of dissolved oxygen in the water will not influence fish size.

(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 1.2.10) in the ANSWER BOOK.

1.2.1 The type of egg produced by reptiles that has extra-embryonic membranes

1.2.2 The type of development in birds where the hatchlings' eyes are open and their bodies are covered with down feathers

1.2.3 The part of the brain that receives impulses from the maculae

1.2.4 The dark pigmented layer of the eye

1.2.5 The structure that connects the left and right hemispheres of the brain

1.2.6 The part of the brain that controls body temperature

1.2.7 The gas in the blood which, when increased, causes an increase in the breathing rate

1.2.8 Plant growth responses to external stimuli

1.2.9 A substance containing plant hormones used to kill unwanted plants

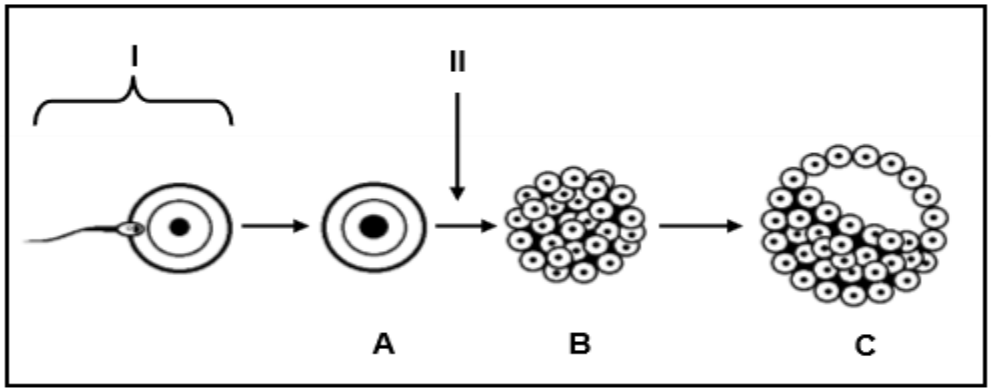
1.2.10 The illegal hunting and killing of animals **(10)**

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 Doubling of DNA	A: Prophase I B: Prophase II
1.3.2 Condition affecting the cornea of the eye	A: Astigmatism B: Cataract
1.3.3 Nutrition provided by the egg	A: Ovipary B: Ovovivipary

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

1.4 The diagram below represents a sequence of events that may take place inside the human female reproductive system.



1.4.1 Identify the process taking place at **I** in the diagram above. (1)

1.4.2 State the type of cell division that takes place at **II** in the diagram above. (1)

1.4.3 Name TWO functional extra-embryonic membranes that are produced by structure **C**. (2)

1.4.4 Identify the stage of development indicated by:

(a) **A** (1)

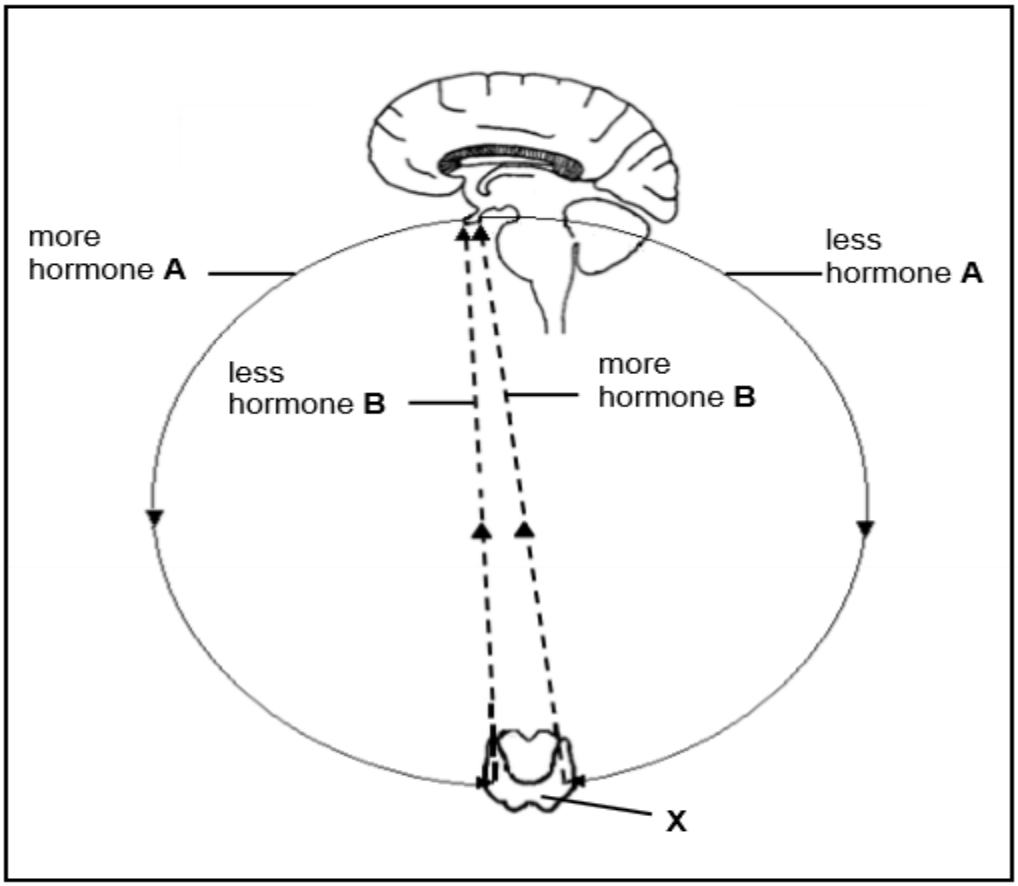
(b) **B** (1)

(c) **C** (1)

1.4.5 Name the part of the female reproductive system where the events in the diagram above usually take place. (1)

1.4.6 Give the chromosome number of the cell at **A** if this cell is going to develop into a child with Down syndrome. (1)
(9)

1.5 The diagram below shows the hormones involved in the homeostatic control of metabolism in the human body. **X** is a gland found around the larynx in the neck.



1.5.1 Identify EACH of the following:

(a) The gland that secretes hormone **A** (1)

(b) Hormone **B** (1)

1.5.2 Name the mechanism in the diagram that regulates the level of hormone **B**. (1)

1.5.3 Half of gland **X** was surgically removed in a person.

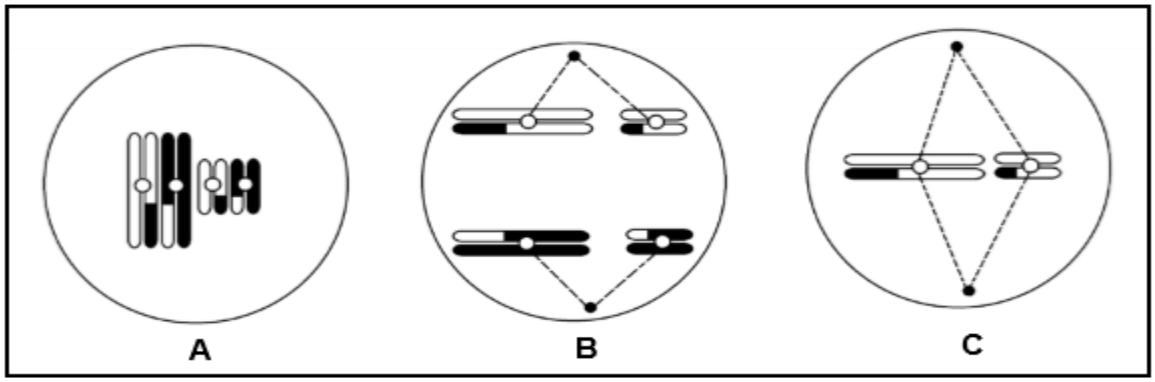
State TWO possible effects that this would have on the secretion of the hormones referred to in the diagram above. (2)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagrams below represent various phases of meiosis.



2.1.1 Identify the phase of meiosis in diagram:

(a) **A** (1)

(b) **B** (1)

2.1.2 Draw a labelled diagram to show the cells that will be formed at the end of meiosis from the cell in diagram **C**. (5)
(7)

2.2 Read the extract below about a medical condition in male babies called cryptorchidism.

> Cryptorchidism occurs in new-borns when one or both of the testes do not descend into the scrotal sac at birth, but remains inside the abdominal cavity.
>
> Cryptorchidism occurs in approximately 3–5% of full-term male infants while approximately one third of premature male babies are born with this condition.
>
> If the testes do not descend naturally by the age of one, treatment is needed. Treatment may involve administering testosterone, but the most common treatment is surgery.
>
> If cryptorchidism is not resolved, it may lead to infertility when both the testes do not descend and an increased risk of testicular cancer by the age of 30 to 40 years.

2.2.1 State ONE function of testosterone not mentioned in the extract above. (1)

2.2.2 According to the extract, state TWO ways in which cryptorchidism is treated. (2)

2.2.3 What percentage of premature male babies are born with cryptorchidism? (1)

2.2.4 From the extract, give ONE reason, other than infertility, why cryptorchidism needs to be treated if the condition is not resolved naturally. (1)

2.2.5 Explain why undescended testes may lead to infertility in young males. (2)
(7)

2.3 Some women take longer to fall pregnant compared to others. A woman with a normal, fertile male partner, who takes longer than 12 months to fall pregnant, is said to be subfertile.

An investigation was conducted to determine the effect of BMI (body mass index) and smoking on subfertility.

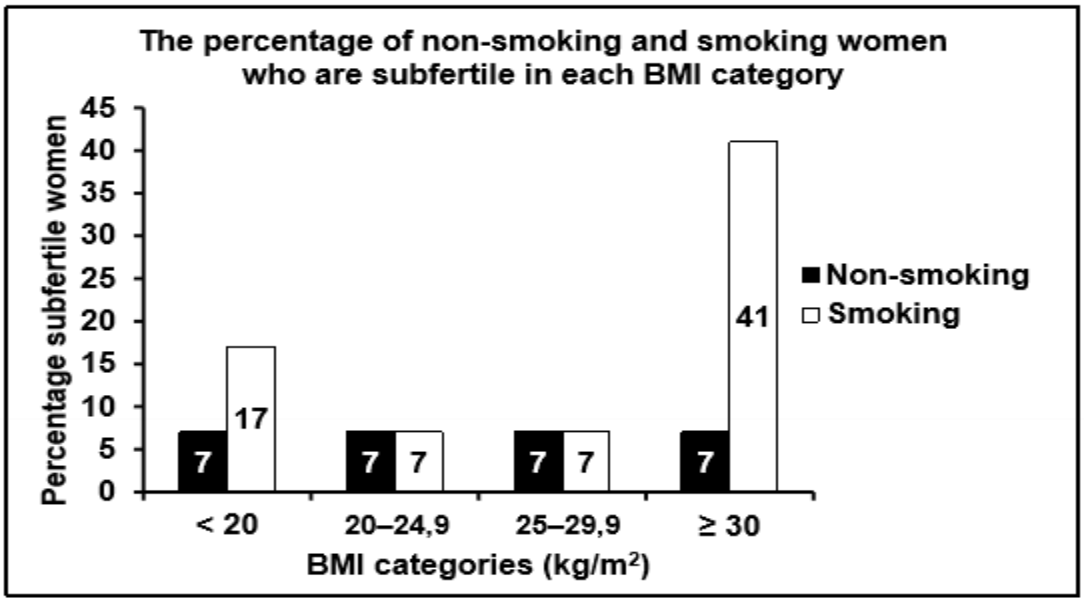
BMI is calculated as follows: $\text{BMI} = \frac{\text{Body mass (kg)}}{(\text{Height in metres})^2}$

A total of 2 587 women between the ages of 20 and 30 participated in the investigation. All of the women were at least 20 weeks pregnant, had planned to fall pregnant and conceived naturally.

The following information was obtained from each woman:

- Height and mass
- Time taken to fall pregnant (in months)
- Smoking habits

Of the total number of women who participated, 1 510 were subfertile.



2.3.1 Give ONE reason why the women were asked for their height and mass. (1)

2.3.2 Determine how many of the participants were subfertile smokers with a BMI ≥30. Show ALL calculations. (3)

2.3.3 Suggest why only women with planned pregnancies were included in the investigation. (2)

2.3.4 State ONE factor that was kept constant in this investigation. (1)

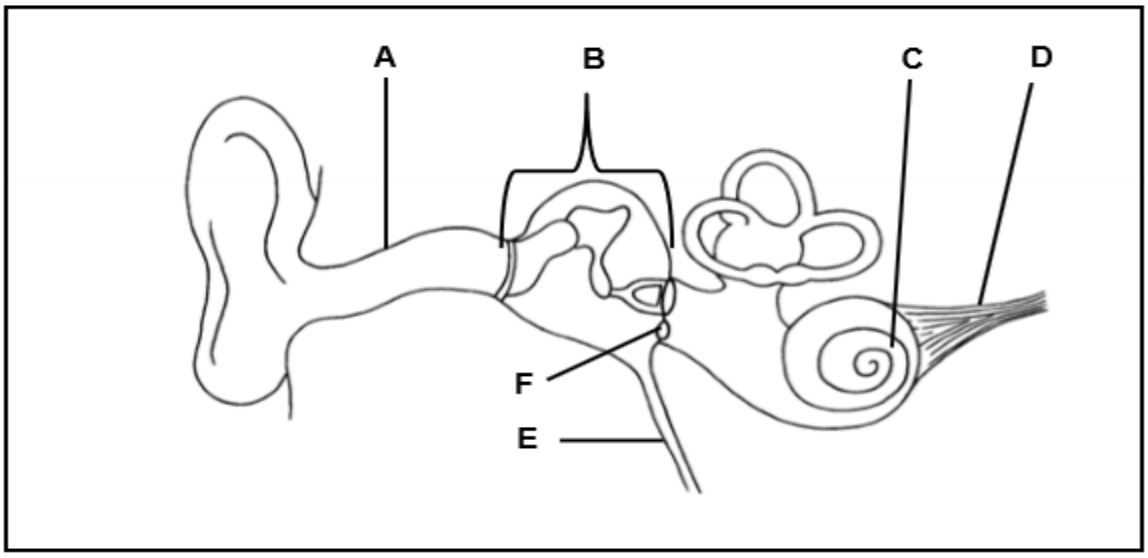
2.3.5 Based on the information in the graph on page 12, what advice should be given to women who want to increase their chances of falling pregnant? (2)

2.3.6 The investigation was carried out in another country and the results below were obtained.

BMI (kg/m^2)	% SUBFERTILE WOMEN	
	Non-smoking	Smoking
<20	7,2	18
20–24,9	7,4	7,3
25–29,9	7,4	7,3
≥30	7,4	38

Explain why the results of the original investigation can be considered to be reliable. (2)
(11)

2.4 Study the diagram below.



2.4.1 Give ONE function of part:

(a) **A** (1)

(b) **E** (1)

(c) **F** (1)

2.4.2 Write down only the LETTER of the part where sound is transmitted in the form of:

(a) A pressure wave in a liquid (1)

(b) An electrical impulse (1)

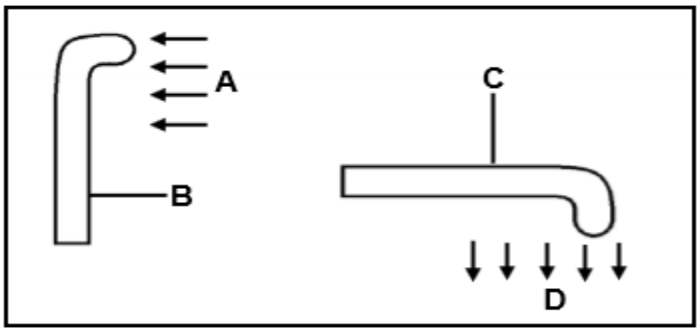
2.4.3 Explain the effect if the receptors in region **C** are damaged. (3)

2.4.4 Describe how the parts of the middle ear, including the membranes, assist with amplifying sounds. (3)

2.4.5 Describe the role of the semi-circular canals in maintaining balance. (4)
(15)
[40]

QUESTION 3

3.1 The diagrams below represent the growth responses of two different plant organs to external stimuli.



3.1.1 Name the group of plant hormones that is responsible for the growth responses observed in the diagrams. (1)

3.1.2 Name the external stimulus at:

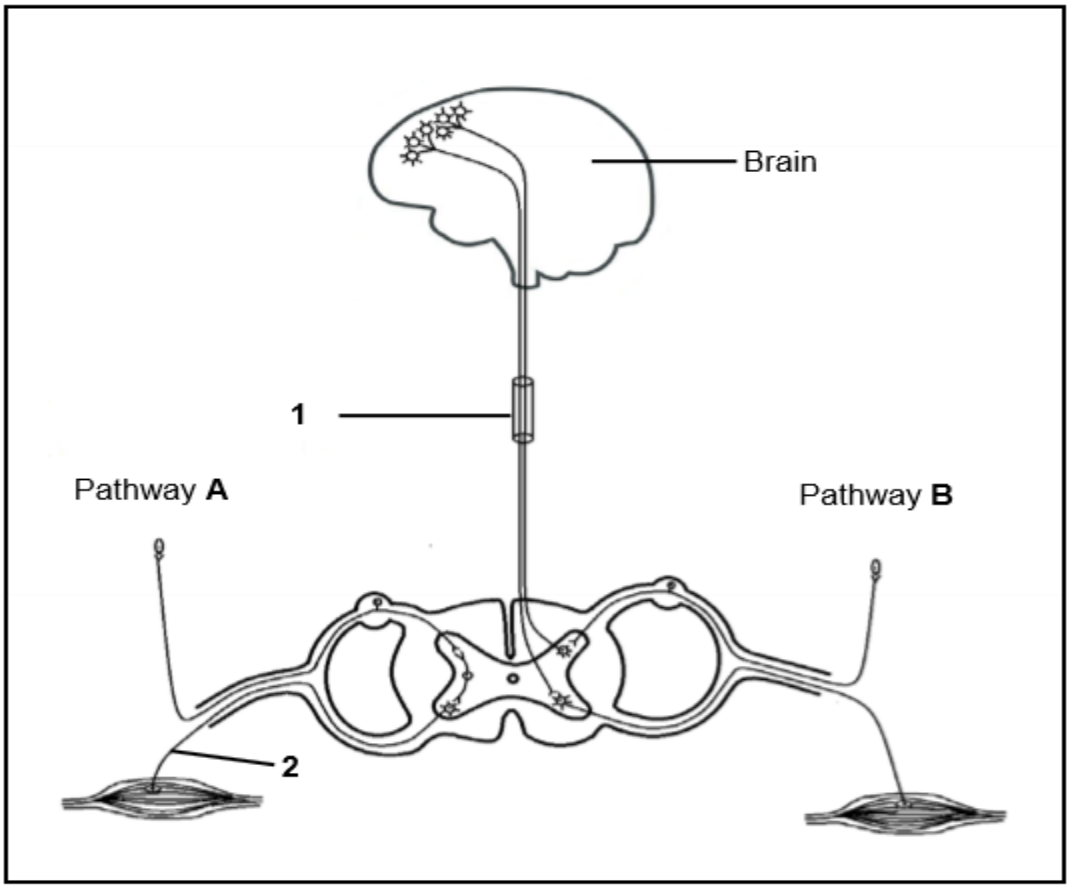
(a) **A** (1)

(b) **D** (1)

3.1.3 Give ONE observable reason why plant organ **B** is a stem. (1)

3.1.4 Explain the growth response observed in plant organ **C**. (3)
(7)

3.2 The diagram below represents two possible pathways, **A** and **B,** which a nerve impulse may follow in the human body.



3.2.1 Which pathway, **A** or **B**, represents a reflex arc? (1)

3.2.2 Give a visible reason in the diagram for your answer to QUESTION 3.2.1. (1)

3.2.3 Describe the importance of a reflex action in the human body. (3)

3.2.4 Identify the part of the nervous system represented by **1**. (1)

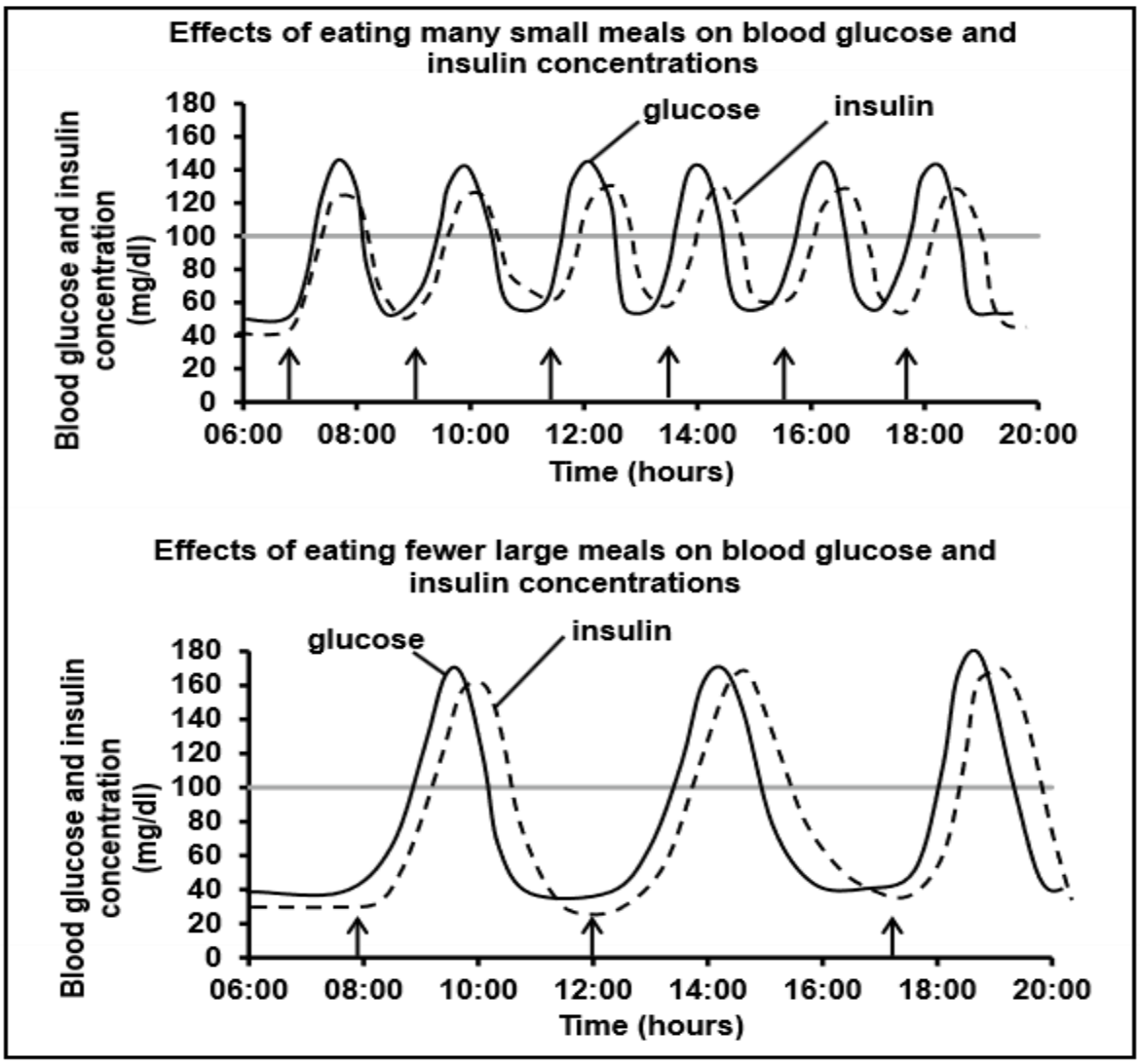
3.2.5 Explain ONE way in which the myelin sheath is important in the functioning of neurons. (2)

3.2.6 Describe how the person would be affected if the axon of neuron **2** was cut. (2)

3.2.7 Describe pathway **B**. (6)
(16)

3.3 The graphs below show the effects of eating many small meals and eating fewer large meals on blood glucose and insulin concentrations in a normal person.

The arrows on the graphs below indicate when meals were eaten. The normal blood glucose concentration is 100 mg/dl.



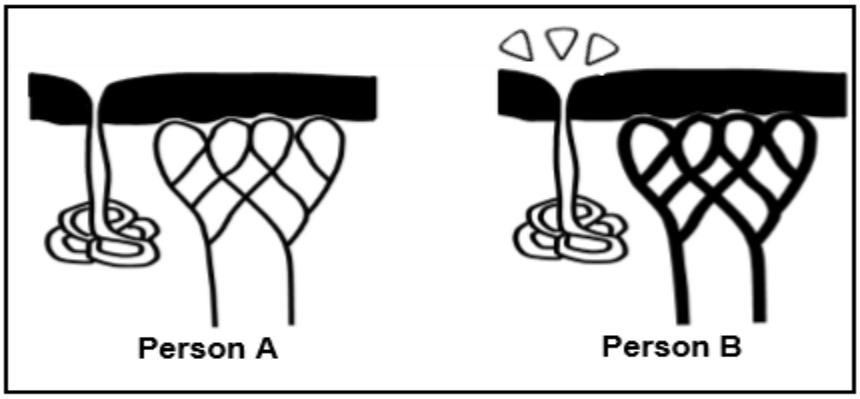
3.3.1 State what happens to the blood glucose concentration immediately after a meal is eaten. (1)

3.3.2 Use the information in the graphs.

Tabulate TWO ways in which eating fewer large meals and eating many small meals affect the blood insulin levels differently. (5)

3.3.3 Explain why eating many small meals per day is better for a diabetic person than eating fewer large meals a day. (4)
(10)

3.4 The diagrams below represent structures in the skin of two people. Both people were in the same room at the same time, but one person was exercising while the other person was sitting still. The skin surface temperature of both people was measured after 10 minutes.



3.4.1 Which person, **A** or **B**, was exercising? (1)

3.4.2 Give TWO visible reasons for you answer to QUESTION 3.4.1. (2)

3.4.3 Name ONE hormone that would have the same effect on the blood vessels that is observable in person **A**. (1)

3.4.4 After 10 minutes the surface skin temperature of each person was measured. The results were as follows:

- Person **A**: 37,2 °C
- Person **B**: 36,6 °C

Explain why the skin temperature of person **A** was higher after 10 minutes. (3)
(7)

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Describe how human activities have caused rapid global warming over the last century, the impact of global warming on weather patterns and how the change in weather patterns affects food security.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of a table, flow charts or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2018

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 9 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	B✓✓		
	1.1.3	D✓✓		
	1.1.4	C✓✓		
	1.1.5	C✓✓		
	1.1.6	A✓✓		
	1.1.7	B✓✓		
	1.1.8	C✓✓		
	1.1.9	A✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Amniotic✓ egg		
	1.2.2	Precocial✓ development		
	1.2.3	Cerebellum✓		
	1.2.4	Choroid✓		
	1.2.5	Corpus callosum✓		
	1.2.6	Hypothalamus✓		
	1.2.7	Carbon dioxide✓/CO_2		
	1.2.8	Tropisms✓		
	1.2.9	Weed-killer✓/herbicide		
	1.2.10	Poaching✓		**(10)**
1.3	1.3.1	None✓✓		
	1.3.2	A only✓✓		
	1.3.3	Both A and B✓✓	(3 x 2)	**(6)**
1.4	1.4.1	Fertilisation✓		(1)
	1.4.2	Mitosis✓		(1)
	1.4.3	- Chorion✓ - Amnion✓ **(Mark first TWO only)**		(2)
	1.4.4	(a) Zygote✓ (b) Morula✓ (c) Blastocyst✓/blastula		(1) (1) (1)
	1.4.5	Fallopian tube✓		(1)
	1.4.6	47✓		(1) **(9)**

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1.5	1.5.1	(a) Pituitary✓/hypophysis	(1)
		(b) Thyroxin✓	(1)
	1.5.2	Negative feedback✓ mechanism	(1)
	1.5.3	- Less hormone B✓/thyroxin will be secreted - More hormone A✓/TSH will be secreted **(Mark first TWO only)**	(2) **(5)**

TOTAL SECTION A: 50

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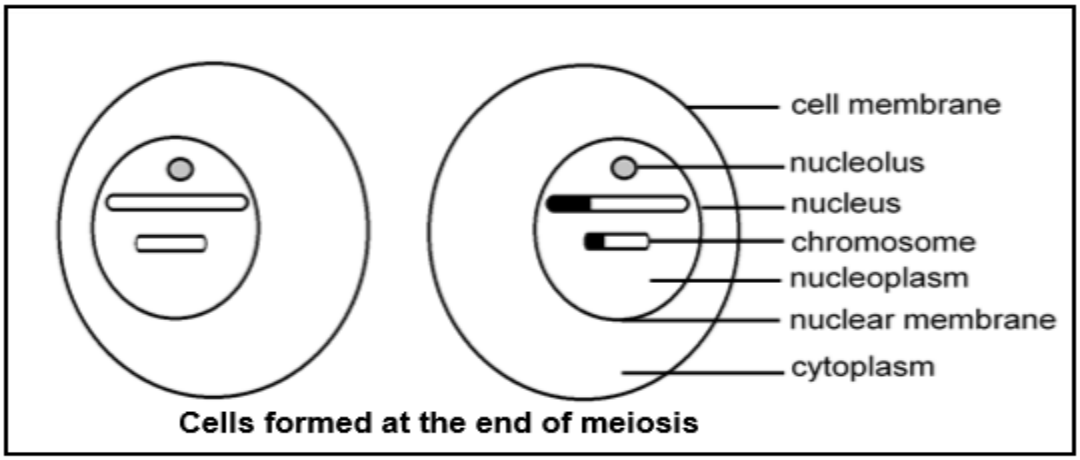
SECTION B

QUESTION 2

2.1 2.1.1 (a) Prophase I✓ (1)

(b) Anaphase I✓ (1)

2.1.2



Cells formed at the end of meiosis

Criteria for marking

Only two cells have been drawn (**D**)	1 mark
Each cell contains only two un-replicated chromosomes (**C**)	1 mark
Each chromosome is the correct size and correctly shaded (**S**)	1 mark
Any TWO correct labels	2 marks

(5)
(7)

2.2 2.2.1
- Needed for spermatogenesis✓
- Stimulates the development of secondary male characteristics✓/deeper voice/facial hair/body hair/increased muscle mass/increase in size of the sex organs/sex drive

(Mark first ONE only) Any (1)

2.2.2
- Administering testosterone✓/hormonal treatment
- Surgery✓

(2)
(Mark first TWO only)

2.2.3 33⅓✓ % (1)

2.2.4 It increases the risk of testicular cancer✓ (1)
(Mark first ONE only)

2.2.5
- The temperature of the testes will be too high✓/poor blood circulation/increased pressure on the testes
- therefore sperm will not mature✓/spermatogenesis will be negatively affected

(2)
(7)

2.3	2.3.1	To calculate BMI✓	(1)
	2.3.2	41/100✓ x 1510✓ = 619✓ (Accept 619,1)	(3)
	2.3.3	Only women with planned pregnancies will know how long it took them to fall pregnant✓✓	(2)
	2.3.4	All the women: - were the same age✓/between the ages of 20 and 30 years - were pregnant for the same amount of time✓/at least 20 weeks pregnant - had planned to fall pregnant✓ - had conceived naturally✓ **(Mark first ONE only)** Any	(1)
	2.3.5	Do not smoke if your BMI is <20 or ≥30✓✓	(2)
	2.3.6	- Similar/same results were obtained✓ - in the second/repeated investigation✓	(2) **(11)**
2.4	2.4.1	(a) Transmits sound waves to the tympanic membrane✓/Secretes ear wax **(Mark first ONE only)**	(1)
		(b) Equalises pressure on either side of the tympanic membrane✓ **(Mark first ONE only)**	(1)
		(c) Releases pressure from the inner ear✓ **(Mark first ONE only)**	(1)
	2.4.2	(a) C✓	(1)
		(b) D✓	(1)
	2.4.3	- The receptors cannot convert the stimuli into impulses✓ - No impulses/fewer impulses are transmitted to the cerebrum✓ - and the person does not hear anything✓/hearing is impaired	(3)
	2.4.4	- The sound vibrations are transmitted from the large tympanic membrane✓ - to the smaller oval window✓ - through the ossicles✓ - which are arranged from largest to smallest✓ - This concentrates the vibrations✓, amplifying them Any	(3)
	2.4.5	- A change in speed/direction of movement✓ - stimulates the cristae✓ - The stimulus is converted to an impulse✓ - The impulse is transmitted to the cerebellum✓ - via the auditory nerve✓ - The cerebellum sends impulses to the muscles✓ to restore balance Any	(4) **(15)** **[40]**

QUESTION 3

3.1	3.1.1	Auxins✓	(1)
	3.1.2	(a) Light✓	(1)
		(b) Gravity✓	(1)
	3.1.3	Plant structure **B** has bent towards the light✓/towards **A**/positively phototropic	(1)
	3.1.4	- Auxins accumulated on the lower side✓ of the root - The high concentration of auxins on the lower side of the root inhibits growth✓ - The lower concentration of auxins on the upper side stimulates growth✓ - causing uneven growth✓/the root to bend downwards/positive geotropism Any	(3) **(7)**
3.2	3.2.1	A✓	(1)
	3.2.2	The impulse does not travel to the brain✓/goes directly from receptor to effector via the spinal cord	(1)
	3.2.3	- Allows the person to respond rapidly✓ - and without thinking✓/involuntarily - to a stimulus✓ - to prevent damage to the body✓* 1* compulsory + any other 2	(3)
	3.2.4	Nerve✓/spinal cord	(1)
	3.2.5	- It acts as an insulator✓ - and therefore, speeds up the nerve impulse✓/prevents a short circuit	(2)
	3.2.6	- The person would be able to feel the stimulus✓ - but would be unable to react✓ - because the impulse would not be transmitted to the effector✓ Any	(2)
	3.2.7	- The receptor receives the stimulus✓ - and converts it into an impulse✓ - which is transported by a sensory neuron✓ via the spinal cord - to the brain✓*/cerebrum - The brain/cerebrum interprets the impulse✓* - The brain/cerebrum sends an impulse to a motor neuron✓ - which conducts the impulse to the effector✓ - to bring about a response✓ 2* compulsory + any other 4	(6) **(16)**

3.3 3.3.1 The level increases✓ (1)

T✓

3.3.2

Fewer larger meals	More smaller meals
1. Maximum blood insulin concentration is higher✓/between 160-180 mg/dl	1. Maximum blood insulin concentration is lower✓/between 120-140 mg/dl
2. Minimum blood insulin concentration is lower✓/between 20-30 mg/dl	2. Minimum blood insulin concentration is higher✓/40 mg/dl
3. Blood insulin concentration rises and falls three times a day✓/less often	3. Blood insulin concentration rises and falls six times a day✓/more often
4. Large changes in insulin concentration✓/between 140-160 mg/dl	4. Small changes in insulin concentration✓/between 80-100 mg/dl
5. Insulin concentration drops below minimum glucose concentration✓	5. Insulin concentration varies above and below minimum glucose concentration✓

(Mark first TWO only) 1 for table + Any 2 x 2 (5)

3.3.3
- A diabetic may not produce sufficient insulin✓
- When eating many smaller meals, less glucose✓ enters the blood
- less insulin✓ is needed
- to return blood glucose to normal✓

OR

- A diabetic may not produce sufficient insulin✓
- When eating fewer larger meals, more glucose✓ enters the blood
- more insulin✓ is needed
- to return blood glucose to normal✓ (4)

(10)

3.4 3.4.1 B✓ (1)

3.4.2
- The person is sweating✓
- Vasodilation has occurred✓ (2)

(Mark first TWO only)

3.4.3 Adrenalin✓ (1)

3.4.4
- Blood vessels are constricted✓
- Less blood is sent to the skin✓/sweat glands
- Less sweat is formed✓/less evaporation occurs
- and less heat is lost✓ Any (3)

(7)
[40]

TOTAL SECTION B: 80

QUESTION 4

The causes of rapid global warming (H)

- The concentration of greenhouse gases in the atmosphere has increased✓
- The burning of fossil fuels✓/use of vehicles/fires
- and industrial processes✓
- have released large amounts of CO_2✓/N_2O/CFC's into the atmosphere

- Deforestation✓
- results in less CO_2 being removed from the atmosphere✓

- Due to the decomposition of organic waste in landfills✓/rice paddies
- and the increased number of livestock✓
- the concentration of methane/CH_4 in the atmosphere has increased✓

- This has caused the enhanced greenhouse effect✓
- More heat is trapped in the atmosphere✓ Any (8)

Impact of global warming on weather patterns (W)

- Higher temperatures✓occur

- Heat waves occur✓
- The distribution of rainfall changes✓
- leading to increased rainfall in some areas✓
- while other areas will have decreased rainfall✓/experience droughts
- Storms are more severe✓/frequent Any (3)

How changes in weather patterns affects food security (F)

- Food security decreases✓*

Changes in rainfall patterns cause:
- Desertification✓
- increased flooding✓
- and wildfires✓
- which increases soil erosion✓ resulting in:
    - fewer crops to be planted✓
    - lower crop yields✓
    - less food for livestock✓

- Higher environmental temperatures negatively affects livestock✓/crops

- These factors further decrease food availability✓
- Food becomes more expensive✓ 1*compulsory + Any other 5 (6)

Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to: - The causes of rapid global warming - The impact of global warming on weather patterns - How changing weather patterns affect food security There is no irrelevant information	All the information regarding the: - The causes of rapid global warming - The impact of global warming on weather patterns - How changing weather patterns affect food security is arranged in a logical manner.	At least the following points should be included: - The causes of rapid global warming **(H)** (5/8) - The impact of global warming on weather patterns **(W)** (2/3) - How changing weather patterns affect food security **(F)** (4/6)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2019

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

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

1.1.1 Which ONE of the following hormones controls metabolic rate?

A Testosterone
B Thyroxin
C Growth hormone
D Insulin

1.1.2 Which ONE of the following will occur in the human body on a cold day?

A Vasodilation in the skin
B Increase in the activity of sweat glands
C Decrease in evaporation of sweat from the surface of the skin
D Increase in blood flow to the surface of the skin

1.1.3 The list below includes some of the factors that affect food security:

(i) Use of pesticides
(ii) Soil erosion
(iii) Genetic modification
(iv) Use of fertilisers

Which ONE of the following combinations includes factors that increase food security?

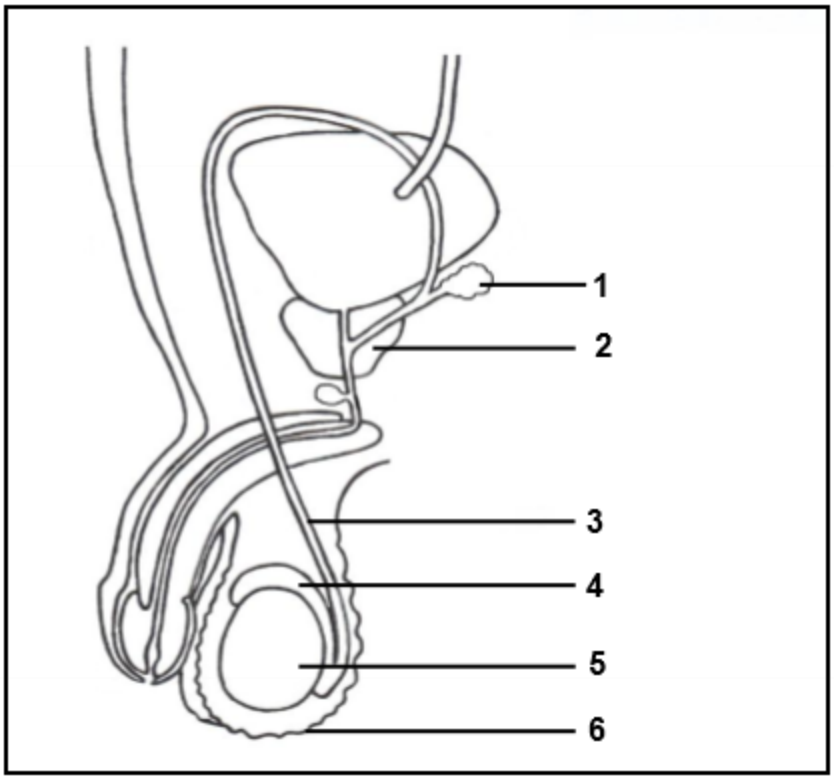
A (ii), (iii) and (iv) only
B (i) and (iv) only
C (i), (iii) and (iv) only
D (i), (ii), (iii) and (iv)

1.1.4 Which part of the neuron transmits impulses towards the cell body?

A Dendrite
B Myelin sheath
C Axon
D Synapse

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QUESTIONS 1.1.5 AND 1.1.6 ARE BASED ON THE DIAGRAM OF THE HUMAN MALE REPRODUCTIVE SYSTEM BELOW.



1.1.5 Which part stores sperm until maturation?

A 3
B 4
C 5
D 6

1.1.6 A man who had cancer underwent surgery to remove part **1** and part **2**.

The man …

A will be able to release semen not containing sperm and therefore cannot reproduce.
B cannot reproduce because he will produce abnormal sperm.
C cannot reproduce as his sperm will not be able to survive the acidic conditions of the vagina.
D will be able to reproduce but his sperm will not be able to move fast as they will not have energy.

1.1.7 Which ONE of the following shows the results when a cell with 20 chromosomes undergoes mitosis?

	NUMBER OF DAUGHTER CELLS	NUMBER OF CHROMOSOMES
A	2	20
B	2	10
C	4	20
D	4	10

1.1.8 Which ONE of the following is a function of amniotic fluid?

A Transports oxygen to the developing foetus
B Protects the foetus from temperature changes
C Produces progesterone and oestrogen
D Protects the foetus from disease

1.1.9 Which part of the ear contains the receptors for hearing?

A Cochlea
B Tympanic membrane
C Oval window
D Round window

1.1.10 Which ONE of the following is a consequence if the round window of the ear hardens?

A Pressure waves will not be created.
B Impulses will not be transmitted to the brain.
C Pressure between the outer and the middle ear will not be equalised.
D An echo will occur and the sound will be distorted. (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 finger-like projections that develop from the outer extra-embryonic membrane

1.2.2 Division of the cytoplasm during cell division

1.2.3 A plant species that does not belong to an area and which outcompetes the indigenous species of that area

1.2.4 A structure in the female reproductive system where semen is deposited during copulation

1.2.5 The permanent, large-scale removal of trees and vegetation from an area

1.2.6 A hormone that stimulates the mammary glands to produce milk

1.2.7 The period of development of the foetus in the uterus

1.2.8 A structure in the female reproductive system where fertilisation takes place

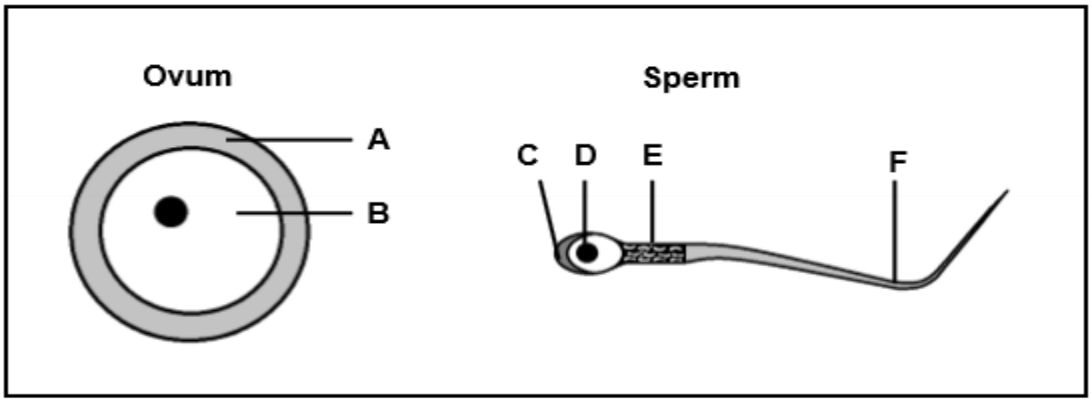
1.2.9 The stage when secondary sexual characteristics develop in males and females (9 x 1) **(9)**

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	The blood vessel that transports oxygenated blood from the placenta to the foetus	A: Umbilical vein B: Umbilical artery
1.3.2	A disorder caused by the degeneration of the myelin sheath of motor neurons	A: Multiple sclerosis B: Alzheimer's disease
1.3.3	A measure of the total amount of carbon dioxide released by an individual per year	A: Greenhouse effect B: Carbon footprint

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

1.4 The diagrams below represent the structures of an ovum and a sperm.



1.4.1 Identify part:

(a) **A** (1)

(b) **B** (1)

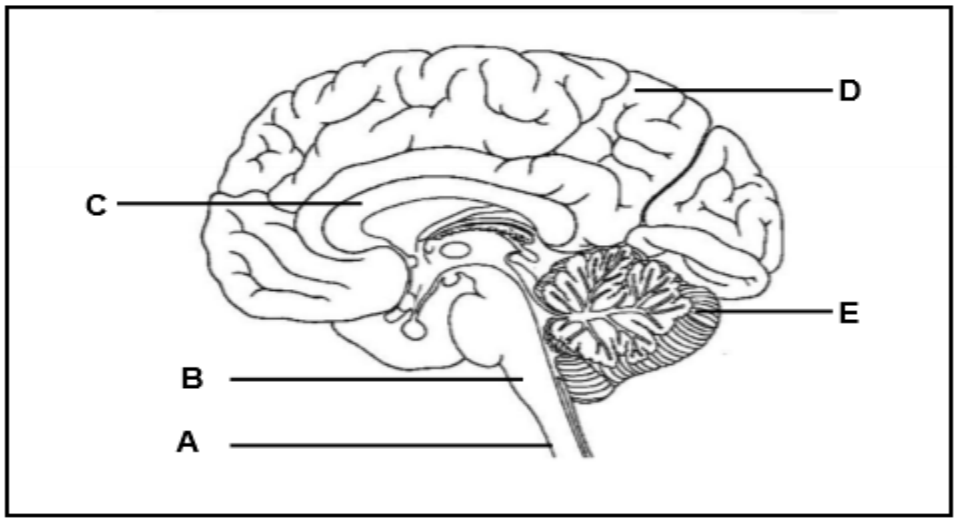
(c) **C** (1)

1.4.2 Name the process involving meiosis that leads to the formation of an ovum. (1)

1.4.3 Write down only the LETTER of the part of the sperm that enters the ovum. (1)

1.4.4 Write down only the LETTERS of TWO parts that enable the sperm to move towards the ovum. (2)
(7)

1.5 The diagram below shows some parts of the human central nervous system.



1.5.1 Identify part:

(a) **A** (1)

(b) **C** (1)

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

(a) Has the centre for interpreting taste (2)

(b) Regulates the heart rate (2)

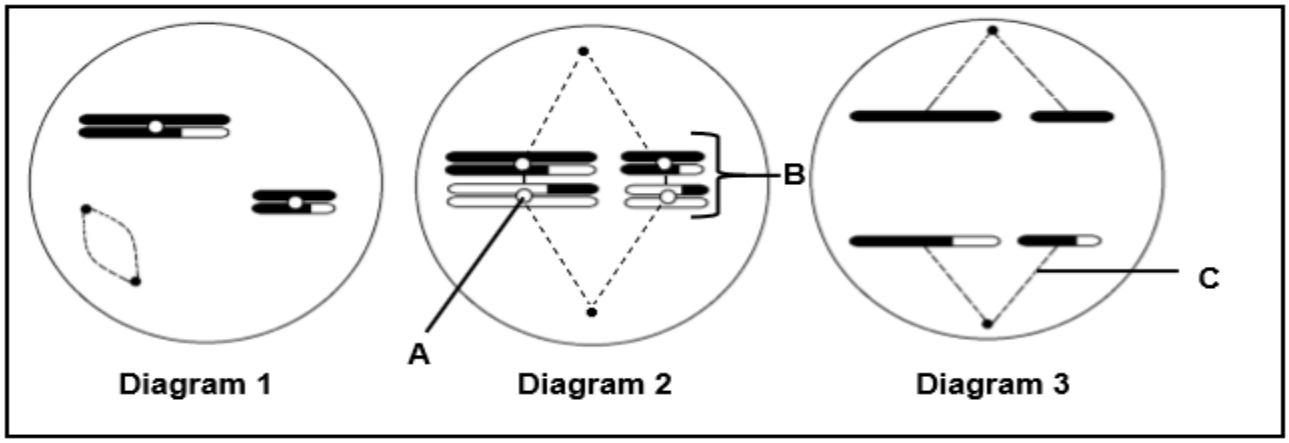
(c) Is responsible for motor coordination (2)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagrams below represent different phases of meiosis in an organism.



2.1.1 Identify:

(a) **A** (1)

(b) **B** (1)

(c) **C** (1)

2.1.2 Identify the phase represented in DIAGRAM **3**. (1)

2.1.3 Write down the numbers of the diagrams to show the sequence in which the phases occur. (2)

2.1.4 State ONE difference between metaphase **I** and metaphase **II**. (2)
(8)

2.2 The table below shows a comparison of the composition of the amniotic egg in three different bird species.

COMPOSITION	BIRD SPECIES		
	1	2	3
Yolk (%)	17	36	22
Water content in yolk (%)	77	57	61
Energy (kcal/g)	1,04	1,44	1,14

2.2.1 Define *ovovivipary*. (2)

2.2.2 Which ONE of the bird species (**1**, **2** or **3**) most probably shows a precocial development reproductive strategy? (1)

2.2.3 Explain your answer to QUESTION 2.2.2. (2)

2.2.4 Which ONE of the bird species (**1**, **2** or **3**) will possibly produce offspring requiring the highest degree of parental care? (1)
(6)

2.3 The table below indicates the percentage of visually impaired people in the world suffering from different visual defects.

VISUAL DEFECT	PEOPLE (%)
Blindness	2
Long-sightedness	64
Short-sightedness	30
Other	4

2.3.1 Which visual defect in the table is the most common among the world population? (1)

2.3.2 In some cases where people are blind, the condition is caused by cataracts.

(a) Explain why people with cataracts may become blind. (2)

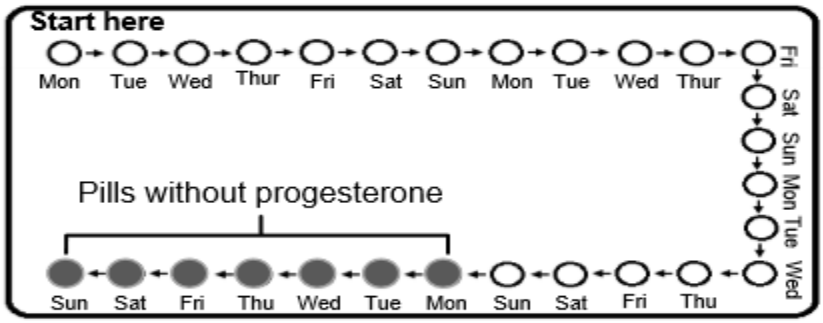
(b) State ONE way in which cataracts can be treated. (1)

2.3.3 Explain why long-sighted people need to wear glasses with biconvex lenses as a corrective measure. (4)

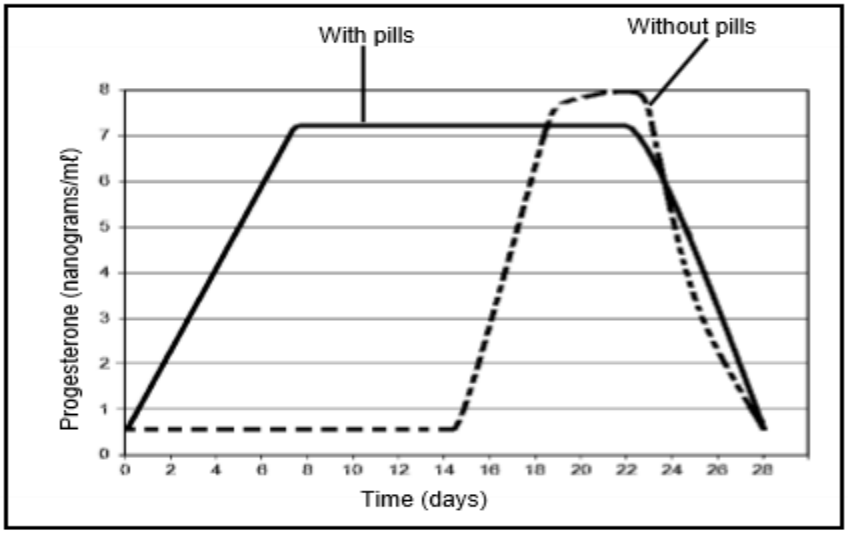
2.3.4 Name a visual defect that is characterised by an uneven cornea or lens. (1)

2.3.5 Draw a pie chart to represent the data in the table. (6)
(15)

2.4 Contraceptives are used to prevent pregnancy. Some females use pills that contain progesterone. In one packet there would be 28 pills, of which 21 contain different concentrations of progesterone according to the day in the cycle and the remaining 7 will contain no progesterone. A female has to take one pill daily at the same time in a given sequence, as shown below.



The graph below shows the difference in the progesterone levels during a menstrual cycle of a woman taking contraceptive pills and a woman not taking contraceptive pills.



2.4.1 The oestrogen levels between days **8** and **22** will remain low in the woman who takes contraceptive pills. Explain why this is the case. (4)

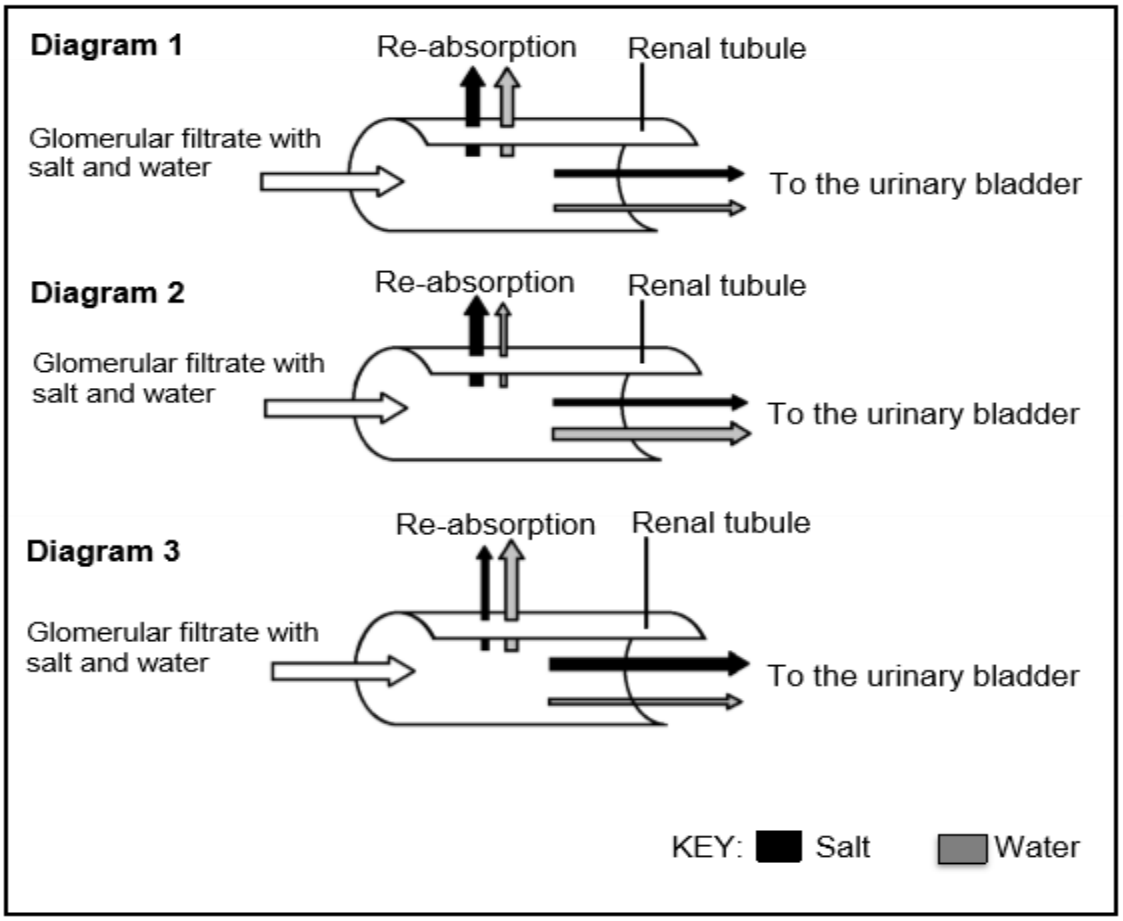
2.4.2 Ovulation took place on day **14** in the woman not taking contraceptive pills. Explain the evidence in the graph that supports this conclusion. (2)

2.4.3 Suggest ONE reason for including pills with no hormones in the contraceptive pill packet. (1)
(7)

2.5 Describe the development of a zygote until implantation occurs. **(4)**
[40]

QUESTION 3

3.1 The diagrams below show the re-absorption of salt and water through the tubules of a nephron in the kidney under three different conditions. The width of the arrows represents the amounts of salt and water.



3.1.1 Name the hormone in a human body that is responsible for controlling the:

(a) Water content (1)

(b) Salt content (1)

3.1.2 Name the gland that secretes the hormone in QUESTION 3.1.1(b). (1)

3.1.3 Which diagram (**1**, **2** or **3**) would represent a person who had eaten salty chips on a hot day without any intake of water? (1)

3.1.4 Explain your answer to QUESTION 3.1.3. (5)
(9)

3.2 Read the extract below.

People with Type I diabetes mellitus are usually insulin-dependent (must inject themselves with insulin to control their blood glucose levels). It has been determined that these people also lose their ability to secrete glucagon within five years of being diagnosed and they become glucagon deficient.

During a stressful situation adrenalin is secreted, which has the same effect as glucagon on the blood glucose levels.

An investigation was conducted to determine the influence of adrenalin on the blood glucose levels of Type I diabetics who were also glucagon deficient.

The investigation was conducted as follows:

- 100 male patients with Type I diabetes mellitus, who were also glucagon deficient, participated in the investigation.
- They were then given the same amount of food and water at the same time for a period of three days.
- Their blood glucose levels were measured on the morning of the third day.
- A solution with a low concentration of adrenalin was then administered intravenously (injected).
- After 20 minutes, the blood glucose concentration in each person was measured again.
- The blood glucose levels before and after administering adrenalin were compared.

3.2.1 Name the gland that secretes glucagon. (1)

3.2.2 Identify the independent variable in the investigation. (1)

3.2.3 State THREE other factors that should have been kept constant during the investigation. (3)

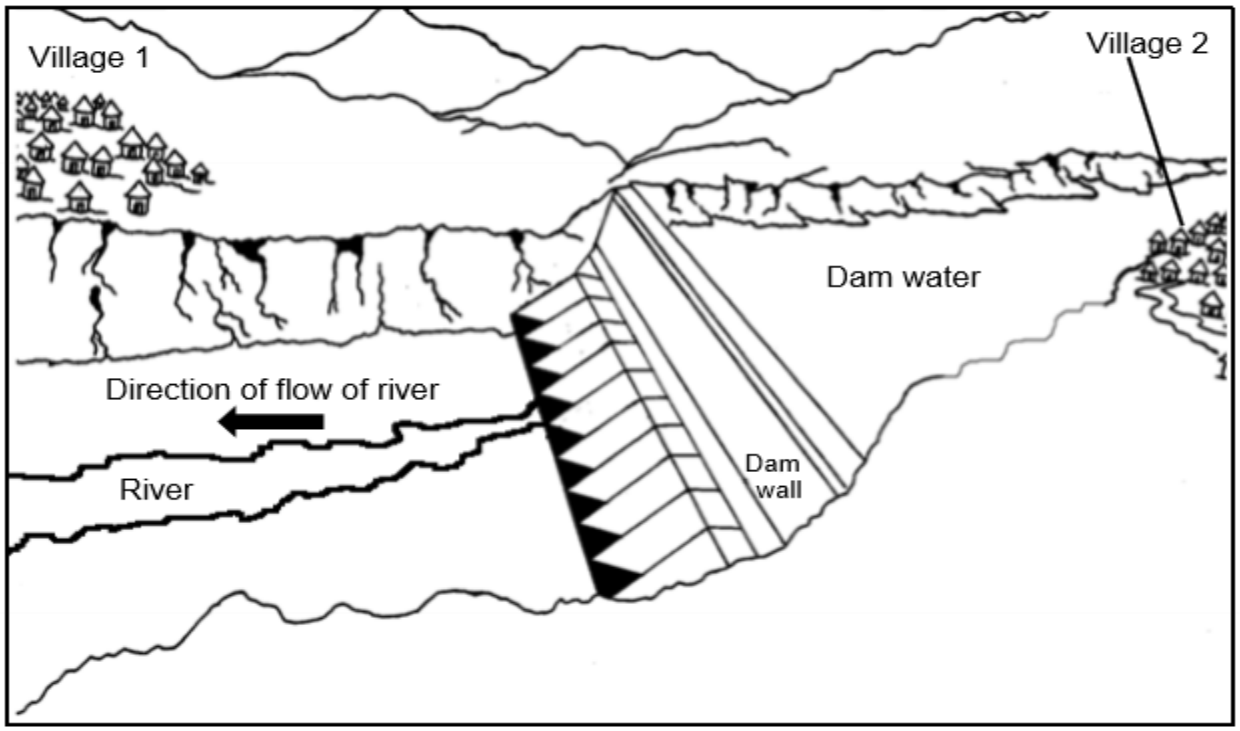
3.2.4 Explain why the blood glucose levels were measured before injecting adrenalin on the third day. (2)

3.2.5 Explain why the adrenalin was injected instead of given orally. (2)

3.2.6 Explain what would be the expected results after adrenalin was injected into the patients. (2)

3.2.7 Give a reason for the use of 100 patients in the investigation instead of only 10 patients. (1)
(12)

3.3 The diagram below shows a dam that was built in a flowing river.



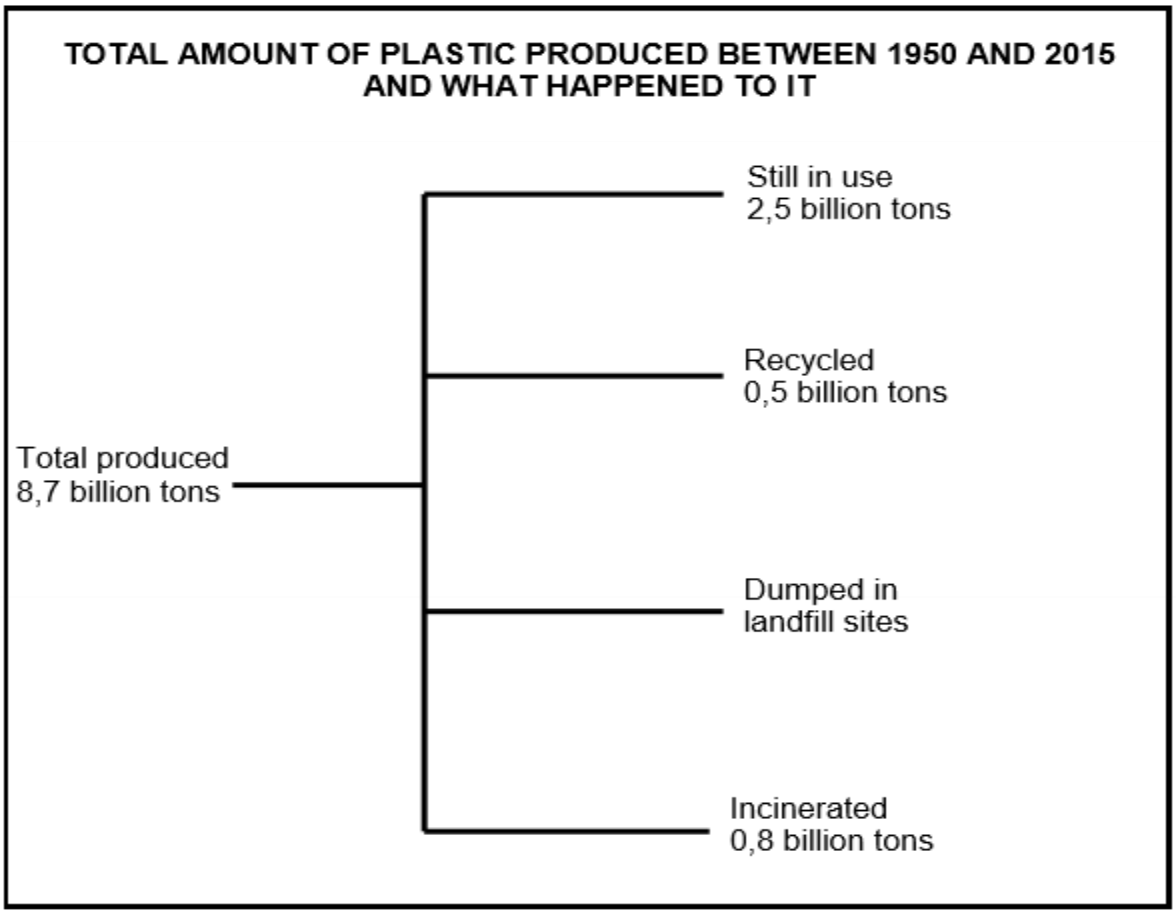
3.3.1 Explain how the presence of a dam can affect the biodiversity in the river. (2)

3.3.2 Village **2** is a farming village that uses fertilisers to increase their crop yield.

Describe the impact of fertilisers on the quality of water when they are washed into the dam during heavy rains. (5)

3.3.3 Explain ONE economic benefit of the constructed dam to the people living in Village **2**. (2)
(9)

3.4 The diagram below shows the total amount of plastic produced between 1950 and 2015 and what happened to it.



3.4.1 Calculate how much plastic (in billions of tons) produced between 1950 and 2015 ended up in landfill sites. Show ALL calculations. (2)

3.4.2 Describe the impact of incinerating (burning) plastic on global warming. (4)

3.4.3 Explain TWO strategies that municipalities could implement to increase the amount of plastic that is recycled by a community. (4)
(10)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Both plants and humans respond to gravity.

Explain why the root and the stem grow in different directions when a pot plant is placed horizontally on the ground, receiving light equally from all directions.

Also describe the role of the maculae in maintaining balance when a person tilts his/her head to one side without falling over.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2019

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 11 pages +
the master for the transparency to mark Question 2.3.5

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SECTION A

QUESTION 1

1.1	1.1.1	B✓✓		
	1.1.2	C✓✓		
	1.1.3	C✓✓		
	1.1.4	A✓✓		
	1.1.5	B✓✓		
	1.1.6	C✓✓		
	1.1.7	A✓✓		
	1.1.8	B✓✓		
	1.1.9	A✓✓		
	1.1.10	D✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Chorionic villi✓		
	1.2.2	Cytokinesis✓		
	1.2.3	Invasive alien✓/Invasive exotic		
	1.2.4	Vagina✓		
	1.2.5	Deforestation✓		
	1.2.6	Prolactin✓		
	1.2.7	Gestation✓		
	1.2.8	Fallopian tubes✓/Oviducts		
	1.2.9	Puberty✓		**(9)**
1.3	1.3.1	A only✓✓		
	1.3.2	A only✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Jelly layer✓/Zona pellucida		(1)
		(b) Cytoplasm✓/cytosol		(1)
		(c) Acrosome✓		(1)
	1.4.2	Oogenesis✓		(1)
	1.4.3	D✓		(1)
	1.4.4	E✓ F✓		(2)
		(Mark first TWO only)		**(7)**
1.5	1.5.1	(a) Spinal cord✓		(1)
		(b) Corpus callosum✓		(1)
	1.5.2	(a) D✓ Cerebrum✓		(2)
		(b) B✓ Medulla oblongata✓		(2)
		(c) E✓ Cerebellum✓		(2)
				(8)
			TOTAL SECTION A:	**50**

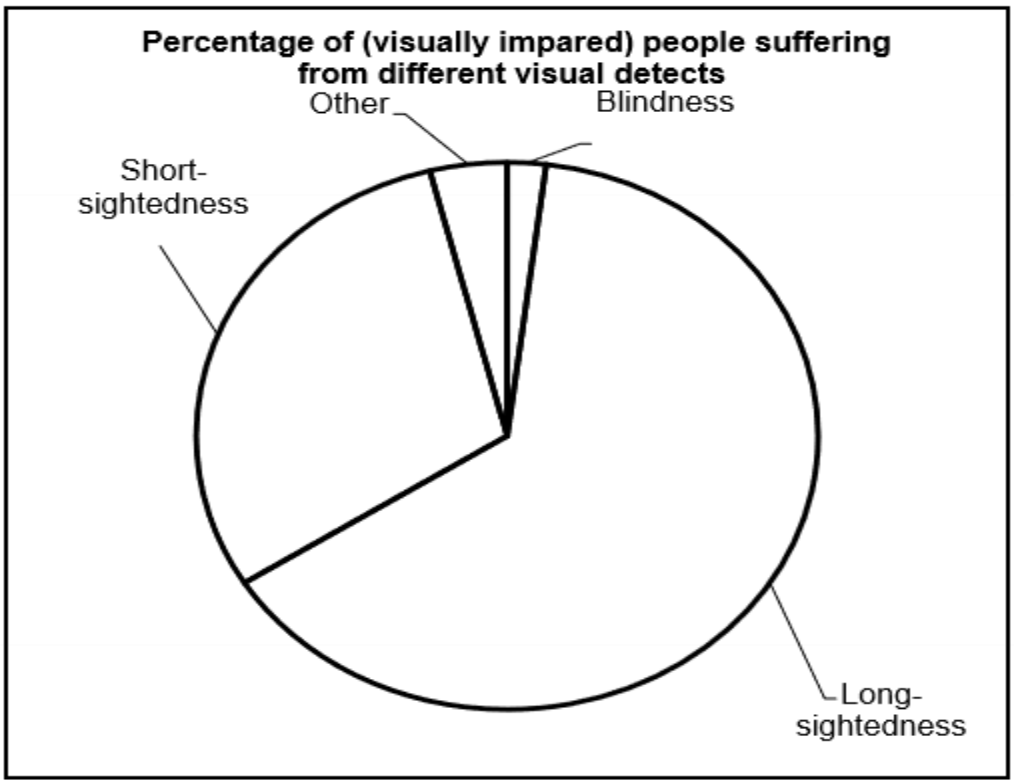
SECTION B

QUESTION 2

2.1	2.1.1	(a) Centromere✓	(1)
		(b) Homologous chromosomes✓	(1)
		(c) Spindle fibre✓/spindle threads	(1)
	2.1.2	Anaphase II✓	(1)
	2.1.3	2, 1, 3✓✓	(2)
	2.1.4	In metaphase I, the chromosomes arrange at the equator in homologous pairs✓ whereas in metaphase II, the chromosomes arrange at the equator singly✓ **(Mark first ONE only)**	(2) **(8)**
2.2	2.2.1	Eggs are retained/hatch in the female body and the young are born live✓✓	(2)
	2.2.2	2✓ **(Mark first ONE only)**	(1)
	2.2.3	- The egg has the highest yolk✓/energy content - that will allow maximum development before hatching✓	(2)
	2.2.4	1✓ **(Mark first ONE only)**	(1) **(6)**
2.3	2.3.1	Long-sightedness✓	(1)
	2.3.2	(a) - The lens becomes opaque✓/milky/cloudy - and therefore does not allow the light to pass through✓	(2)
		(b) Surgery✓ **(Mark first ONE only)**	(1)
	2.3.3	- The lens is less convex✓/the eye ball is too short/cornea is flat - This causes the light rays to fall behind the retina✓ - A biconvex lens increases the refractive power✓ - Therefore light rays are focussed on the retina✓ to form a clear image	(4)
	2.3.4	Astigmatism✓	(1)

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2.3.5



Calculations:

Blindness: 2/100 x 360° = 7,2°
Short-sightedness: 30/100 x 360° = 108°
Long-sightedness: 64/100 x 360° = 230,4°
Other: 4/100 x 360° = 14,4°

Criteria for assessing the graph:

Pie chart drawn (**T**)	1
Title of the graph shows the relationship between the two variables (**H**)	1
Correct calculations to determine the proportions (**C**)	2: All 4 correct 1: 1-3 correct
Correct proportions for the labelled sectors (**P**) (To be checked using prepared transparency – see *Annexure A – Page 12*)	2: All 4 sectors correct 1: 1-2 sectors correct

(6)
(15)

2.4	2.4.1	- The high levels of progesterone✓in the pills - will inhibit the secretion of FSH✓from the pituitary gland - No follicle will develop✓ - and hence no oestrogen will be secreted✓		(4)
	2.4.2	- The increase in the progesterone level✓ - indicates that corpus luteum has been formed✓		(2)
	2.4.3	- Women will stay in the habit of taking a pill every day✓/will not forget to take the progesterone containing pills - To allow menstruation to occur✓ **(Mark first ONE only)**	Any	(1) **(7)**
2.5		- Zygote divides by mitosis✓ - to form a ball of cells✓ - called the morula✓ - which further divides to form a hollow ball of cells✓ - called the blastula✓/blastocyst	Any	**(4)** **[40]**

QUESTION 3

3.1	3.1.1	(a) ADH✓/antidiuretic hormone/vasopressin	(1)
		(b) Aldosterone✓	(1)
	3.1.2	Adrenal✓gland	(1)
	3.1.3	3✓	(1)
	3.1.4	- The blood will have a high salt content✓ - and therefore less/no aldosterone will be secreted✓ - resulting in less salt reabsorbed into the blood✓/more salt excreted in the urine - The blood will have less water than normal✓ - and therefore more ADH will be secreted✓ - making the kidney tubules more permeable✓ - resulting in more water reabsorbed into the blood✓/less water will leave the body with the urine Any	(5) **(9)**
3.2	3.2.1	Islets of Langerhans✓/pancreas	(1)
	3.2.2	Adrenalin✓	(1)
	3.2.3	Same: - Type of food given✓ - Concentration of adrenalin✓ - Amount of adrenalin✓ - Measuring tools used✓ - Person measuring the glucose concentrations✓ - Levels of activity✓ - Age of patients✓ - Body mass of patients✓ - Health condition of patients✓ **(Mark first THREE only)** Any	(3)
	3.2.4	- Provides a baseline✓/starting level/point of reference/control - to compare with the effect of injecting adrenalin✓	(2)
	3.2.5	- Hormones are proteins✓ - and will therefore be digested✓/denatured making it ineffective **OR** - Since it enters the blood directly✓ - it will reach the target organs faster✓	(2)

3.2.6
- The blood glucose levels will increase✓
- because an increase in adrenalin stimulates the conversion of glycogen to glucose✓ (2)

3.2.7 Increases reliability✓ of the results (1)
(12)

3.3 3.3.1
- Biodiversity will decrease✓*
- The flow of the river decreases✓/size of habitat decreases
- This may affect migration patterns✓/spawning of fish
- Opening of floodgates increases pressure of water flow✓

1 compulsory* + any 1 other (2)

3.3.2
- The water quality will decrease✓*
- as the fertilisers increase the amount of nutrients✓/cause eutrophication
- which will result in algal bloom✓
- This will block-out the sunlight✓
- The under-water plants cannot photosynthesise✓/die
- Animals that feed on plants also die✓
- This leads to an increase in decomposers✓ feeding off the dead organisms
- The decomposers deplete the oxygen in the water✓

1 compulsory* + any 4 others (5)

3.3.3
- Constant availability of water✓ to increase crop yield✓
- More food will be available✓ and hence less money spent on buying agricultural products✓
- More people are employed in the management of agriculture✓/dam/tourism therefore more income stability for the people in the community✓

(Mark first ONE only) Any 1 x 2 (2)
(9)

3.4 3.4.1 8,7 – 3,8✓ **OR** 8,7 - (2,5 + 0,5 + 0,8)

= 4,9 ✓ billion tons (2)

3.4.2
- There would be an increase in global warming✓*
- The burning of plastic releases carbon dioxide✓into the atmosphere
- leading to the enhanced greenhouse effect✓
- increasing the amount of heat trapped in the atmosphere✓
- causing an increase in temperature✓

1 compulsory* + any 3 others (4)

3.4.3
- Supply special bins✓/garbage bags to encourage the collection of plastic✓
- Bring recycling stations close to communities✓to increase access✓
- Increase campaigns✓/ awareness/ education on the benefits of recycling✓
- Giving incentives✓ for collecting more plastics✓

(Mark first TWO only) Any (2 x 2) (4)
(10)
[40]

SECTION C

QUESTION 4

Plant's response to gravity (P)

When a plant is placed horizontally:
- auxins✓
- are attracted by gravity✓

Root
- There is a high concentration of auxins on the lower side of the root✓
- which inhibits growth/cell elongation/cell division on the lower side✓
- There is a low concentration of auxins on the upper side of the root✓
- which stimulates growth/cell elongation/cell division on the upper side✓
- The upper side of the root grows faster✓/Uneven growth occurs
- causing the root to grow/bend downwards✓
- The root grows towards gravity✓/The root is positively geotropic

Stem
- There is a high concentration of auxins on the lower side of the stem✓
- which stimulates growth/cell elongation/cell division on the lower side✓
- There is a low concentration of auxins on the upper side of the stem✓
- which inhibits growth/cell elongation/cell division on the upper side✓
- The lower side of the stem grows faster✓/Uneven growth occurs
- causing the stem to grow/bend upwards✓
- The stem grows away from gravity✓/The stem is negatively geotropic (11)

Maintaining balance (B)

When the position of the head changes, the maculae:
- are stimulated✓
- The stimulus is converted to an impulse✓
- which is transmitted by the auditory nerve✓
- to the cerebellum✓
- where the impulse is interpreted✓
- The cerebellum sends impulses to the muscles✓
- and balance is restored✓

Any (6)

Content (17)
Synthesis (3)
(20)

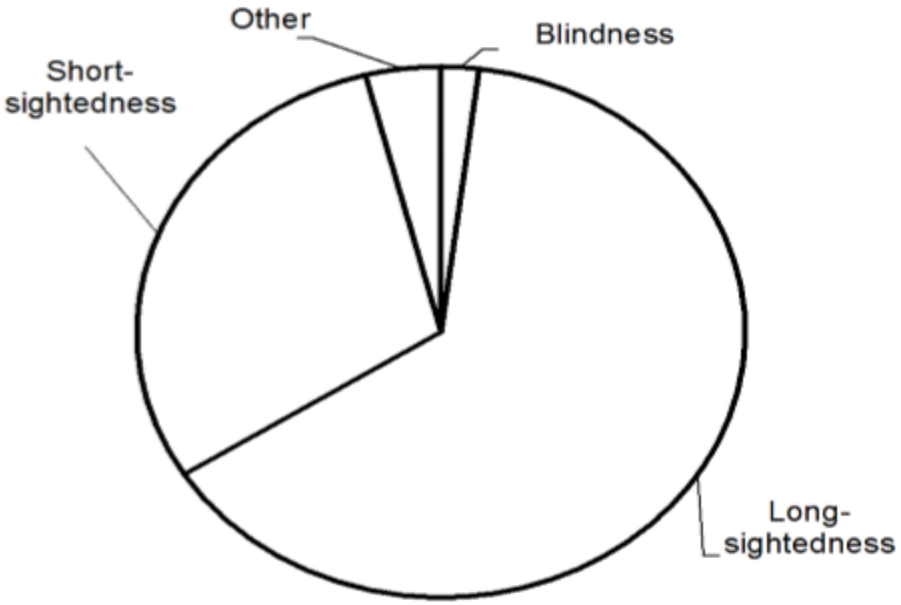
ASSESSING THE PRESENTATION OF THE ESSAY

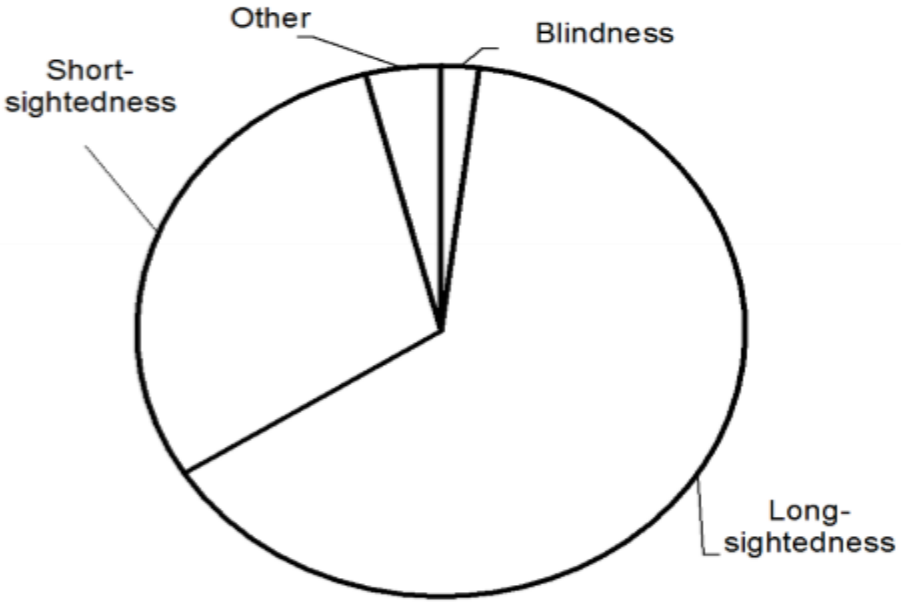
Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All information is relevant to the: - Plant response to gravity - Maintenance of balance There is no irrelevant information	The sequence of events in the: - Plant response to gravity - Maintenance of balance are in a logical sequence	The following must be included: - Plant response to gravity **(P)** (7/11) - Maintaining balance **(B)** (4/6)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Annexure A – Master for transparency to mark Question 2.3.5





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Department:
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REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/ NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2020(2)

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

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

1.1.1 Which part controls the amount of light entering the eye?

A Cornea
B Iris
C Choroid
D Lens

1.1.2 Which ONE of the following refers to an aquifer?

A An increase in the temperature of water bodies as a result of water from industries
B Planting of the same crop on the same area repeatedly
C An underground permeable rock saturated with water
D The release of water with chemicals from mines

1.1.3 The structure in the amniotic egg that removes waste products:

A Yolk sac
B Chorion
C Amnion
D Allantois

1.1.4 Which ONE of the following is CORRECT with regard to astigmatism?

A Light cannot pass through the cornea
B Light cannot pass through the lens
C Refraction of light rays by the cornea is uneven
D The lens cannot become more rounded

1.1.5 Which structures secrete progesterone during pregnancy?

A Adrenal gland and corpus luteum
B Corpus luteum and placenta
C Thyroid gland and Graafian follicle
D Pituitary gland and Graafian follicle

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1.1.6 Which ONE of the following shows the correct sequence of an impulse from the receptor in a simple reflex arc?

A Sensory neuron through the dorsal root → motor neuron through the ventral root → effector
B Motor neuron through the dorsal root → sensory neuron through the ventral root → effector
C Sensory neuron through the dorsal root → effector → motor neuron through the ventral root
D Effector → interneuron through the dorsal root → motor neuron through the ventral root

1.1.7 Which ONE of the following would be a disadvantage when a biological method is used to control alien plant invasion?

A Able to control alien plants without the use of harmful chemicals
B Some part of the alien plant may be left to regrow when mechanically removed
C The species introduced might be alien in the area and outcompete the indigenous species
D Chemicals might affect the indigenous plants in the area

1.1.8 Which ONE of the following is a consequence of the destruction of wetlands?

A Increased biodiversity
B Decreased water availability
C Decreased global warming
D Increased water quality

1.1.9 Nocturnal animals have the ability to see clearly in the dark. They have …

A bigger eyes.
B more rods in the retina.
C more cones in the retina.
D no blind spot.

1.1.10 Which ONE of the following is CORRECT regarding the homeostatic control of glucose in the human body?

	GLAND	HORMONE SECRETED	EFFECT ON BLOOD GLUCOSE LEVEL
A	Pancreas	Insulin	Increase
B	Pituitary	Glucagon	Increase
C	Pancreas	Insulin	Decrease
D	Pancreas	Glucagon	Decrease

(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 1.2.10) in the ANSWER BOOK.

1.2.1 The layer in the atmosphere that protects living organisms from the ultraviolet rays of the sun

1.2.2 The illegal hunting and killing of animals

1.2.3 A condition of the cell where there is only one set of chromosomes

1.2.4 The response of a part of a plant to a light stimulus

1.2.5 A hormone that stimulates ovulation in humans

1.2.6 The part of the brain that connects the left and right hemispheres

1.2.7 The blood vessel that transports deoxygenated blood from the foetus towards the placenta

1.2.8 A small device that is inserted in the ear to drain fluids caused by a middle-ear infection

1.2.9 The branch of the autonomic nervous system that restores an increased heart rate back to normal

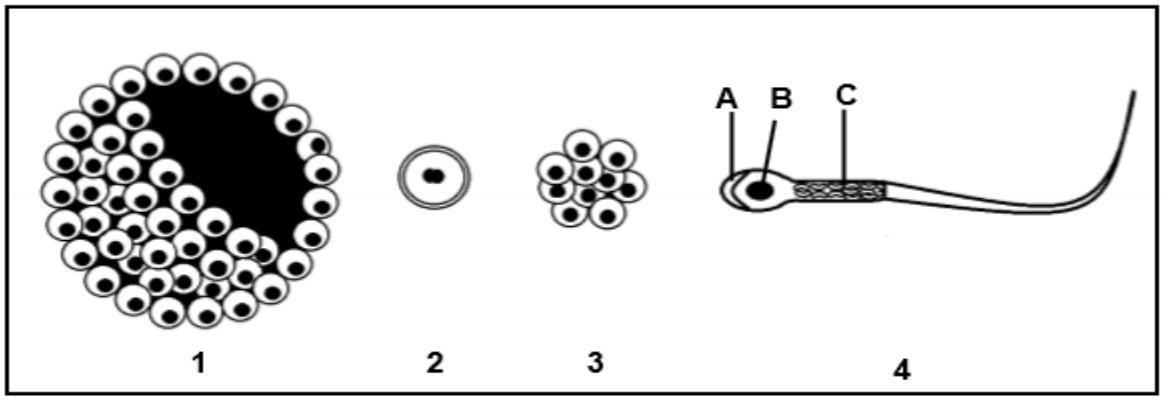
1.2.10 A structure in the eye that absorbs light to prevent internal reflection (10 x 1) **(10)**

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	The functional connection between two consecutive neurons	A: Receptor B: Synapse
1.3.2	The young develops and is nourished in an amniotic egg that is retained in the mother's body	A: Ovipary B: Vivipary
1.3.3	A reproductive strategy in vertebrates where internal fertilisation occurs	A: Altricial development B: Precocial development

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

1.4 The diagrams below show structures formed during human reproduction.



1.4.1 Identify part **A**. (1)

1.4.2 Name the organelle found in large numbers in part **C**. (1)

1.4.3 Give the NUMBER (**1**, **2**, **3** or **4**) only of the diagram that represents the following:

(a) Morula (1)

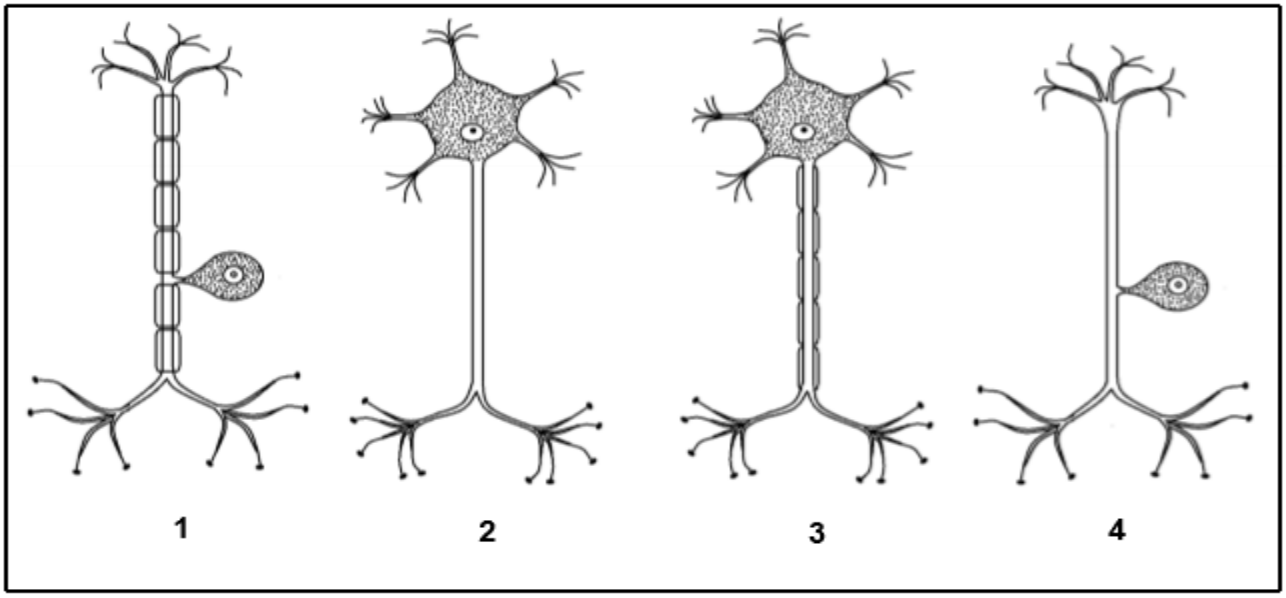
(b) Structure that will implant in the uterus (1)

(c) Blastula/Blastocyst (1)

1.4.4 Give the LETTER and NAME of the part that will enter the ovum during fertilisation. (2)

1.4.5 Name the type of cell division that occurred to produce the structure in diagram **3**. (1)
(8)

1.5 The diagrams below show different neurons.



Give only the NUMBERS (**1**, **2**, **3** or **4**) of TWO neurons that:

1.5.1 Transport impulses from the receptor to the central nervous system (2)

1.5.2 Will have a faster transmission of impulses (2)

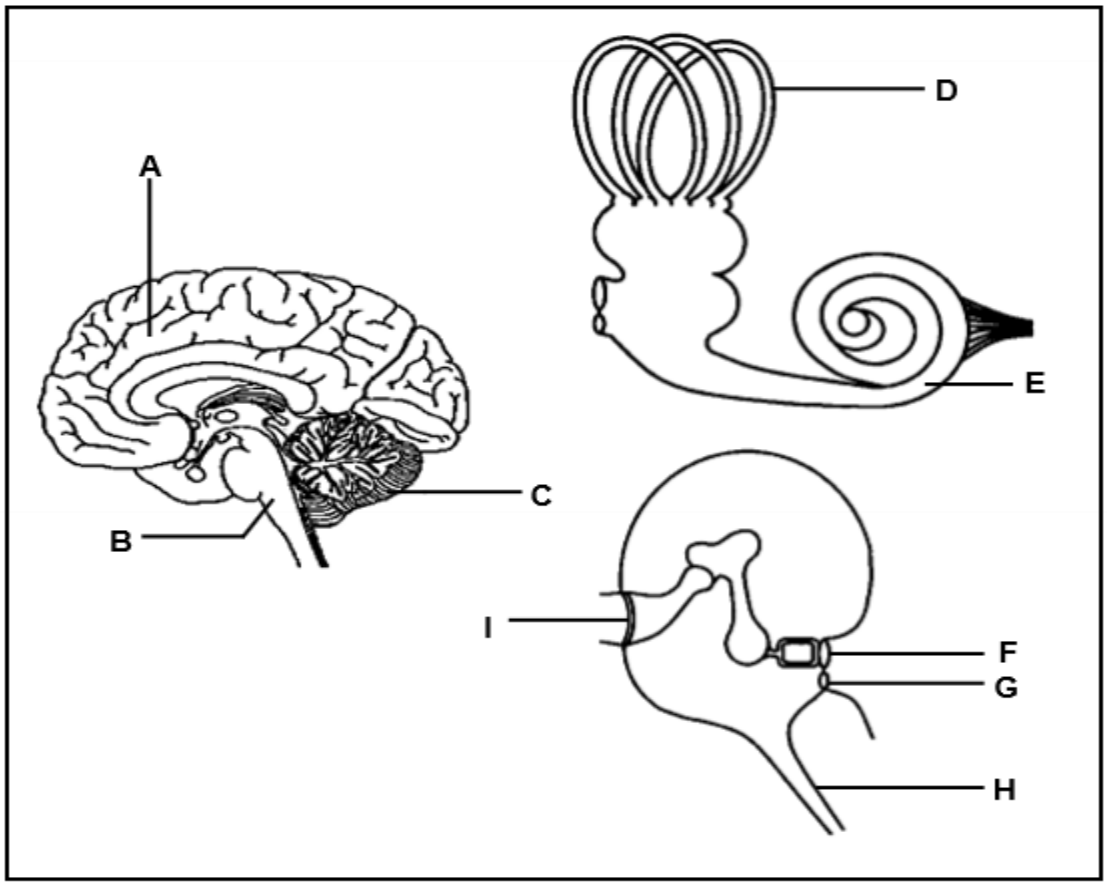
1.5.3 Are damaged if a person can feel the stimulus but is unable to react (2)
(6)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagrams below show different parts of the brain and the ear.



2.1.1 Identify part:

(a) **A** (1)

(b) **B** (1)

(c) **H** (1)

2.1.2 Give the LETTER and NAME of the part of the ear that absorbs excess pressure waves from the inner ear. (2)

2.1.3 Name the receptors found at part **E**. (1)

2.1.4 Explain why damage to part **B** can lead to instant death. (2)

2.1.5 Describe how part **C** responds to impulses received from part **D**. (3)

2.1.6 In older people, part **F** of the ear may harden.

Explain how this condition may lead to hearing loss. (4)
(15)

2.2 Describe the accommodation of the eye for distant vision. **(5)**

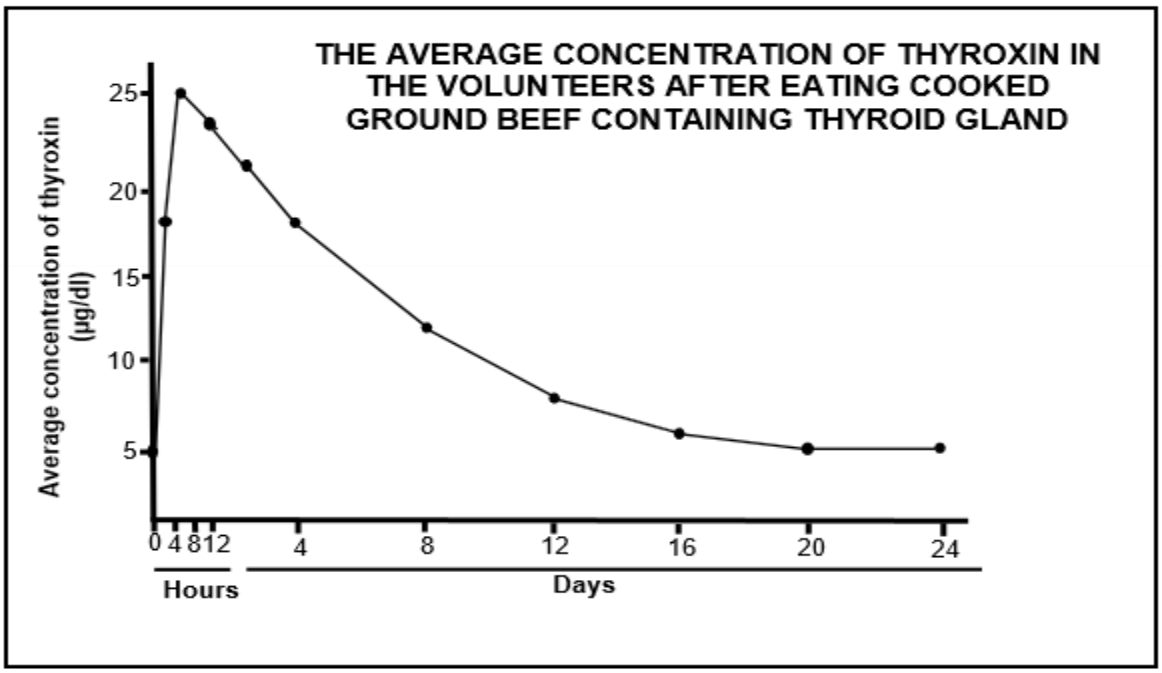
2.3 Read the extract below.

AN OUTBREAK OF THYROTOXICOSIS

Thyrotoxicosis is a medical condition caused by high levels of thyroxin in the blood. There was a sudden increase in the number of reported cases of this condition in one city. They suspected that this was due to people eating ground beef (minced meat) from a local butcher. The butcher added the thyroid glands of cattle when he produced the ground beef. Some people who ate this ground beef showed symptoms of increased heart rate, excessive sweating and weight loss.

Doctors conducted an investigation to determine if the ground beef caused the thyrotoxicosis. The normal thyroxin levels of 5 volunteers were measured. They were then given cooked ground beef from the butchery to eat. Their thyroxin concentration was measured every **4 hours on day 1** and then **once a day for the next 23 days**. The average thyroxin levels was calculated and recorded.

The results are shown in the graph below.



2.3.1 Give the average normal thyroxin concentration (µg/dl) in the blood of the volunteers. (1)

2.3.2 Calculate the percentage increase of the average thyroxin concentration in the first 8 hours after eating the ground beef. Show ALL working. (3)

2.3.3 Explain why thyrotoxicosis causes weight loss. (3)

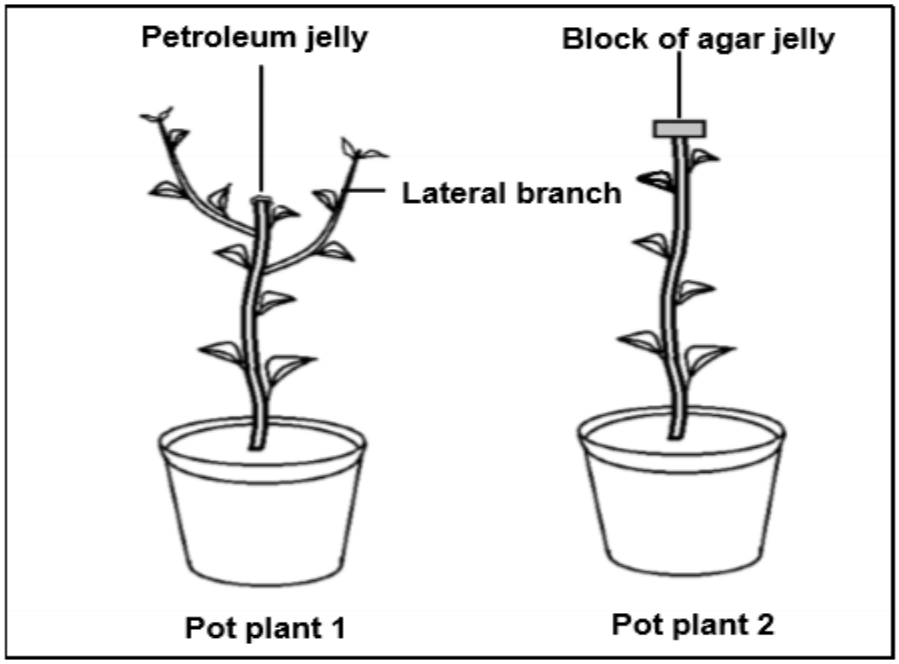
2.3.4 Explain the expected concentration of TSH in the blood 8 hours after eating the ground beef. (4)
(11)

2.4 An investigation was done to determine the effect of a plant hormone on plant growth:

The procedure was as follows:

- Two pot plants (**1** and **2**) of the same species and age were used.
- The apical buds of both plants were cut at the same length along the stem.
- The cut surface of plant **1** was sealed with **petroleum jelly**.
- The cut apical bud of pot plant **2** was placed on a **block of agar jelly** for 2 hours.
- The block of agar jelly was then placed on the cut surface of plant **2**.
- The plants were exposed to the same environmental conditions for 2 weeks.
- The growth of both plants was observed at the end of this period.

The diagrams below show the **results** obtained.



2.4.1 State why the apical bud was placed on a block of agar jelly for 2 hours. (2)

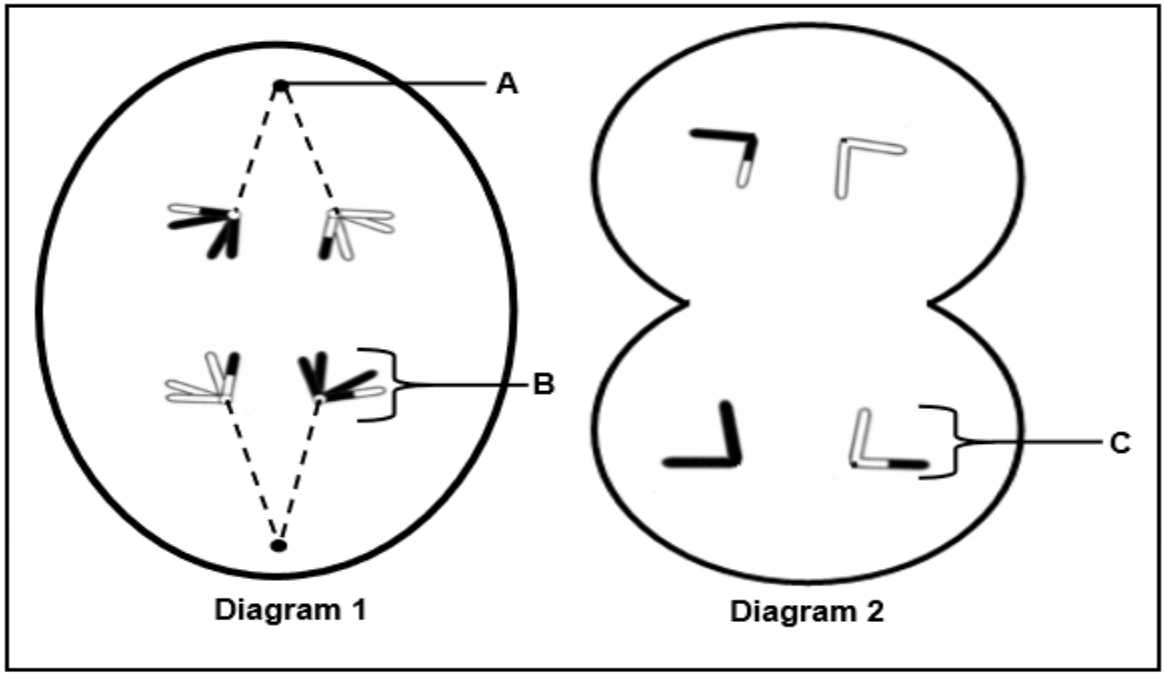
2.4.2 Describe the results obtained for plant **1**. (2)

2.4.3 Explain how fruit farmers can use the knowledge from the results in QUESTION 2.4.2 to their benefit. (2)

2.4.4 Explain why the stem in pot plant **2** grew upwards. (3)
(9)
[40]

QUESTION 3

3.1 The diagrams below represent two phases of meiosis.



3.1.1 Identify part **A**. (1)

3.1.2 Identify the phase represented by diagram **1**. (1)

3.1.3 Describe the events that took place in the phase before the one represented in diagram **2**. (2)

3.1.4 Name the process that causes the chromosomes to have a combination of genes as shown in the diagrams. (1)

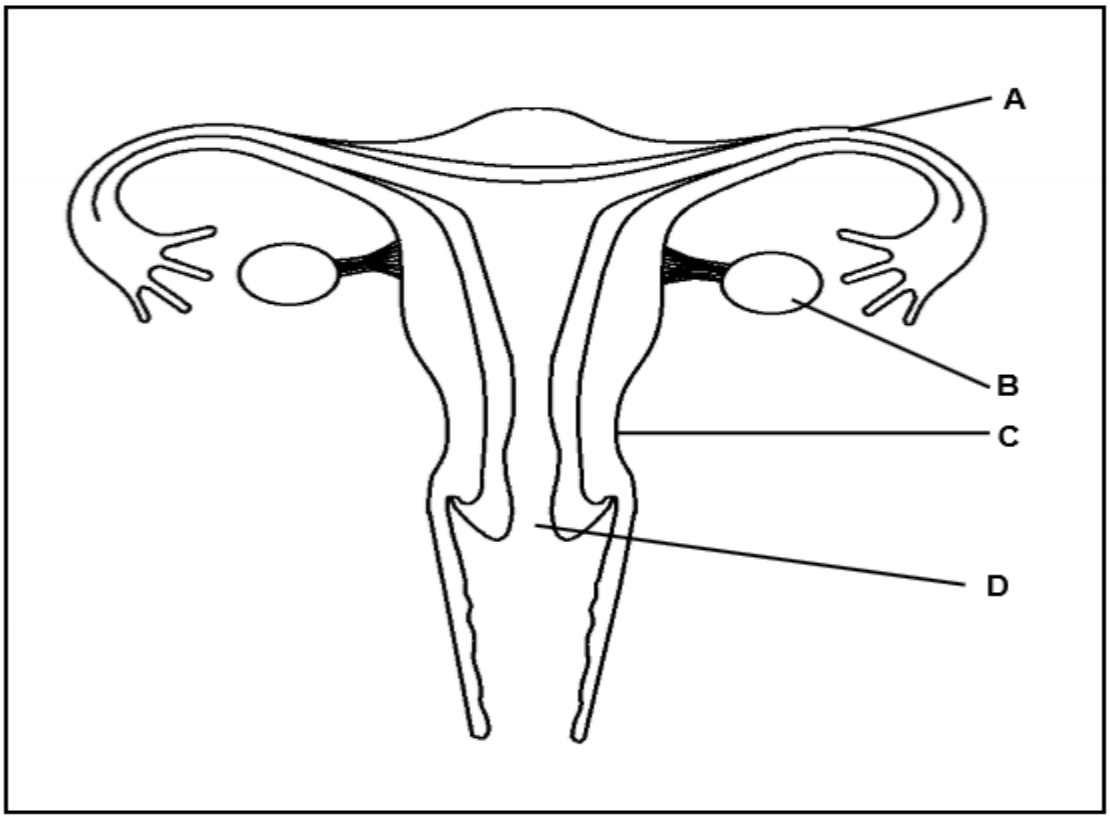
3.1.5 Give ONE reason why the process named in QUESTION 3.1.4 is important. (1)

3.1.6 If this was a human cell, how many chromosomes would be present in the cell during the phase represented in diagram **1**? (1)

3.1.7 Structure **B** and structure **C** are both chromosomes.

Explain why they are structurally different. (3)
(10)

3.2 The structure below represents a part of the female reproductive system.



3.2.1 Identify part **D**. (1)

3.2.2 State ONE function of part **A**. (1)

3.2.3 Describe the process of oogenesis as it occurs in part **B**. (4)

3.2.4 State ONE way in which structure **C** is suited for its function during pregnancy (1)

3.2.5 A person undergoes a surgical operation to remove part **B** on both sides.

Explain why this person will not menstruate. (3)
(10)

3.3 Male hormone contraceptive (birth control) pills have been in development for over 50 years. The pills contain a substance called TU, which inhibits the secretion of testosterone. There is, however, no product available on the market yet, mainly due to many side effects associated with the product.

An investigation was done to determine how TU affects male fertility.

The procedure was as follows:

- 308 healthy, male volunteers were selected.
- A sperm count for each volunteer was done initially.
- Each volunteer was given 500 mg of TU monthly over a period of 12 months.
- During the period of the investigation, the volunteers were asked to wear loose-fitting trousers and underwear made of the same light fabric.
- A sperm count was done weekly over a period of 24 months.
- The average sperm count was calculated per volunteer.

NOTE: Sperm count refers to the total number of healthy sperm per ml of semen and is an indication of male fertility.

3.3.1 Identify the dependent variable in the investigation. (1)

3.3.2 State how the dependent variable in QUESTION 3.3.1 was measured. (1)

3.3.3 Name TWO other factors that should be considered when selecting volunteers. (2)

3.3.4 Explain how TU reduces fertility. (2)

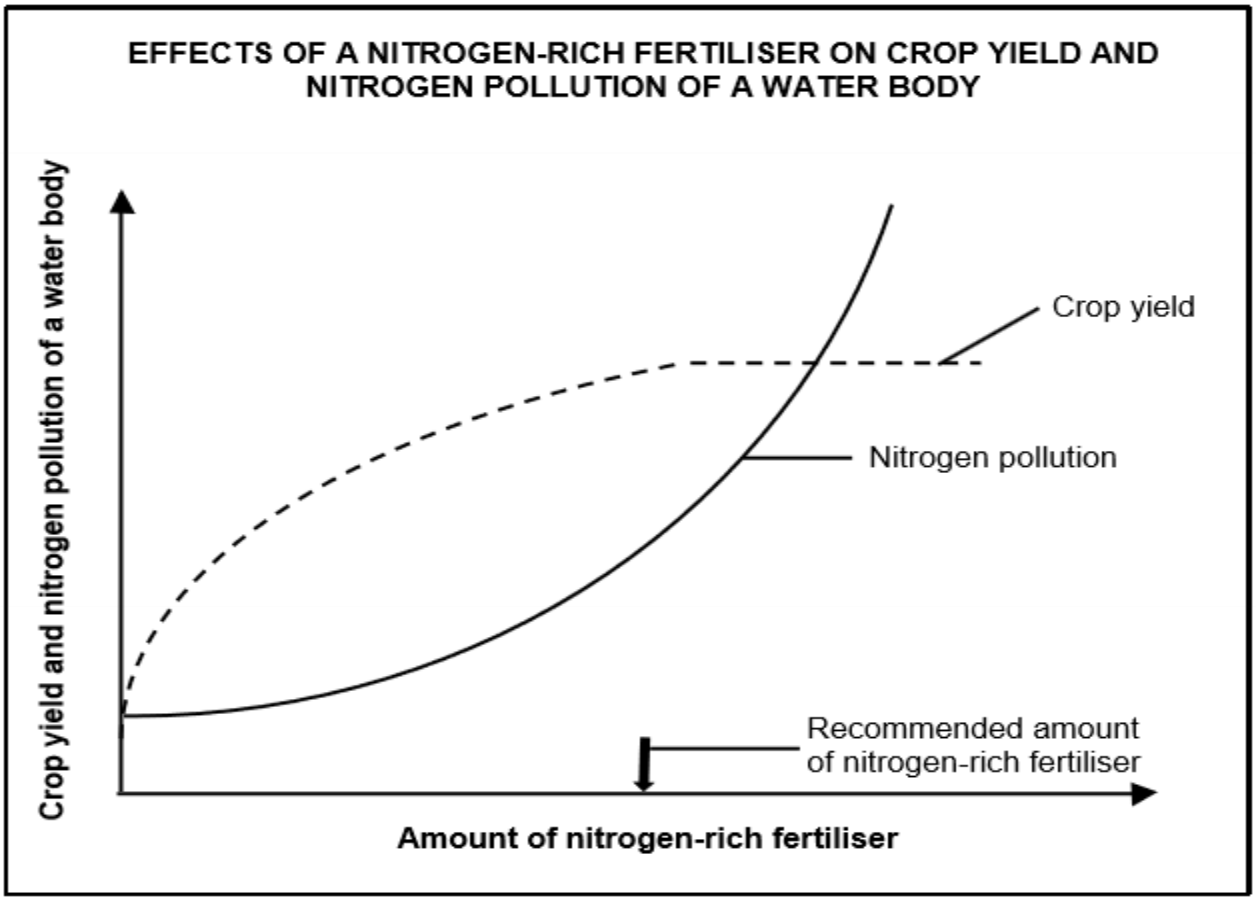
3.3.5 Explain why wearing tight-fitting trousers will decrease male fertility. (2)

3.3.6 Suggest ONE reason for doing the sperm count for an additional 12 months after stopping the TU treatment. (1)

3.3.7 The contraceptive options that are currently available for men are limited to condoms and vasectomy. Vasectomy involves the cutting and tying of both the vas deferens.

Explain how a vasectomy prevents pregnancy. (2)
(11)

3.4 The graph below shows the influence of a nitrogen-rich fertiliser on crop yield and nitrogen pollution of a nearby water body.



3.4.1 Name the process whereby excess nutrients accumulate in a water body. (1)

3.4.2 Explain why it will not economically benefit the farmer to use more than the recommended amount of fertiliser. (3)

3.4.3 Suggest ONE reason why farmers are advised to apply fertilisers to the soil during the dry season of the year. (1)

3.4.4 Explain the effect that an increase in nitrogen pollution will have on the number of bacteria in the water. (4)
(9)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Describe how the human body maintains the temperature and carbon dioxide concentration in the blood when they rise above normal limits.

Also, describe the importance of carbon dioxide in regulating atmospheric temperature, and why increasing levels of carbon dioxide leads to global warming.

Content: (17)
Synthesis: (3)
[20]

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE/ NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2020(2)

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 10 pages.

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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	C✓✓		
	1.1.5	B✓✓		
	1.1.6	A✓✓		
	1.1.7	C✓✓		
	1.1.8	B✓✓		
	1.1.9	B✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Ozone✓/stratosphere		
	1.2.2	Poaching✓		
	1.2.3	Haploid✓		
	1.2.4	Phototropism✓		
	1.2.5	Luteinising✓ hormone/LH		
	1.2.6	Corpus callosum✓		
	1.2.7	Umbilical artery✓		
	1.2.8	Grommet✓		
	1.2.9	Parasympathetic✓nervous system		
	1.2.10	Choroid✓	(10 x 1)	**(10)**
1.3	1.3.1	B only✓✓		
	1.3.2	None✓✓		
	1.3.3	Both A and B✓✓	(3 x 2)	**(6)**
1.4	1.4.1	Acrosome✓		(1)
	1.4.2	Mitochondria✓		(1)
	1.4.3	(a) 3✓		(1)
		(b) 1✓		(1)
		(c) 1✓		(1)
	1.4.4	B✓- Nucleus✓		(2)
	1.4.5	Mitosis✓		(1) **(8)**
1.5	1.5.1	1✓ and 4✓ **(Mark first TWO only)**		(2)
	1.5.2	1✓ and 3✓ **(Mark first TWO only)**		(2)
	1.5.3	2✓ and 3✓ **(Mark first TWO only)**		(2) **(6)**

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

2.1 2.1.1 (a) Cerebrum ✓ (1)

(b) Medulla oblongata ✓ (1)

(c) Eustachian tube✓ (1)

2.1.2 G✓ Round window✓ (2)

2.1.3 Hair cells✓/Organ of Corti (1)

2.1.4
- Part B controls vital processes✓/heartbeat/breathing
- These processes will stop✓ leading to death (2)

2.1.5
- The impulses will be interpreted✓
- and sent to the skeletal muscles✓
- to maintain balance✓ (3)

2.1.6
- The oval window/Part F will not vibrate✓ freely
- Fewer/no vibrations will be carried to the cochlea✓/inner ear
- Fewer/no pressure waves will form✓ in the cochlea
- There will be less/no stimulation of the organ of Corti✓/hair cells
- Fewer/no impulses will be transmitted to the cerebrum✓ leading to hearing loss Any (4)

(15)

2.2 For distant vision:
- The ciliary muscle is relaxed✓
- The ciliary body/choroid layer moves backward✓/away from the lens
- The suspensory ligaments are tight✓/taut
- Tension on the lens is increased✓
- The lens is less convex✓/flatter
- Light rays are refracted less✓
- so that a clear image falls on the retina✓/yellow spot Any **(5)**

2.3 2.3.1 5✓µg/dl (1)

2.3.2 $\left[\frac{(25 - 5)}{5}\right]$ ✓ x 100 ✓
= 400✓%

OR

$\left[\frac{(24 - 5)}{5}\right]$ ✓ x 100 ✓
= 380✓%

Accept a range between:
- 24 and 25 for the first value and
- 380% and 400% for the answer (3)

	2.3.3	- Thyrotoxicosis increases the metabolic rate✓/rate of cellular respiration - More glucose is used✓ - less glucose is stored✓ - fat is broken down✓ causing weight loss	Any	(3)
	2.3.4	- The high levels of thyroxin✓ in the blood - causes the pituitary gland✓/hypophysis - to secrete less TSH✓ into blood - causing the level of TSH to decrease✓		(4) **(11)**
2.4	2.4.1	- So that the plant hormone✓/ auxins from the apical tip - could diffuse into the block of agar jelly✓		(2)
	2.4.2	- The stem stopped growing upwards✓ - Lateral branches developed✓		(2)
	2.4.3	- (Lateral) branches develop✓ - that can bear more fruit✓/increased yield **OR** - Shorter trees✓ /development of lateral branches - makes harvesting of fruit easier✓	Any (1 x 2)	(2)
	2.4.4	- Auxins✓in the block of agar jelly - move downwards ✓into the stem - causing (cell) elongation✓/growth resulting in upward growth of the stem		(3) **(9)** **[40]**

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QUESTION 3

3.1	3.1.1	Centriole✓/centrosome		(1)
	3.1.2	Anaphase I✓		(1)
	3.1.3	- The spindle fibres contract✓ - The centromeres split✓ - Each chromatid is pulled to the opposite poles✓	Any	(2)
	3.1.4	Crossing over✓		(1)
	3.1.5	It leads to (genetic) variation✓ **(Mark first ONE only)**		(1)
	3.1.6	46✓/23 pairs		(1)
	3.1.7	- Structure B consists of two DNA molecules✓/contains a double thread/is made up of two chromatids - because of DNA replication✓ - Structure C consists of one DNA molecule✓/ contains a single thread/chromatid - because it is unreplicated✓/as a result of the splitting of the chromosome during anaphase 2	Any	(3) **(10)**
3.2	3.2.1	Cervix✓		(1)
	3.2.2	- The site of fertilisation ✓ - The site of zygote division✓ - The transfer of the ovum/embryo to the uterus✓ **(Mark first ONE only)**	Any	(1)
	3.2.3	- Diploid cells in the ovary undergo mitosis✓ - to form numerous follicles✓ - Under the influence of FSH✓ - one cell undergoes meiosis✓ - to form a (haploid) ovum✓	Any	(4)
	3.2.4	- It is a hollow organ✓ - It has a muscular wall✓ - It has a blood-rich lining✓/endometrium **(Mark first ONE only)**	Any	(1)
	3.2.5	- No follicle will develop✓ - No oestrogen produced✓ - and no progesterone produced✓ - Therefore, the endometrium will not develop✓* to be shed during menstruation	**Compulsory mark✓*1** + Any 2	(3) **(10)**

3.3	3.3.1	Male fertility✓		(1)
	3.3.2	Measuring the sperm count✓		(1)
	3.3.3	- Age✓ - Diet✓ - Exercise✓ - Activity level✓ - Lifestyle✓ - Occupation✓ etc (Accept factors that are NOT related to health; race) **(Mark first TWO only)**	Any	(2)
	3.3.4	- TU inhibits the secretion of testosterone✓ - spermatogenesis cannot take place✓/no sperm will be produced		(2)
	3.3.5	- The higher temperature/pressure on the testes✓ due to the tight underwear - could decrease the sperm count✓/sperm production/lead to the production of abnormal sperm		(2)
	3.3.6	- To determine if TU is still effective after 12 months✓ - To see if the sperm count returns to normal✓ when the treatment stops **(Mark first ONE only)**	Any	(1)
	3.3.7	- No sperm will be transported✓ - from the epididymis to the urethra✓ - Semen without sperm will be released✓	Any	(2) **(11)**
3.4	3.4.1	Eutrophication✓		(1)
	3.4.2	- The crop yield reaches a maximum at the recommended amount✓ - Using more fertilizer will cost more✓ without increasing crop yield - Therefore the profit will be less✓		(3)
	3.4.3	- Less fertiliser will be lost due to run-off✓/leaching **(Mark first ONE only)**		(1)
	3.4.4	- Algal bloom✓ occurs - A layer of algae will form on the water, blocking out sunlight✓ - The (water) plants die because they are unable to photosynthesise✓ - Animals that feed on the plants will also die✓ - Decomposition✓ of the dead plants and animals - cause an increase in the number of bacteria✓*	**Compulsory mark✓*1** + Any 3	(4) **(9)** **[40]**
			TOTAL SECTION B:	**80**

SECTION C

QUESTION 4

When temperature rises above normal (T):

- Receptors are stimulated✓
- and send impulses to the hypothalamus✓
- The hypothalamus sends impulses to the blood vessels in the skin✓
- and to the sweat glands✓
- The blood vessels in the skin dilate✓/vasodilation takes place
- More blood flows to the surface of the skin✓/sweat glands so that
- (More) heat is lost from the body✓
- More sweat is produced✓ and
- (More) heat is lost when sweat evaporates✓
- The temperature of the body returns to normal✓ Any

When the carbon dioxide levels rise above normal (C): (7)

- Receptor cells in the (carotid) artery in the neck/aorta are stimulated✓
- to send impulses to the medulla oblongata✓
- The medulla oblongata sends an impulse to the breathing muscles✓
- to contract more actively✓
- and increase the rate/depth of breathing✓
- An impulse is also sent to the heart✓
- to beat faster✓
- More carbon dioxide is taken to the lungs✓/exhaled
- The carbon dioxide levels return to normal✓ Any

Importance of carbon dioxide in regulating atmospheric temperature and its influence on global warming (A): (5)

- Carbon dioxide is a greenhouse gas✓
- It traps heat/ prevents it from escaping from the atmosphere✓
- This is called the greenhouse effect✓ which
- keeps the earth warm to make life on earth possible✓
- An increase in carbon dioxide levels in the atmosphere causes an enhanced greenhouse effect✓
- More heat is trapped in the atmosphere✓
- causing an increase in the average global temperature✓ Any

Content (17)
Synthesis (5)

(3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

RELEVANCE	LOGICAL SEQUENCE	COMPREHENSIVE
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information is relevant to: - Homeostatic control of temperature when it rises above normal - Homeostatic control of CO_2 - Importance of CO_2 in regulating atmosphere temperature and its influence on global warming No irrelevant information	The sequence of the events in the: - Homeostatic control of temperature - Homeostatic control of CO_2 - Importance of CO_2 in regulating atmosphere temperature and its influence on global warming are in a logical sequence	The following must be included: - Homeostatic control of temperature (**T: 5/7**) - Homeostatic control of CO_2 (**C: 3/5)** - Importance of CO_2 in regulating atmospheric temperature and its influence on global warming (**A**: **3/5)**
1 mark	1 mark	1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150

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Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2021

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

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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 to D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, e.g. 1.1.10 D.

1.1.1 Grommets are used in the treatment of …

A deafness.
B blindness.
C middle-ear infection.
D multiple sclerosis.

1.1.2 The ability of the lens of the eye to change its shape when viewing an object that is near or far is called …

A binocular vision.
B accommodation.
C pupillary mechanism.
D refraction of light rays.

1.1.3 Which ONE of the following is the visual defect that results from the uneven curvature of the cornea?

A Cataracts
B Long-sightedness
C Short-sightedness
D Astigmatism

1.1.4 The receptor(s) involved in maintaining balance is/are the …

A organ of Corti only.
B maculae only.
C maculae and cristae only.
D organ of Corti, maculae and cristae.

1.1.5 Which of the following structures are involved in maintaining balance when there is a change in the direction of movement of the body?

A Semi-circular canals and cerebellum
B Eustachian tube and cerebellum
C Semi-circular canals and cerebrum
D Eustachian tube and cerebrum

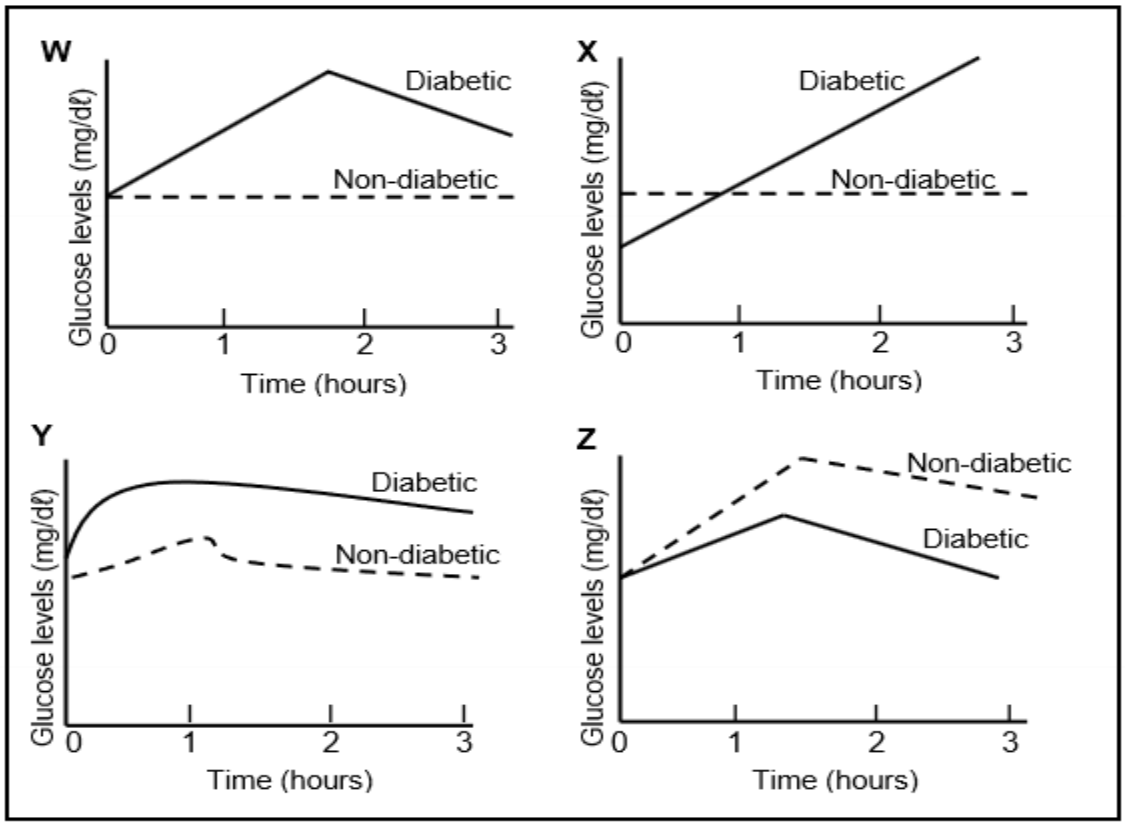
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1.1.6 Which of the following structures are protected by the meninges?

A Spinal cord and receptors
B Spinal cord and brain
C Brain and effectors
D Effectors and receptors

1.1.7 Two men were given a glucose-rich meal at the same time (0 hours). One man is diabetic and the other is non-diabetic. The diabetic did not receive any medical treatment. Their blood glucose levels were measured over a period of 3 hours.

The graphs below show the possible blood glucose levels of the two men during this time.



Which ONE of the graphs correctly represents the blood glucose levels of the two men?

A W
B X
C Y
D Z

1.1.8 During a reflex action, impulses enter the spinal cord by means of a/an …

A sensory neuron through the ventral root of the spinal nerve.
B sensory neuron through the dorsal root of the spinal nerve.
C interneuron through the ventral root of the spinal nerve.
D interneuron through the dorsal root of the spinal nerve.

1.1.9 A person produces a smaller volume of urine most probably because …

A ADH levels are high in the blood and the renal tubules are more permeable to water.
B ADH levels are high in the blood and the renal tubules are less permeable to water.
C ADH levels are low in the blood and the renal tubules are more permeable to water.
D ADH levels are low in the blood and the renal tubules are less permeable to water. (9 x 2) **(18)**

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 1.2.8) in the ANSWER BOOK.

1.2.1 The release of an ovum from the ovary

1.2.2 The microscopic gap between two consecutive neurons

1.2.3 The period of development of the foetus in the uterus

1.2.4 The growth movement of a plant in response to a stimulus

1.2.5 The type of development in birds where the young are able to independently move and feed themselves after hatching

1.2.6 The extra-embryonic membrane that is responsible for the excretion of waste in an amniotic egg

1.2.7 Tubules in the testes where spermatogenesis occurs

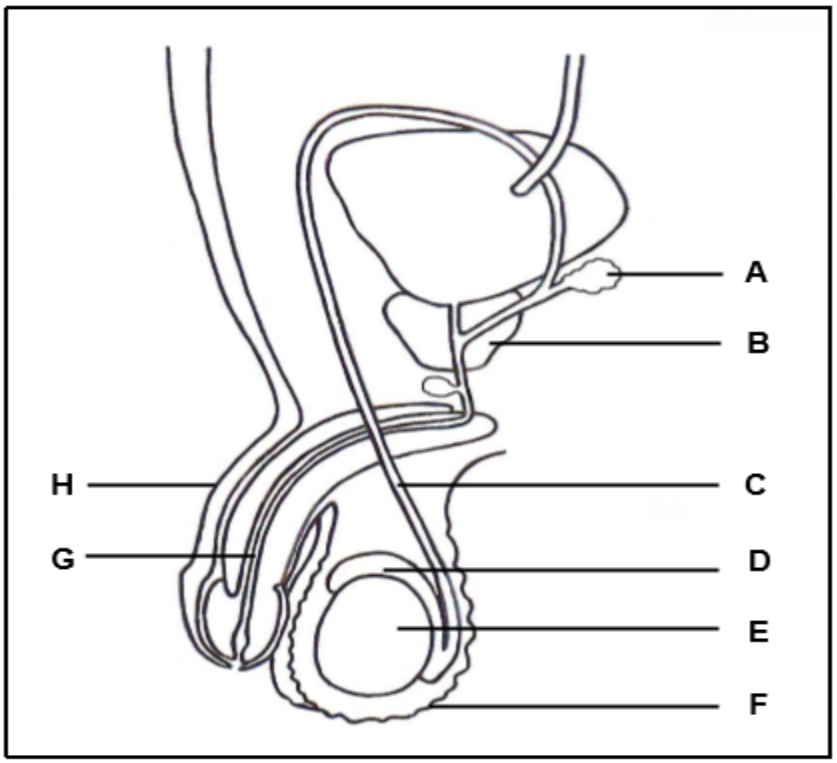
1.2.8 The plant hormone that brings about seed dormancy when conditions are unfavourable (8 x 1) **(8)**

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 number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	An exocrine gland	A: Cowper's gland B: Pancreas
1.3.2	A component of the peripheral nervous system	A: Cranial nerves B: Spinal cord
1.3.3	A disorder of the nervous system characterised by the degeneration of the brain cells	A: Goitre B: Alzheimer's disease

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

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



1.4.1 Identify part:

(a) **C** (1)

(b) **F** (1)

(c) **H** (1)

1.4.2 Give the LETTER and NAME of the part that:

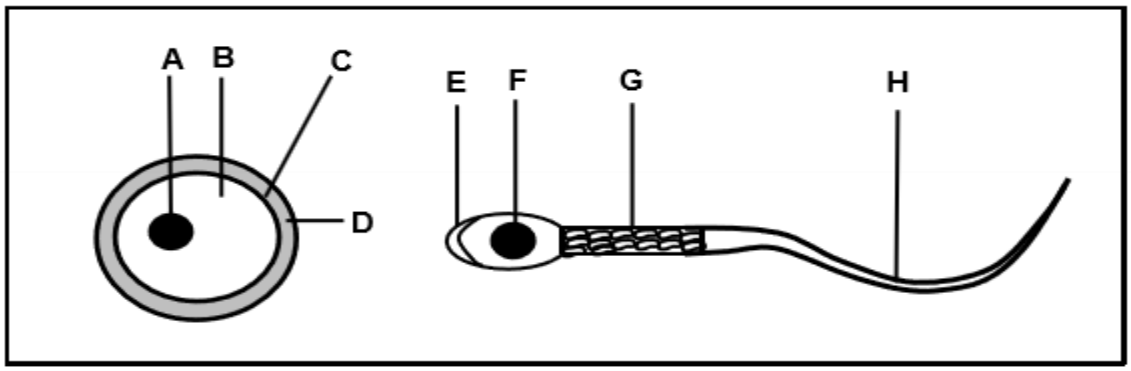
(a) Stores sperm temporarily (2)

(b) Transports both semen and urine (2)

(c) Produces testosterone (2)

1.4.3 Give the LETTERS of TWO parts that contribute to the formation of semen. (2)
(11)

1.5 The diagram below represents an ovum and a sperm.



1.5.1 Identify part:

(a) **B** (1)

(b) **D** (1)

(c) **H** (1)

1.5.2 Name the organelle found in large numbers in part **G**. (1)

1.5.3 Give the LETTERS of the TWO parts that fuse during fertilisation. (2)

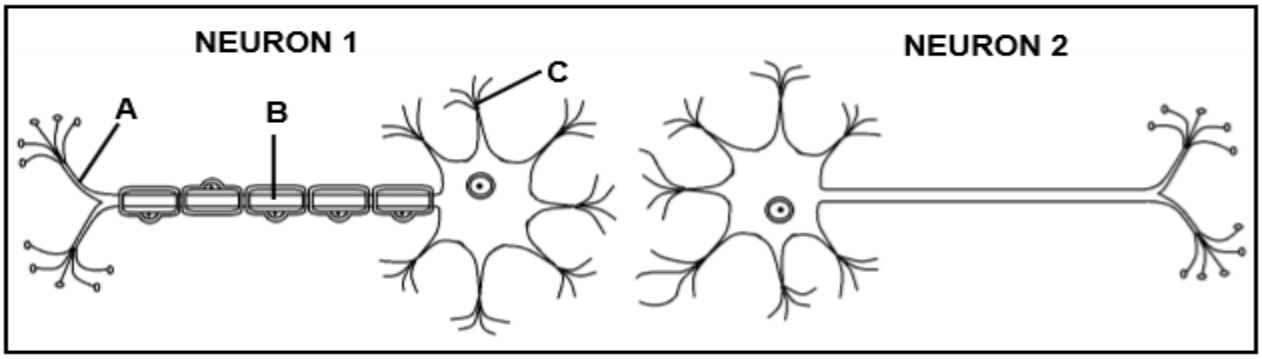
1.5.4 Name the meiotic process whereby ova are produced. (1)
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a type of neuron found in the human body.



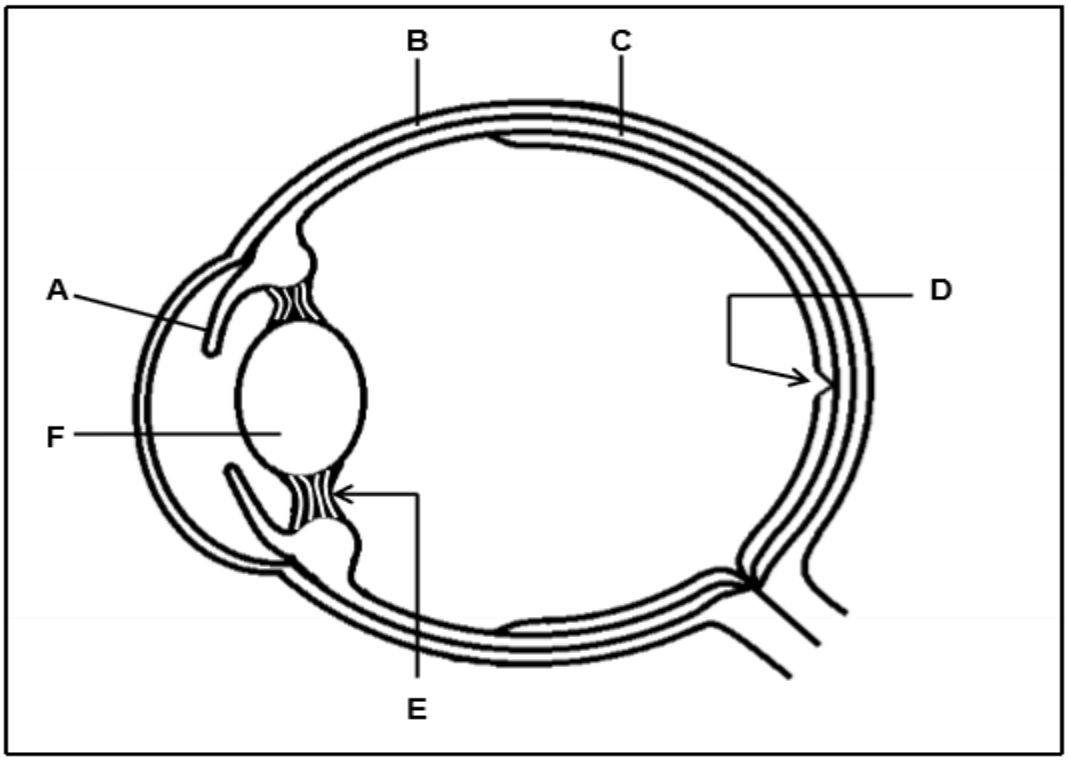
2.1.1 Identify the type of neuron shown. (1)

2.1.2 Using the LETTERS **A**, **B** and **C** only, give the correct sequence for the transmission of an impulse along neuron **1**. (2)

2.1.3 Explain how the speed of transmission of impulses will differ for neuron **1** and neuron **2**. (3)

2.1.4 Explain why a person will feel the stimulus but will not be able to respond if only this type of neuron is damaged. (3)
(9)

2.2 The diagram below represents the structure of the human eye.



2.2.1 Identify part **C**. (1)

2.2.2 Give ONE function of part **E**. (1)

2.2.3 State why the clearest image will form when light rays fall on part **D**. (1)

2.2.4 Explain ONE way in which part **B** is structurally different from part **F**. (4)

2.2.5 Describe how the muscles in part **A** function to increase the amount of light entering the eye. (3)

2.2.6 Describe how a blurred image forms if a person with normal vision wears spectacles with biconvex lenses while reading a book. (3)
(13)

2.3 Read the extract below.

> Endometriosis is a medical condition that occurs when the endometrium develops in or on other structures such as the Fallopian tubes, ovaries or pelvis. It is caused by higher than normal levels of oestrogen. Females with this condition will most likely experience mild to severe menstrual pains. This condition can sometimes lead to infertility.
>
> Doctors may prescribe a contraceptive pill as treatment to reduce the development of the endometrium. The pill contains progesterone.

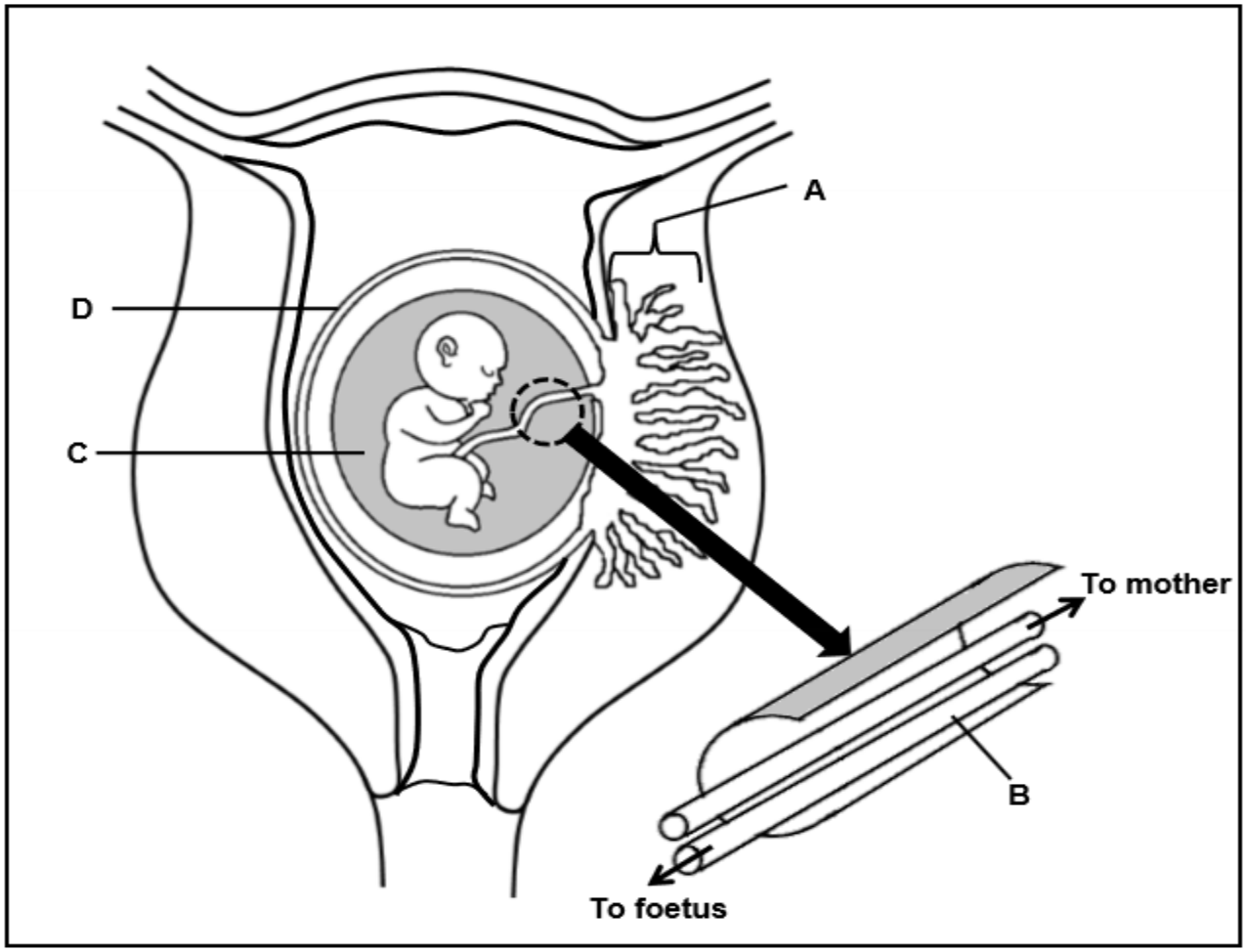
2.3.1 Name the structure where the endometrium normally develops. (1)

2.3.2 Explain why endometriosis in the Fallopian tubes may lead to infertility. (3)

2.3.3 Use the negative feedback mechanism to explain why the pills containing progesterone are successful in treating endometriosis. (4)
(8)

2.4 Describe the process of hearing. **(7)**

2.5 The diagram below shows a developing human foetus.



2.5.1 Identify part **D**. (1)

2.5.2 State TWO functions of the fluid in part **C**. (2)

2.5.3 Describe the development of the zygote until implantation occurs. (4)

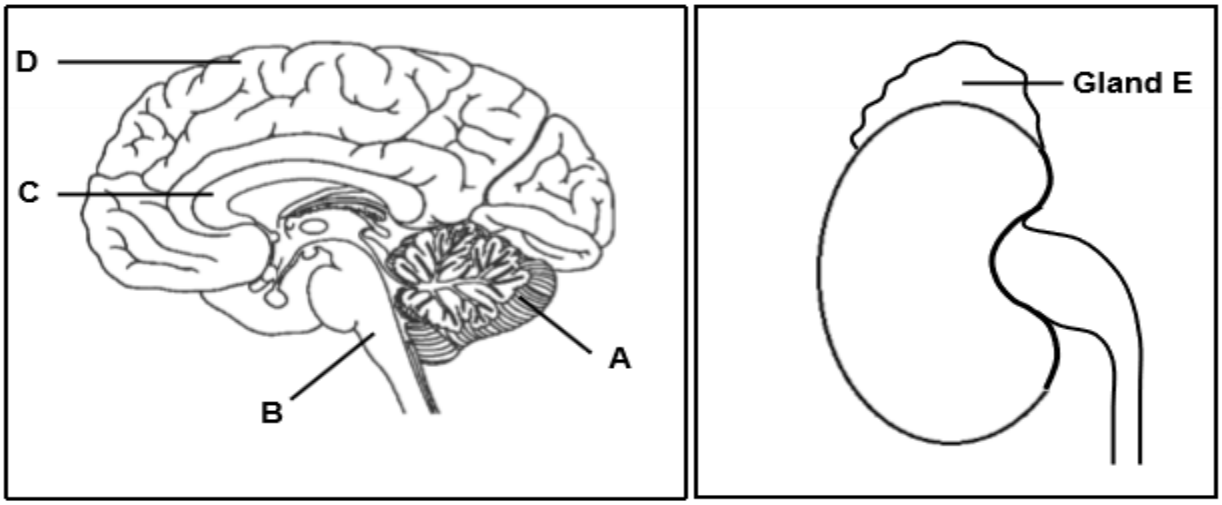
2.5.4 State TWO ways in which part **A** functions in protecting the developing foetus. (2)

2.5.5 Identify blood vessel **B**. (1)

2.5.6 Describe how the nutrition of a human foetus differs from that of oviparous organisms. (3)
(13)
[50]

QUESTION 3

3.1 The diagrams below show the human brain and human kidney.



3.1.1 Identify part **A**. (1)

3.1.2 State ONE function of part **C**. (1)

3.1.3 A person sustained a head injury in a car accident and lost his memory.

Write down the LETTER and NAME of the part of the brain that was affected. (2)

3.1.4 During an emergency situation, gland **E** releases a hormone that prepares the body for a 'fight or flight' response by stimulating an increase in breathing rate and heart rate. This increase leads to increased energy production in the skeletal muscles and an increase in blood carbon dioxide levels.

(a) Name the hormone secreted by gland **E** in an emergency situation. (1)

(b) Explain how an increase in breathing rate and heart rate results in increased energy production in skeletal muscles. (4)

(c) Describe how part **B** is involved in carbon dioxide homeostasis. (4)
(13)

3.2 The table below shows the average rate of blood flow to the skin at different environmental temperatures.

ENVIRONMENTAL TEMPERATURE (°C)	AVERAGE RATE OF BLOOD FLOW TO THE SKIN (mℓ /100 mℓ tissue/min)
0	2,5
5	4
20	4,5
35	11
45	18
50	19

3.2.1 Give the environmental temperature at which there was the greatest average rate of blood flow to the skin. (1)

3.2.2 Describe the relationship between the environmental temperature and the average rate of blood flow to the skin. (2)

3.2.3 Calculate the percentage increase in blood flow to the skin between 5 °C and 35 °C. Show ALL your workings. (3)

3.2.4 Explain the average rate of blood flow to the skin between 20 °C and 45 °C. (4)

3.2.5 Frostbite is a condition where long term exposure to extremely cold conditions (0 °C or less) leads to the death of tissue in areas like the hands and feet.

Use the data from the table to explain why tissue may die. (2)
(12)

3.3 3.3.1 Describe the negative feedback mechanism that occurs when thyroxin levels in the blood are high. (5)

3.3.2 A person has a medical condition that results in the under-secretion of thyroxin.

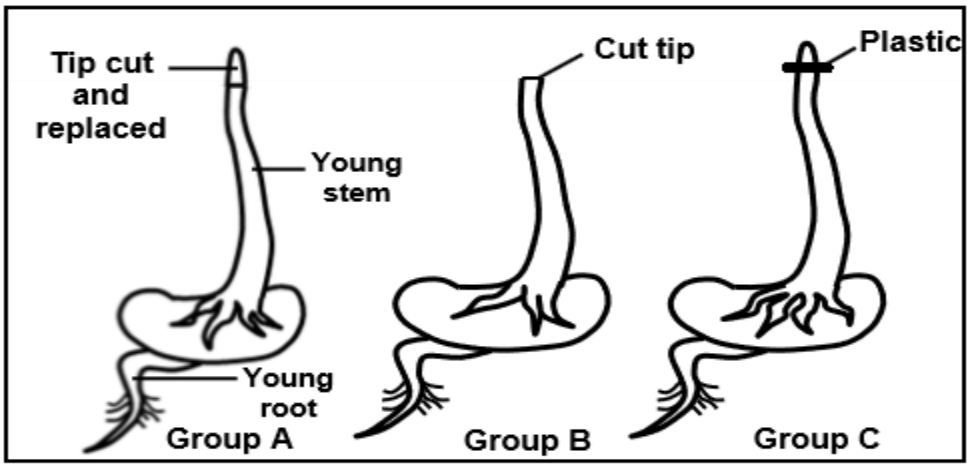
Explain why this person will gain weight if the thyroxin levels remain continuously low in the blood. (3)
(8)

3.4 A group of learners conducted an investigation to determine the effect of auxins on the growth of stems in bean seedlings.

The procedure was as follows:

- 30 bean seeds were allowed to germinate for 5 days to produce seedlings.
- The seedlings were divided into 3 groups (**A**, **B** and **C**) of 10 seedlings each.
- The tips of all the seedlings were cut at the same length.
- In group **A**, the cut tip was placed back on top of the young stem.
- In group **B**, the tip was not placed back.
- In group **C**, a piece of plastic was placed on top of the cut surface and the tip was then placed on top of the plastic.
- The seedlings in all the groups were placed in a dark cupboard for a week.
- The growth of the stem was then observed.

The diagram below shows how the seedlings in each group were treated.



3.4.1 Identify the dependent variable in this investigation. (1)

3.4.2 Why did the learners cut the tips of the young stems? (1)

3.4.3 Give ONE reason why 10 bean seedlings were used in each group. (1)

3.4.4 Write down the LETTER(S) (**A**, **B** or **C**) of the group(s) where there will be no upward growth of the stem. (2)

3.4.5 Describe how auxins cause apical dominance. (3)

3.4.6 Name the plant hormone:

(a) Other than auxins, that promotes the germination of seeds (1)

(b) That inhibits the germination of seeds (1)
(10)

3.5 Read the extract below.

> The bluefin tuna, the great white shark and the bottlenose dolphin are three aquatic species that are found in the Indian Ocean.
>
> An adult bluefin tuna releases up to 540 000 000 eggs into the water annually, while the great white shark female produces 2 to 12 offspring through ovovivipary every two years. A bottlenose dolphin female, being a mammal, is viviparous and produces one offspring every two to three years.

3.5.1 Name the type of fertilisation that takes place in the bottlenose dolphin. (1)

3.5.2 Explain how TWO of the reproductive strategies of the great white shark increase its reproductive success. (4)

3.5.3 Explain ONE reason why the bluefin tuna releases a large number of eggs. (2)
(7)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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Department:
Basic Education
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GRADE 12

LIFE SCIENCES P1

NOVEMBER 2021

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 9 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	B✓✓		
	1.1.3	D✓✓		
	1.1.4	C✓✓		
	1.1.5	A✓✓		
	1.1.6	B✓✓		
	1.1.7	C✓✓		
	1.1.8	B✓✓		
	1.1.9	A✓✓	(9 x 2)	**(18)**
1.2	1.2.1	Ovulation✓		
	1.2.2	Synapse✓		
	1.2.3	Gestation✓		
	1.2.4	Tropism✓		
	1.2.5	Precocial✓ development		
	1.2.6	Allantois✓		
	1.2.7	Seminiferous✓ tubules		
	1.2.8	Abscisic acid✓	(8 x 1)	**(8)**
1.3	1.3.1	Both A and B✓✓		
	1.3.2	A only✓✓		
	1.3.3	B only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Vas deferens✓/sperm duct		(1)
		(b) Scrotum✓		(1)
		(c) Penis✓		(1)
	1.4.2	(a) D✓ Epididymis✓		(2)
		(b) G✓ Urethra✓		(2)
		(c) E✓ Testis✓		(2)
	1.4.3	A✓ B✓ E✓ **(Mark first TWO only)**	Any	(2) **(11)**
1.5	1.5.1	(a) Cytoplasm✓		(1)
		(b) Jelly layer✓		(1)
		(c) Tail✓/ Flagellum		(1)
	1.5.2	Mitochondrion✓		(1)
	1.5.3	A✓ and F✓ **(Mark first TWO only)**		(2)
	1.5.4	Oogenesis✓		(1) **(7)**

TOTAL SECTION A: 50

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SECTION B

QUESTION 2

2.1	2.1.1	Motor✓ /efferent neuron	(1)
	2.1.2	C → B → A✓✓ **(Must be in the correct sequence)**	(2)
	2.1.3	- Impulses will be transmitted faster in neuron 1✓✓/ slower in neuron 2 - because of the presence of a myelin sheath in neuron 1✓/ absence of a myelin sheath in neuron 2	(3)
	2.1.4	- Impulses from the receptor✓/sensory neuron - will be transmitted to the central nervous system✓ but - the impulse will not reach the effector✓	(3) **(9)**
2.2	2.2.1	Choroid✓	(1)
	2.2.2	- Holds the lens in position✓ - Connects the lens to the ciliary body✓ - Plays a role in accommodation✓ Any **(Mark first ONE only)**	(1)
	2.2.3	(D/the yellow spot) has the highest concentration of cones✓	(1)
	2.2.4	- Part B/sclera is opaque✓✓/does not allow light to pass through/ white - part F/lens is transparent✓✓/allows light to pass into the eye **OR** - Part B/sclera is non-elastic✓✓/maintains the shape of the eye - part F/lens is elastic✓✓/able to change its shape **(Mark first ONE only)**	(4)
	2.2.5	- The circular muscles relax✓ - The radial muscles contract✓ - causing the pupil to dilate✓	(3)
	2.2.6	- The lenses in the spectacles will refract the light rays✓ - The lens of the eye also refracts✓ the light rays - The light rays will therefore be focused in front of the retina✓	(3) **(13)**

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2.3 2.3.1 Uterus✓ (1)

2.3.2
- The thickened layer may cause an obstruction✓/blockage
- which may prevent the passage of gametes✓
- preventing fertilisation✓ from taking place

OR

- The thickened layer may cause an obstruction✓/blockage
- which may prevent the embryo from reaching the uterus✓/ implantation could occur in the Fallopian tube
- which may lead to the death of the embryo✓/rupturing of the fallopian tube/miscarriage (3)

2.3.3
- A high concentration of progesterone✓
- inhibits the pituitary gland from secreting FSH✓
- Without FSH a follicle will not develop✓ in the ovary
- Therefore, oestrogen will not be secreted✓ (4)

(8)

2.4
- The pinna of the ear traps sound waves✓
- The auditory canal directs the sound waves to the tympanic membrane✓
- causing the tympanic membrane to vibrate✓
- which causes the ossicles to vibrate✓ and
- pass the vibrations to the oval window✓/amplify the vibrations
- (Pressure) waves are set up in the inner ear✓/perilymph/endolymph
- The organ of Corti is stimulated✓
- and converts the stimuli into impulses✓
- which are transmitted by the auditory nerve✓
- to the cerebrum✓ for interpretation Any **(7)**

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2.5	2.5.1	Chorion✓		(1)
	2.5.2	- Acts as a shock absorber✓ - It prevents desiccation✓/dehydration - It helps to keep the temperature within a narrow range✓ - It facilitates free movement✓ of the foetus **(Mark first TWO only)**	Any	(2)
	2.5.3	- The zygote divides by mitosis✓ - to form a (solid) ball of cells✓ - called the morula✓ - which develops into a hollow ball of cells✓ - called the blastula✓/blastocyst	Any	(4)
	2.5.4	- Acts as a micro-filter✓/protect against pathogens - Removal of harmful metabolic waste✓ - Produces antibodies✓ - Maintains the endometrium✓ **(Mark first TWO only)**	Any	(2)
	2.5.5	Umbilical vein✓		(1)
	2.5.6	- In humans the developing foetus receives nutrients from the mother's✓ blood - via the placenta✓/umbilical vein - In oviparous organisms the developing embryo receives nutrients from the yolk✓/albumen	Any	(3) **(13)** **[50]**

QUESTION 3

3.1 3.1.1 Cerebellum✓ (1)

3.1.2 - Connects the two hemispheres of the brain✓
- Allows for communication between the two hemispheres of the brain✓ Any (1)
(Mark first ONE only)

3.1.3 D✓ Cerebrum✓ (2)

3.1.4 (a) Adrenalin✓ (1)

(b)
- More air/oxygen will be inhaled✓
- Blood will be pumped faster✓
- therefore, transporting more oxygen and glucose✓ to the skeletal muscles
- which will increase the rate of cellular respiration✓/metabolism (4)

(c)
- Part B/the medulla oblongata is stimulated✓
- and sends impulses to the heart✓and to
- the breathing muscles✓/ intercostal muscles and diaphragm
- More blood is transported to the lungs✓
- and the carbon dioxide is exhaled faster✓ (4)
- and the carbon dioxide levels return to normal✓ Any **(13)**

3.2 3.2.1 50✓°C (1)

3.2.2 As the temperature increases the average rate of blood-flow to the skin increases✓✓ (2)

3.2.3 $\left.\frac{11-4}{4}\right\}$ ✓ x 100✓ = 175✓% **OR** $\left.\frac{7}{4}\right\}$ ✓ x 100✓ = 175✓% (3)

3.2.4
- As the temperature increases✓ from 20 °C to 45 °C
- vasodilation occurs✓/blood vessels dilate
- to increase the rate of blood flow✓ /more blood flows to the skin
- so that more heat✓/ sweat can be lost (4)

3.2.5
- Less blood flows to the skin✓ at low temperatures
- Less oxygen✓/nutrients reach the cells of the tissue and the cells may die

OR

- Less blood flows to the skin✓ at low temperatures
- More carbon dioxide✓/waste products accumulate in the cells of the tissue and the cells may die (2)

(12)

3.3	3.3.1	- The pituitary gland✓ is stimulated - to secrete less TSH✓ - Low TSH levels causes the thyroid gland✓ - to secrete less thyroxin✓ - Thyroxin levels return to normal✓	(5)
	3.3.2	- The rate of metabolism/respiration in the body decreases✓ - Less glucose will be broken down✓ - and more glucose will be converted and stored as fat✓/glycogen	(3) **(8)**
3.4	3.4.1	Stem growth✓	(1)
	3.4.2	- To remove the source of auxins✓ - The tip produces auxins✓ Any	(1)
	3.4.3	To increase the reliability✓/validity of the results	(1)
	3.4.4	B✓ and C✓	(2)
	3.4.5	- The presence of auxins✓ in the tip of the stem - stimulate upward growth✓ - and inhibit development of lateral branches✓	(3)
	3.4.6	(a) Gibberellins✓	(1)
		(b) Abscisic acid✓	(1) **(10)**
3.5	3.5.1	Internal✓ fertilisation	(1)
	3.5.2	- Internal fertilisation✓ increases the chances of fertilisation✓ - Ovovivipary✓/ eggs retained inside the female's body where they are protected✓ **(Mark first TWO only)** (2 x 2)	(4)
	3.5.3	- To increase the chances of fertilisation✓/ the survival of the eggs/ number of offspring - As eggs may be lost to predators✓/environmental factors etc - Since there is external fertilisation✓ Any	(2) **(7)** **[50]**
		TOTAL SECTION B:	**100**
		GRAND TOTAL:	**150**

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GRADE 12

LIFE SCIENCES P1

NOVEMBER 2022

MARKS: 150

TIME: 2½ hours

This question paper consists of 17 pages.

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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 Which ONE of the following maintains the shape of the eyeball?

A Cornea
B Lens
C Vitreous humour
D Retina

1.1.2 The choroid …

A is richly supplied with blood vessels.
B contains photoreceptors.
C refracts the light rays.
D sends impulses to the brain.

1.1.3 Which ONE of the following occurs immediately after fertilisation?

A The blastula, which is a hollow ball of cells, is formed by meiosis.
B The morula, which is a hollow ball of cells, is formed by meiosis.
C The blastula, which is a solid ball of cells, is formed by mitosis.
D The morula, which is a solid ball of cells, is formed by mitosis.

1.1.4 On a hot day …

A less blood flows to the surface of the skin.
B the sweat glands become inactive.
C more blood flows to the surface of the skin.
D vasoconstriction takes place.

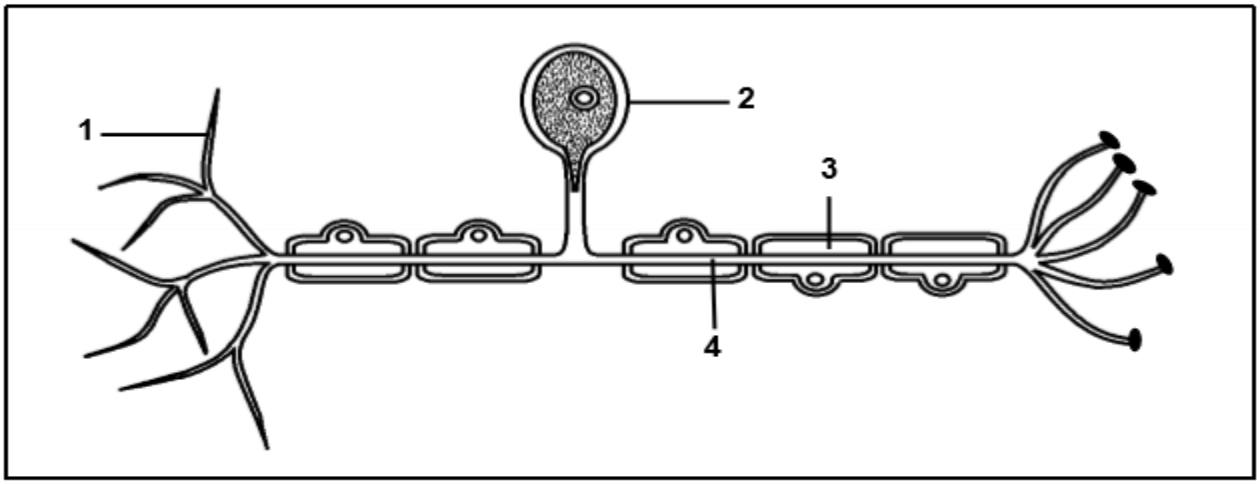
1.1.5 The normal site of fertilisation in a human female is the …

A uterus.
B ovary.
C vagina.
D Fallopian tube.

1.1.6 Which ONE of the following best describes the events of accommodation when a person is viewing an object that is less than 6 m away?

	Ciliary muscle	Suspensory ligaments	Tension on the lens
A	Relaxes	Tighten	Increases
B	Contracts	Slacken	Decreases
C	Relaxes	Slacken	Decreases
D	Contracts	Tighten	Increases

QUESTIONS 1.1.7 AND 1.1.8 ARE BASED ON THE DIAGRAM OF THE NEURON BELOW.



1.1.7 The axon is represented by structure …

A 1.
B 2.
C 3.
D 4.

1.1.8 Which labelled part affects the speed of impulse transmission?

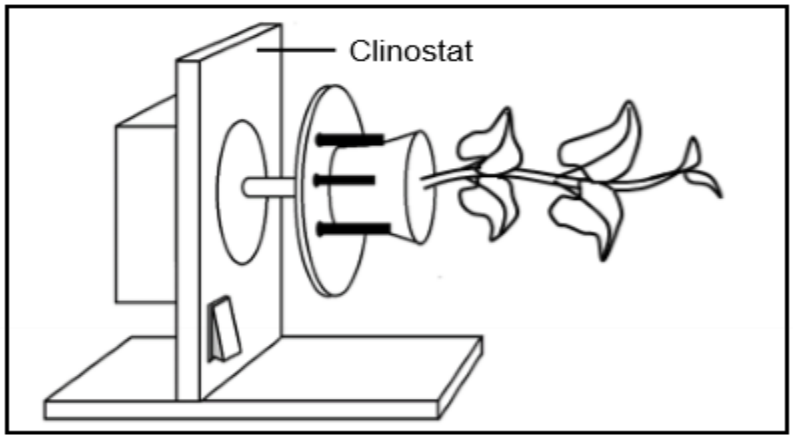
A 1
B 2
C 3
D 4

QUESTIONS 1.1.9 AND 1.1.10 REFER TO THE DIAGRAM BELOW THAT SHOWS AN INVESTIGATION DONE TO DETERMINE THE EFFECT OF AUXINS ON TROPISM.

The procedure was as follows:

- A pot plant was placed on a stationary clinostat.
- The plant was exposed to light from all directions.
- The growth was then observed after few days.

The diagram below shows the set-up of the investigation.



The results after a few days showed the stem growing upwards.

1.1.9 Which ONE of the following is an explanation of the results?

A Phototropism occurred because the auxins moved towards light, which inhibited growth on the lower side of the stem.
B Geotropism occurred because the auxins moved downwards, which stimulated growth on the lower side of the stem.
C Phototropism occurred because the auxins moved away from light, which stimulated growth on the upper side of the stem.
D Geotropism occurred because the auxins moved upwards, which inhibited growth on the upper side of the stem.

1.1.10 A control for the same investigation was set up by putting an identical pot plant on a **rotating** clinostat.

Which ONE of the following would be the expected results observed after a few days?

A There will be no growth.
B The stem will grow upwards.
C The stem will grow downwards.
D The stem will grow horizontally. (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 1.2.10) in the ANSWER BOOK.

1.2.1 The part of the skull that protects the brain

1.2.2 The homeostatic process whereby temperature is controlled in the body

1.2.3 The visual defect characterised by a cloudy lens

1.2.4 The blood vessel that transports deoxygenated blood from the foetus towards the placenta

1.2.5 The part of the brain that controls body temperature

1.2.6 A branch of the nervous system that is made up of spinal and cranial nerves

1.2.7 Finger-like projections that develop from the outer membrane of an embryo after implantation

1.2.8 A hormone that regulates the salt levels in blood

1.2.9 The fluid that protects the developing foetus against mechanical injury

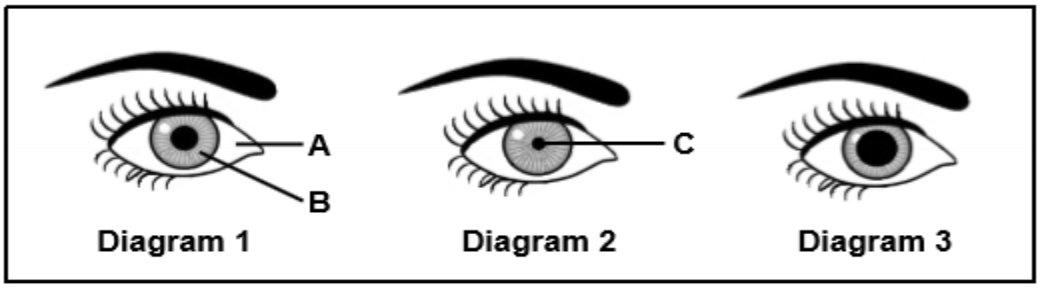
1.2.10 The area of the retina that contains the highest concentration of cones (10 x 1) **(10)**

1.3 Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	A plant hormone that inhibits the germination of seeds	A: Gibberellins B: Abscisic acid
1.3.2	The functional connection between two consecutive neurons	A: Synapse B: Effector
1.3.3	A hormone that stimulates puberty	A: Testosterone B: Oestrogen

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

1.4 The diagrams below show the condition of the eyes for different light intensities when viewing the same object.



1.4.1 Give the LETTER and NAME of the part that:

(a) Contains muscles (2)

(b) Is made up of tough white fibrous tissue (2)

1.4.2 Which diagram (**1**, **2** or **3**) represents the eye of a person:

(a) In a very bright area (1)

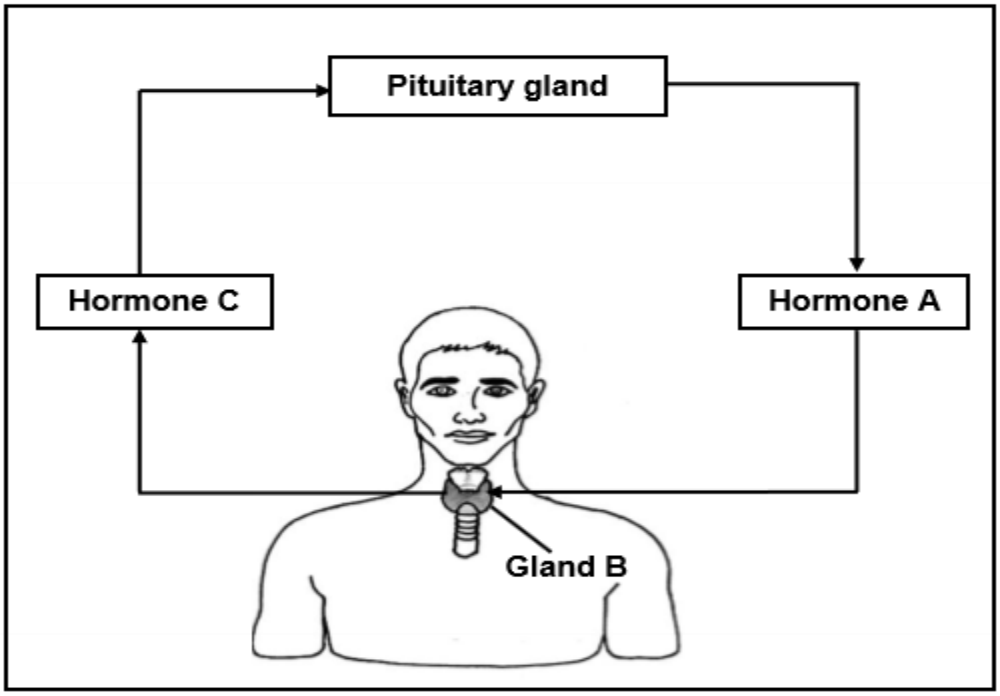
(b) Where the rods are stimulated the most (1)

1.4.3 Which muscles are:

(a) Contracted in diagram **2** (1)

(b) Relaxed in diagram **3** (1)
(8)

1.5 The diagram below shows the interaction between two endocrine glands.



1.5.1 Name the type of interaction that occurs between hormone **A** and gland **B**. (1)

1.5.2 Identify:

(a) Gland **B** (1)

(b) Hormone **A** (1)

(c) Hormone **C** (1)

1.5.3 Name the disorder that results when gland **B** is overstimulated and becomes enlarged. (1)

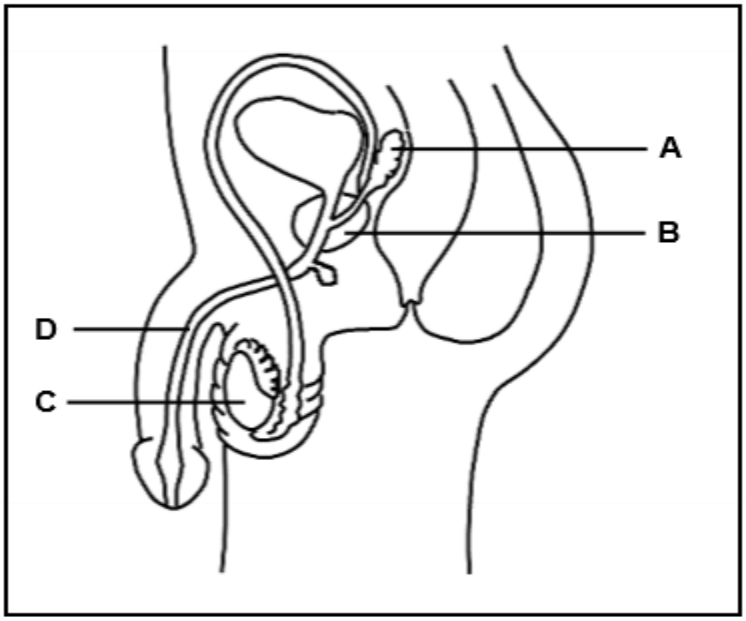
1.5.4 Which hormone (**A** or **C**) will be expected to be high in the blood of the person with the disorder named in QUESTION 1.5.3? (1)
(6)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents the human male reproductive system.



2.1.1 Identify structure **A**. (1)

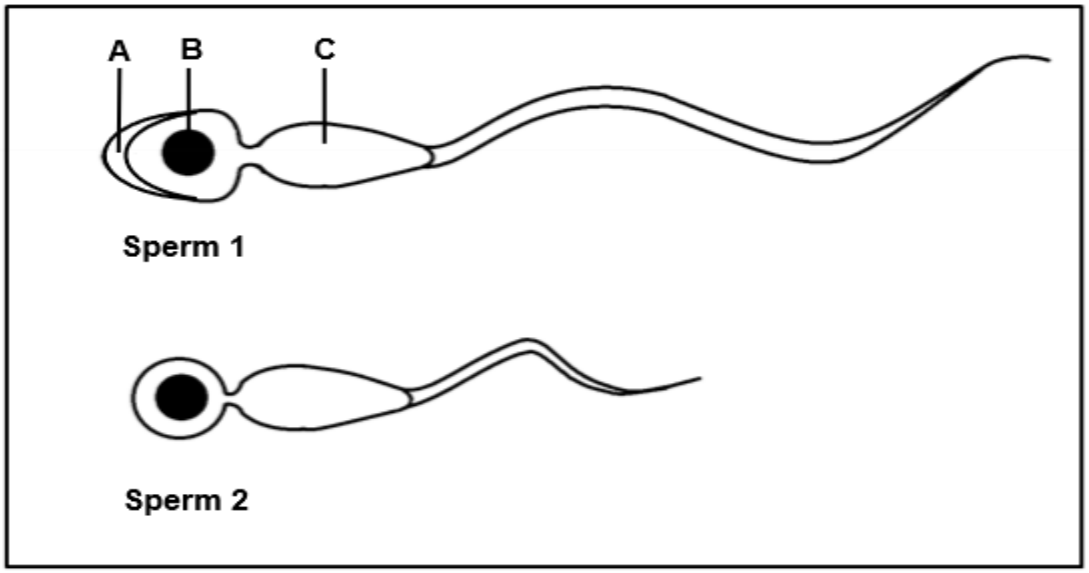
2.1.2 State ONE function of part **D** in reproduction. (1)

2.1.3 Give TWO reasons why structure **B** is NOT considered to be an endocrine gland. (2)

2.1.4 Name the type of gametogenesis that occurs in part **C**. (1)

2.1.5 Explain how the secretions of structures **A** and **B** improve the chances of fertilisation. (4)
(9)

2.2 The diagrams below show the structure of a normal and an abnormal sperm. (The diagrams are drawn to scale.)



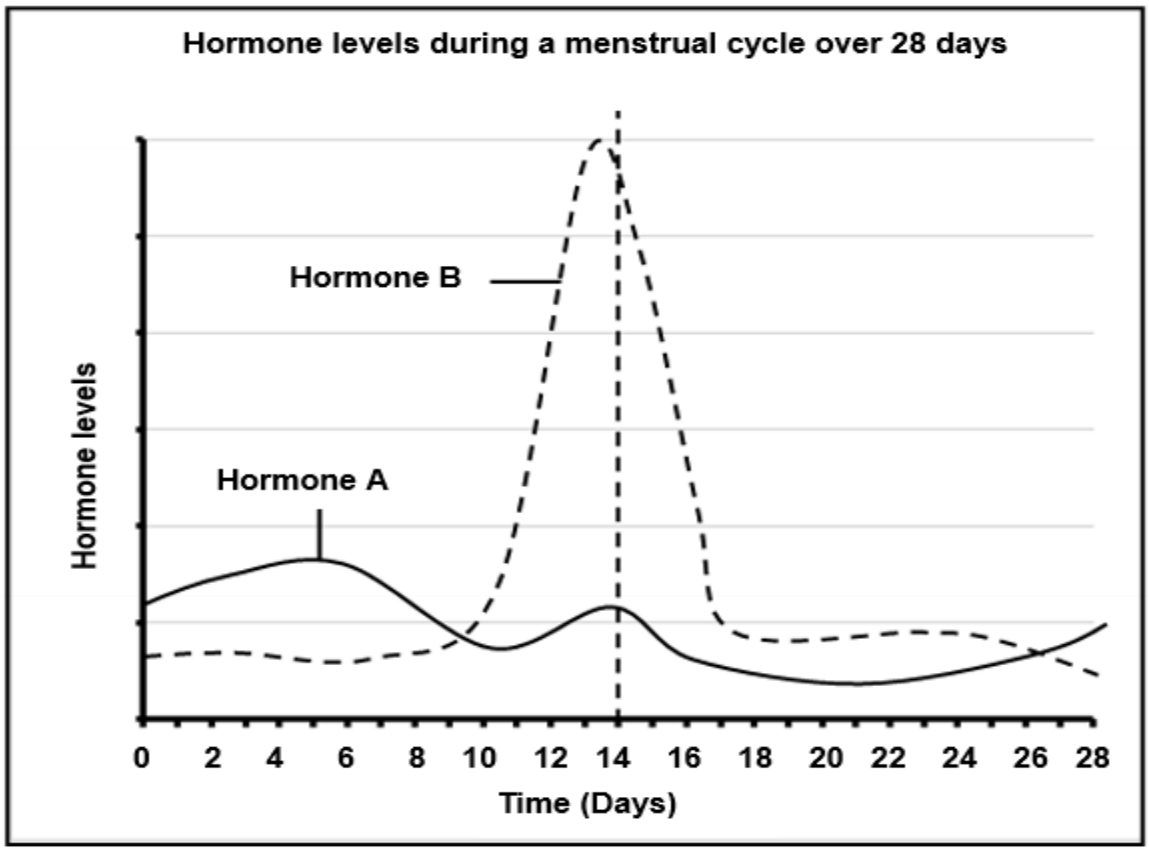
2.2.1 Identify part **A**. (1)

2.2.2 Describe the role of structure **B** during fertilisation. (1)

2.2.3 Explain the role of the organelles found in large numbers in part **C**. (2)

2.2.4 Explain TWO reasons why sperm **1** is structurally better suited for fertilisation than sperm **2**. (4)
(8)

2.3 The graph below shows the levels of two hormones that are secreted by the pituitary gland during the menstrual cycle.



2.3.1 State TWO functions of hormone **B**. (2)

2.3.2 Explain why a female who is struggling to get pregnant:

(a) May be given pills containing hormone **A** as a treatment (3)

(b) Will have her levels of hormone **B** constantly monitored (2)

2.3.3 Explain how the levels of hormone **A** on days 0 to 5 will differ in a pregnant female. (3)
(10)

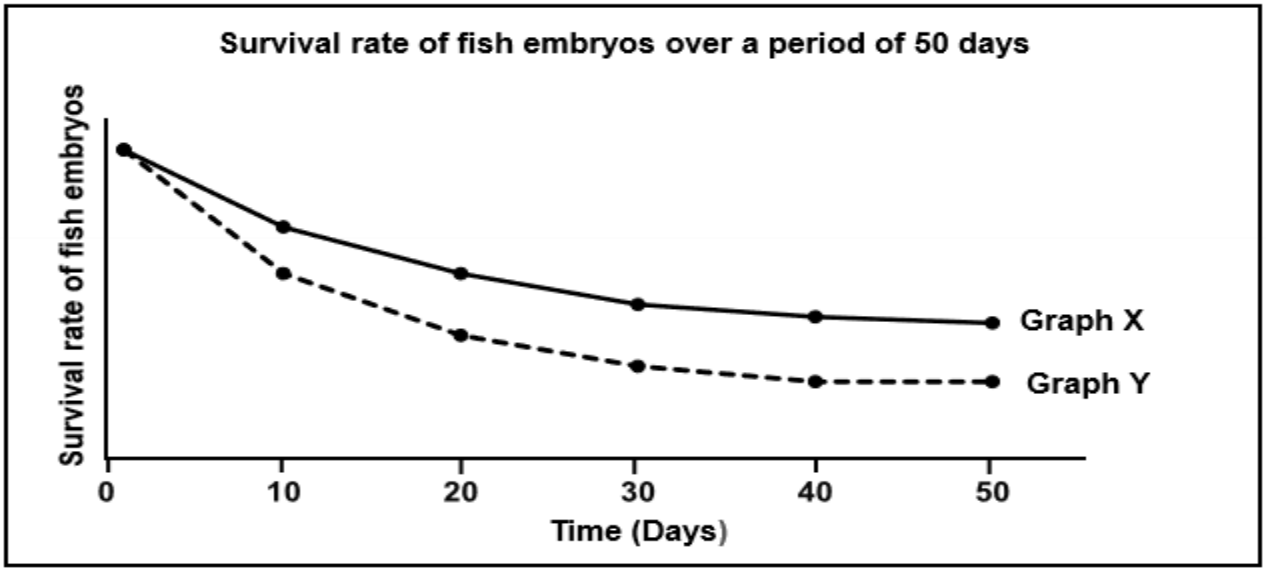
2.4 Describe the secretion of the ovarian hormones and their role in the menstrual cycle. **(5)**

2.5 Read the extract below.

Anchovy is a type of fish found in the Pacific Ocean. During the breeding season, the females and males gather in large groups and release ova and semen into the water. Once fertilised, the eggs float in the water and embryonic development occurs until hatching.

The northern pike fish is found mainly in rivers. During the breeding season, the female releases thousands of ova and the male releases semen all around the female. The fertilised eggs attach to vegetation near the riverbed, where embryonic development occurs until hatching.

The graph below shows the survival rate of both fish species.



2.5.1 Name the type of fertilisation that takes place in both fish species. (1)

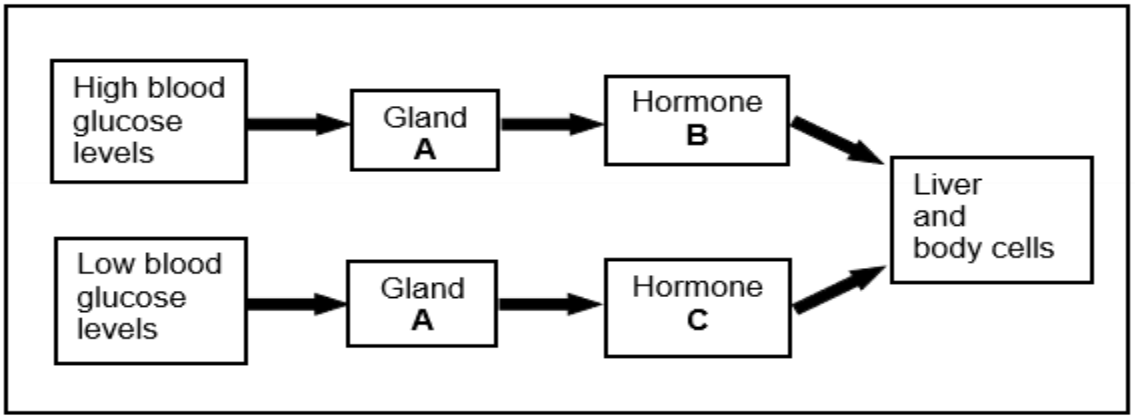
2.5.2 Explain why both fish species are oviparous. (2)

2.5.3 Describe TWO ways in which the chances of fertilisation are increased in the northern pike fish. (2)

2.5.4 Which graph (**X** or **Y**) represents the survival rate of the northern pike fish? (1)

2.5.5 Explain your answer to QUESTION 2.5.4. (3)
(9)

2.6 The diagram below shows the homeostatic control of blood glucose levels.



2.6.1 Identify:

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

(b) Hormone **C** (1)

2.6.2 A certain disorder causes decreased production of hormone **B**.

(a) Explain how this will affect the blood glucose levels. (3)

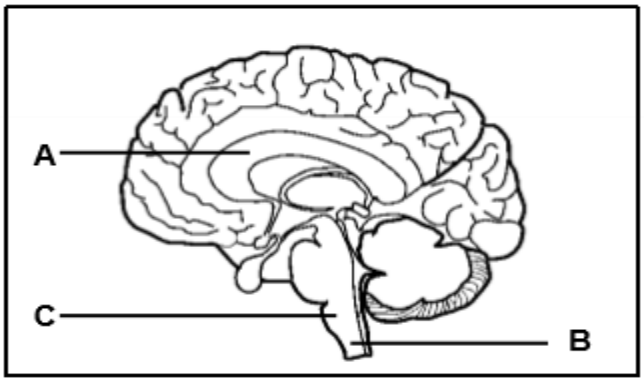
(b) Name the disorder. (1)

2.6.3 Scientists have been investigating the use of adrenalin as a treatment for people who cannot produce hormone **C**.

Explain why this treatment may work. (3)
(9)
[50]

QUESTION 3

3.1 The diagram below shows a part of the human brain.



3.1.1 Identify part **A**. (1)

3.1.2 Explain why a person may die if part **C** is damaged. (2)

3.1.3 Part **B** is damaged in a person's lower back.

(a) Identify part **B**. (1)

(b) Explain why the person will have no control of the skeletal muscles of the legs. (2)
(6)

3.2 The table below shows the recorded number of severe brain injuries per 100 000 people per year in different regions of the world.

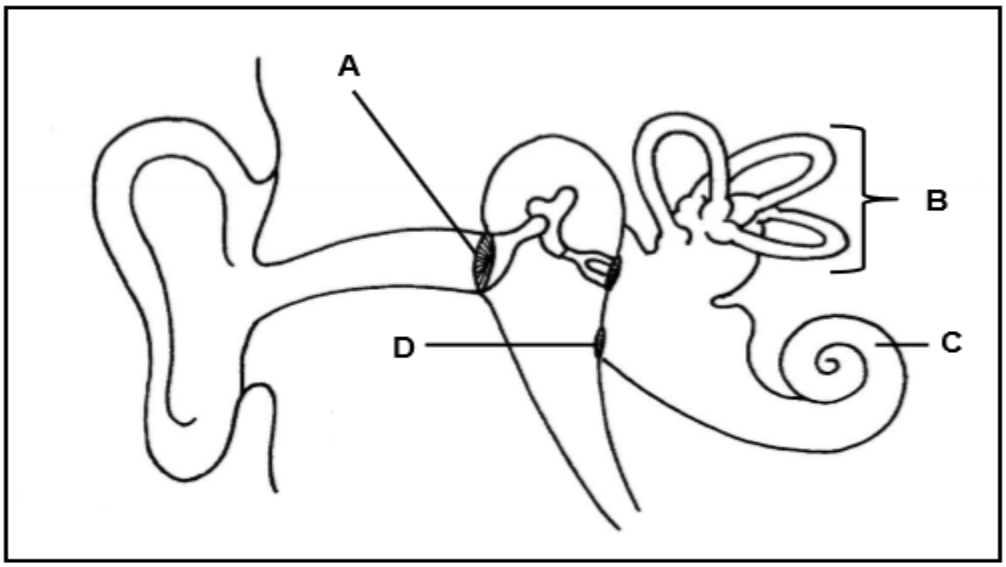
REGIONS OF THE WORLD	NUMBER OF SEVERE BRAIN INJURIES (PER 100 000 PEOPLE PER YEAR)
Latin America	900
USA and Canada	1 300
East Mediterranean	890
Europe	1 010
Africa	800

3.2.1 Which region has the smallest number of severe brain injuries? (1)

3.2.2 Explain why this data may not be accurate for the region named in QUESTION 3.2.1. (2)

3.2.3 Draw a bar graph to represent the data in the table. (6)
(9)

3.3 The diagram below represents a part of the human ear.



3.3.1 Identify part **C**. (1)

3.3.2 State ONE function of:

(a) Part **D** (1)

(b) The receptors found in part **C** (1)

3.3.3 Explain why a build-up of ear wax at part **A** may result in temporary hearing loss. (2)

3.3.4 A grommet is a small device that allows the air to move into and out of the middle ear. This prevents pressure build-up in the middle ear.

Explain how the use of grommets in the treatment of middle-ear infections prevents hearing loss. (4)

3.3.5 Describe how the receptors in part **B** are involved in maintaining balance when there are changes in the speed and direction of movement of the head. (4)
(13)

3.4 Wearing a face mask is recommended to reduce the spread of the coronavirus. There are some concerns about the efficiency of breathing when wearing a face mask.

Scientists investigated the effect of wearing face masks on the carbon dioxide levels in blood.

They:

- Obtained permission from 150 healthy volunteers, aged 30, to participate in the investigation
- Applied a sensor to the participants' skin to measure the carbon dioxide levels in the blood
- Asked the participants to:
  - Sit still for 10 minutes without wearing a face mask
  - Sit still for 10 minutes while wearing a face mask
  - Exercise for 10 minutes without wearing a face mask
  - Exercise for 10 minutes while wearing a face mask
- Allowed a 15-minute interval between each 10-minute phase
- Recorded the carbon dioxide levels at the end of each 10-minute phase
- Ensured that the face mask covered the nose and mouth

3.4.1 Identify the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.4.2 State TWO factors that were taken into consideration in the selection of the participants. (2)

3.4.3 Give ONE reason why the results at the end of this investigation may be considered reliable. (1)

3.4.4 Explain why scientists allowed a 15-minute interval between each phase. (2)

3.4.5 Give a reason why the carbon dioxide levels were measured while participants were sitting still. (1)

3.4.6 Describe the *homeostatic control* of carbon dioxide when it is high in blood. (7)
(15)

3.5 Read the extract below.

> Auxins control different aspects of growth and development in plants. They are known to influence the growth of stems and they also stimulate the development of new roots on stem cuttings in plant propagation.
>
> During plant propagation, a stem of a plant is cut and is then placed in water containing small quantities of artificial auxins. The auxins stimulate root development in the cuttings.

3.5.1 Name TWO places in plants where auxins are produced. (2)

3.5.2 State TWO ways in which auxins cause an increase in the length of stems. (2)

3.5.3 Name ONE other plant hormone that causes an increase in the length of stems. (1)

3.5.4 Explain how auxins can be used in plant propagation to the advantage of nature conservation. (2)
(7)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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Department:
Basic Education
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GRADE 12

LIFE SCIENCES P1

NOVEMBER 2022

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 10 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	C✓✓		
	1.1.2	A✓✓		
	1.1.3	D✓✓		
	1.1.4	C✓✓		
	1.1.5	D✓✓		
	1.1.6	B✓✓		
	1.1.7	D✓✓		
	1.1.8	C✓✓		
	1.1.9	B✓✓		
	1.1.10	D✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Cranium✓		
	1.2.2	Thermoregulation✓		
	1.2.3	Cataract✓		
	1.2.4	Umbilical artery✓		
	1.2.5	Hypothalamus✓		
	1.2.6	Peripheral✓ nervous system		
	1.2.7	Chorionic villi✓		
	1.2.8	Aldosterone✓		
	1.2.9	Amniotic✓ fluid		
	1.2.10	Fovea centralis✓/ yellow spot	(10 x 1)	**(10)**
1.3	1.3.1	B only✓✓		
	1.3.2	A only✓✓		
	1.3.3	Both A and B✓✓	(3 x 2)	**(6)**
	1.4.1	(a) B✓ - Iris✓		(2)
		(b) A✓ - Sclera✓		(2)
	1.4.2	(a) 2✓		(1)
		(b) 3✓		(1)
	1.4.3	(a) Circular✓ muscles		(1)
		(b) Circular✓ muscles		(1)
				(8)
1.5	1.5.1	Negative feedback✓ mechanism		(1)
	1.5.2	(a) Thyroid✓		(1)
		(b) TSH✓/thyroid stimulating hormone		(1)
		(c) Thyroxin✓		(1)
	1.5.3	Goitre✓		(1)
	1.5.4	Hormone A✓		(1)
				(6)
			TOTAL SECTION A:	**50**

SECTION B

QUESTION 2

2.1	2.1.1	Seminal vesicle✓		(1)
	2.1.2	Transports semen out of the body✓ **(Mark first ONE only)**		(1)
	2.1.3	- Transports its secretions in ducts✓/ secretion not directly in blood - Does not produce a hormone✓ **(Mark first TWO only)**		(2)
	2.1.4	Spermatogenesis✓		(1)
	2.1.5	- The secretion is alkaline ✓ to neutralise the acidity of the vagina✓/ urethra - The secretion contains nutrients✓ for the sperm to generate energy for movement✓ - The secretion is a fluid✓/mucus which facilitates the movement of the sperm cells✓	Any (2 x 2)	(4) **(9)**
2.2	2.2.1	Acrosome✓		(1)
	2.2.2	- Fuses with the nucleus of the ovum✓ - Carries genetic material✓	Any	(1)
	2.2.3	- Produce energy✓/ site for cellular respiration - which is needed for movement✓ of the sperm		(2)
	2.2.4	- The oval/torpedo-shaped head✓ - will facilitate faster movement✓ - The presence of an acrosome✓/part **A** - enables the sperm to penetrate the ovum✓ - A longer tail✓ - ensures faster movement✓ **(Mark first TWO only)**	Any (2 x 2)	(4) **(8)**
2.3	2.3.1	- Stimulates ovulation✓ - Stimulates the development of the corpus luteum✓ **(Mark the first TWO only)**		(2)

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2.3.2 (a)
- FSH✓/a high concentration of hormone A
- will stimulate follicles to develop✓
- Therefore, ova will be produced✓ increasing the chances to fall pregnant (3)

(b)
- A peak in hormone B✓/LH
- will indicate that ovulation is about to happen✓
- therefore, an ovum will be available for fertilisation✓ Any (2)

2.3.3
- The levels will remain low✓ because
- the high progesterone levels✓ during pregnancy
- will inhibit the secretion of FSH✓ /hormone A (3)

(10)

2.4
- The Graafian follicle✓
- secretes oestrogen✓
- causing the endometrium to become thicker✓/more glandular or vascular
- The corpus luteum✓
- secretes progesterone✓
- which (further) increases the thickness of the endometrium✓
- High levels of progesterone inhibit FSH secretion✓ Any **(5)**

2.5 2.5.1 External✓ fertilisation (1)

2.5.2
- Their embryos develop inside eggs✓ that are
- outside the body of the female✓ (2)

2.5.3
- The males release semen all around the female✓
- A large number of gametes/ ova are produced✓ (2)

2.5.4 Graph X✓ (1)

2.5.5
- They will have a higher number of surviving embryos✓/eggs/offspring
- Because their fertilised eggs are attached to the vegetation✓
- where they are protected from predators✓/washing away (3)

(9)

2.6	2.6.1	(a) Pancreas✓ /Islets of Langerhans	(1)
		(b) Glucagon✓	(1)
	2.6.2	(a) - The blood glucose levels will remain high✓ - because the cells will not be able to absorb glucose✓ from the blood - excess glucose cannot be converted to glycogen by the liver✓/ muscles	(3)
		(b) Diabetes✓mellitus	(1)
	2.6.3	- Adrenalin stimulates the liver✓ - to convert glycogen to glucose✓ - to increase the blood glucose levels✓	(3) **(9)** **[50]**

QUESTION 3

3.1 3.1.1 Corpus callosum✓ (1)

3.1.2 - It controls vital processes✓/heartbeat/breathing
- which will stop✓ when it is damaged (2)

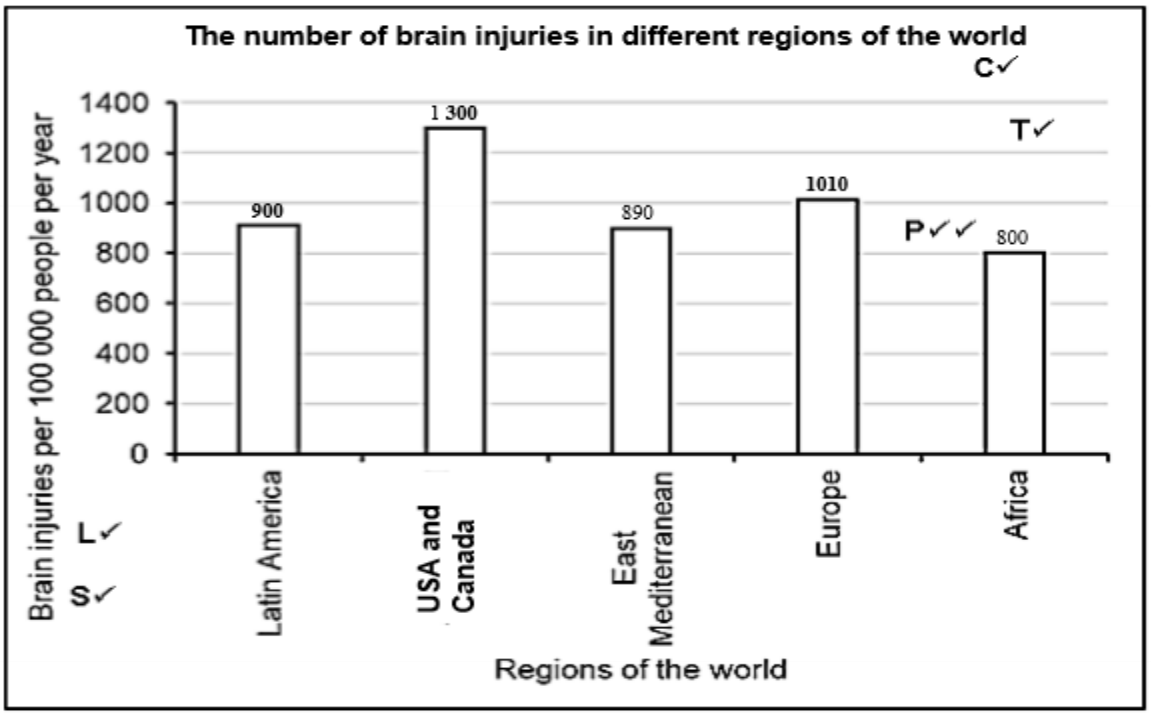
3.1.3 (a) Spinal cord✓ (1)

(b) - The impulses from the cerebrum✓
- are not transmitted✓ to the skeletal muscles (2)
(6)

3.2 3.2.1 Africa✓ (1)

3.2.2 - Not all brain injuries are recorded✓
- due to poor health facilities✓ (2)

3.2.3



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 (L)	1
Correct scale for Y-axis Equal spaces between bars and equal width of bars for X-axis (S)	1
Plotting: (P) 1-4 co-ordinates plotted correctly All 5 co-ordinates plotted correctly	 1 2

(6)
(9)

3.3	3.3.1	Cochlea✓	(1)
	3.3.2	(a) Absorbs excess pressure waves✓/releases pressure from the inner ear/ prevents an echo **(Mark first ONE only)**	(1)
		(b) It converts stimuli/pressure waves into impulses✓ **(Mark first ONE only)**	(1)
	3.3.3	- Part A/tympanic membrane will not be able to vibrate✓/vibrate freely - No/less vibrations will be carried to the middle ear✓/ossicles	(2)
	3.3.4	- Middle ear infections cause fluid build-up in the middle ear✓ - which can block the Eustachian tube✓ - The grommet will release the pressure✓ that will build up in the middle ear/ drain the fluid from the middle ear - The pressure on either side of the tympanic membrane is equalised✓ - preventing the tympanic membrane from rupturing✓ and - allowing the ossicles to vibrate freely✓ Any	(4)
	3.3.5	- The cristae are stimulated✓ and - convert the stimuli into impulses✓ - The impulses are sent via the auditory nerve✓ - to the cerebellum✓ - which interprets the information✓ and - sends impulses to the skeletal muscles✓ to restore balance Any	(4) **(13)**
3.4	3.4.1	(a) Wearing of a facemask✓	(1)
		(b) Carbon dioxide levels in blood✓	(1)
	3.4.2	- Age✓ - Healthy✓ individuals **(Mark first TWO only)**	(2)
	3.4.3	150 volunteers were used✓ **(Mark first ONE only)**	(1)
	3.4.4	- To allow the carbon dioxide levels in the blood to go back to normal✓ - so that each phase will have the same carbon dioxide level as a starting point✓	(2)
	3.4.5	- To act as a control ✓/baseline - To see if it is the facemask that affects the carbon dioxide levels and not the physical activity✓ Any	(1)

	3.4.6	- 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 taken to the lungs✓ - The breathing muscles✓/intercostal muscles and diaphragm - contract more actively✓ and - the rate/ depth of breathing increases✓ - More carbon dioxide is exhaled✓ - The carbon dioxide level in the blood decreases✓ /returns to normal Any	(7) **(15)**
3.5	3.5.1	- (Apical) tip of the stem✓ /apical bud - (Apical) tip of the root✓ **(Mark first TWO only)**	(2)
	3.5.2	- Stimulate cell division✓/mitosis - Stimulate cell elongation✓ **(Mark first TWO only)**	(2)
	3.5.3	Gibberellins✓ **(Mark first ONE only)**	(1)
	3.5.4	- Increased plant growth✓ - saves species that are facing extinction✓	(2) **(7)** **[50]**

TOTAL SECTION B: 100
GRAND TOTAL: 150

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basic education

Department:
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REPUBLIC OF SOUTH AFRICA

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GRADE 12

LIFE SCIENCES P1

NOVEMBER 2023

MARKS: 150

TIME: 2½ hours

This question paper consists of 19 pages.

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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.

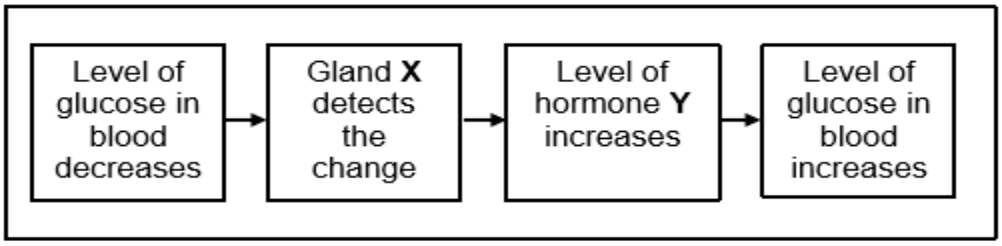
1.1.1 Which ONE of the following parts controls the amount of light entering the eye by influencing the size of the pupil?

A Sclera
B Cornea
C Retina
D Iris

1.1.2 The function of the umbilical vein is to transport …

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

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



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

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

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

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

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

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

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

Which ONE of the following changes occurred in her eyes?

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

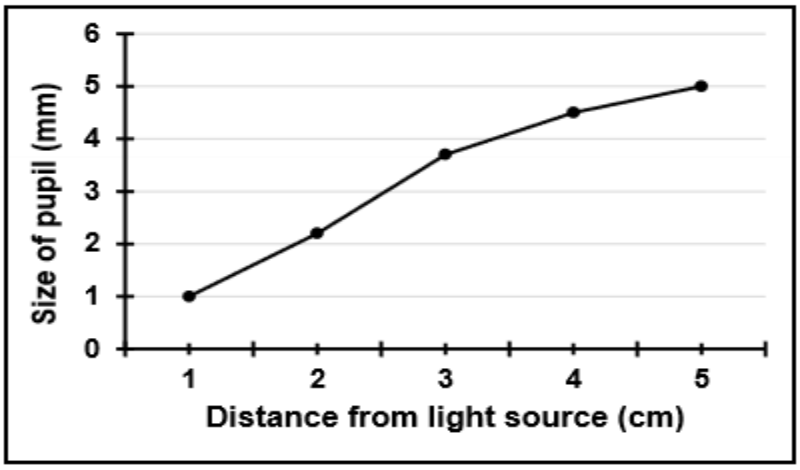
1.1.7 One of the characteristics of a sperm that causes it to move faster is the …

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

1.1.8 In a person suffering from long-sightedness, …

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

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



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

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

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

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

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

A (i), (ii), (iii), (iv) and (v)
B (ii), (iii), (iv) and (v) only
C (ii) and (iii) only
D (iii) only (10 x 2) **(20)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.8) in the ANSWER BOOK.

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

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

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

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

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

1.2.6 The pigmented layer of the eye that absorbs excess light

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

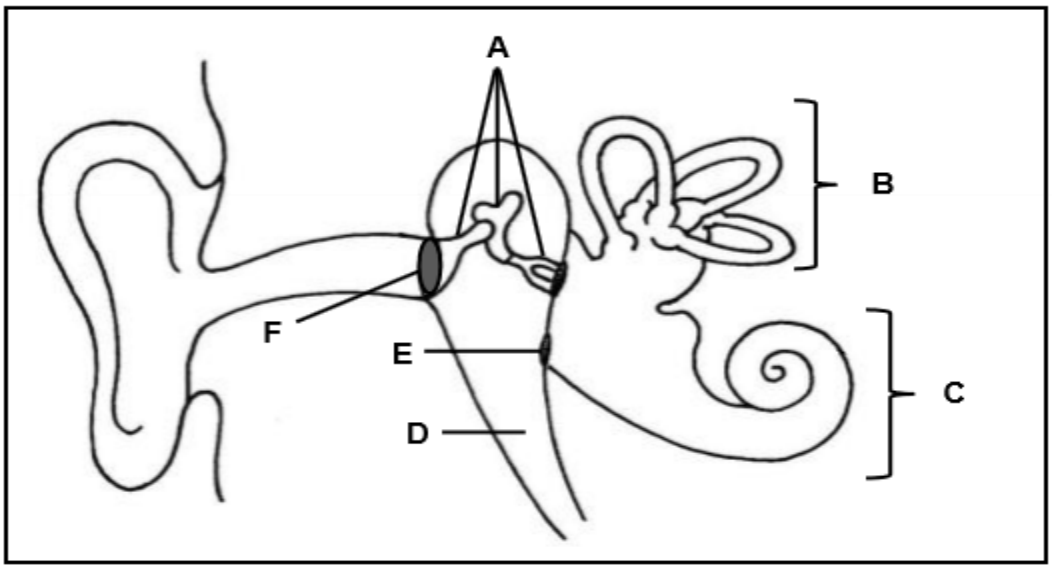
1.2.8 The part of the male reproductive system which temporarily stores sperm until they mature (8 x 1) **(8)**

1.3 Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

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

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

1.4 The diagram below represents the human ear.



1.4.1 Identify part:

(a) **B** (1)

(b) **E** (1)

1.4.2 Give the LETTER and NAME of the part that:

(a) Is filled with air (2)

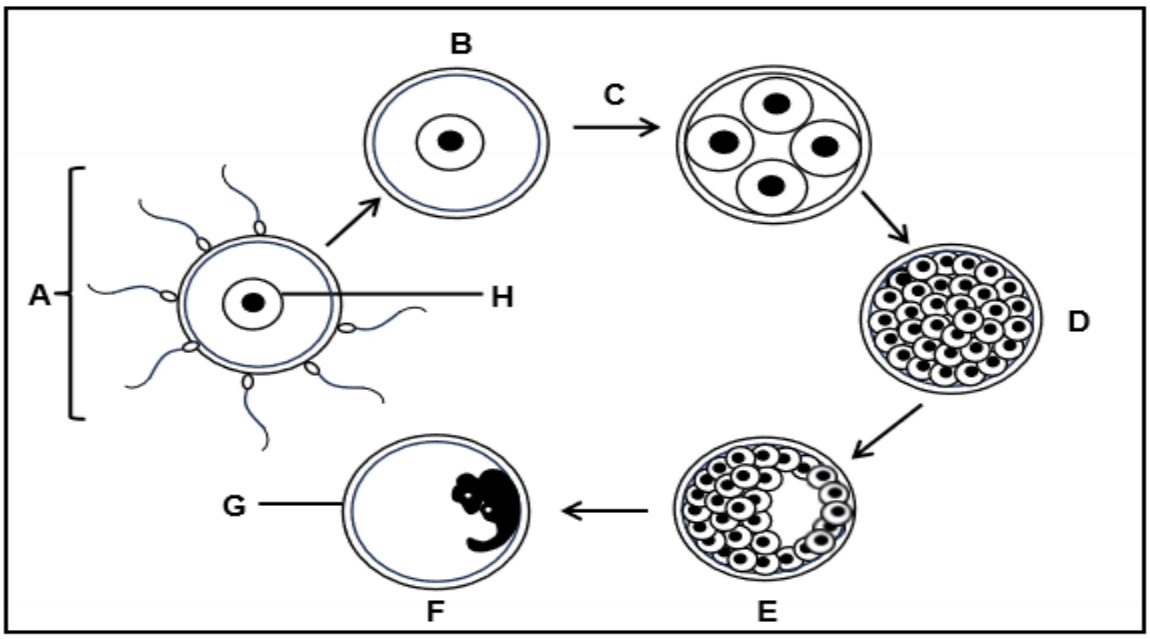
(b) Contains the organ of Corti (2)

1.4.3 Give the LETTER of the part:

(a) Where grommets are inserted (1)

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

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



1.5.1 Identify structure:

(a) **B** (1)

(b) **D** (1)

(c) **E** (1)

1.5.2 Name the:

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

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

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

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

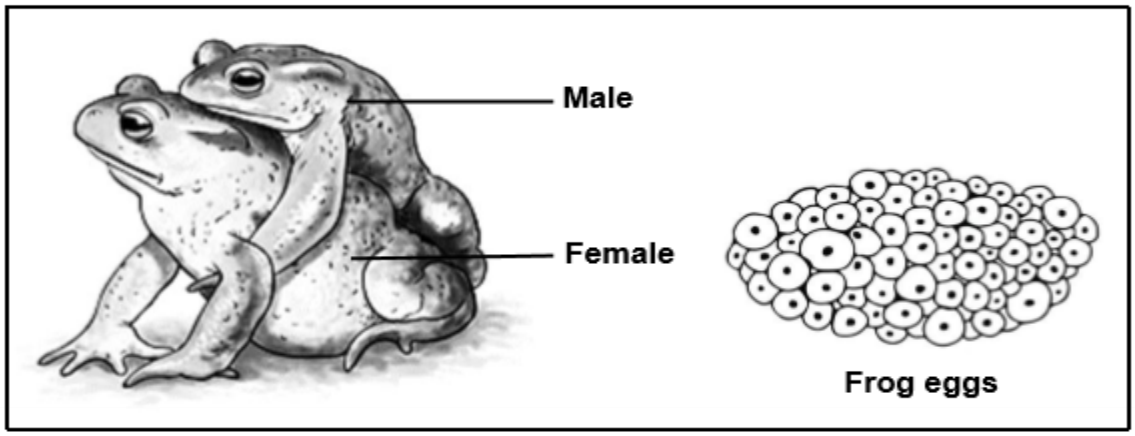
1.5.5 Identify the extra-embryonic membrane **G**. (1)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

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



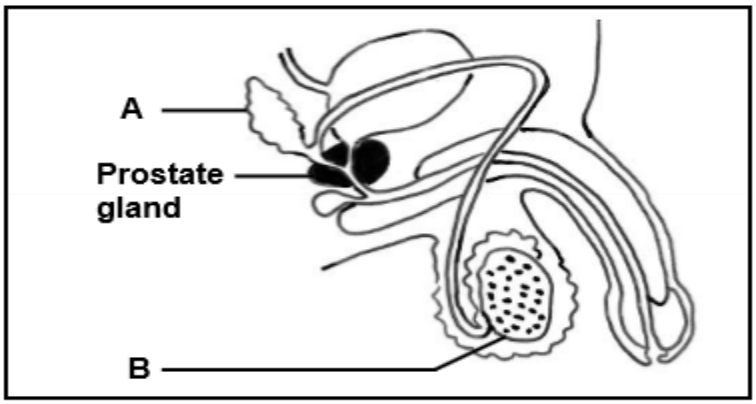
2.1.1 Name the type of fertilisation that occurs during reproduction in frogs. (1)

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

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

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

2.2 The diagram below represents the male reproductive system.



2.2.1 Name:

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

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

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

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

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

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

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

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

2.3 Read the extract below.

OVARIAN CYSTS IN FEMALES

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

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

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

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

2.3.1 From the extract, give:

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

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

2.3.2 Name the hormone:

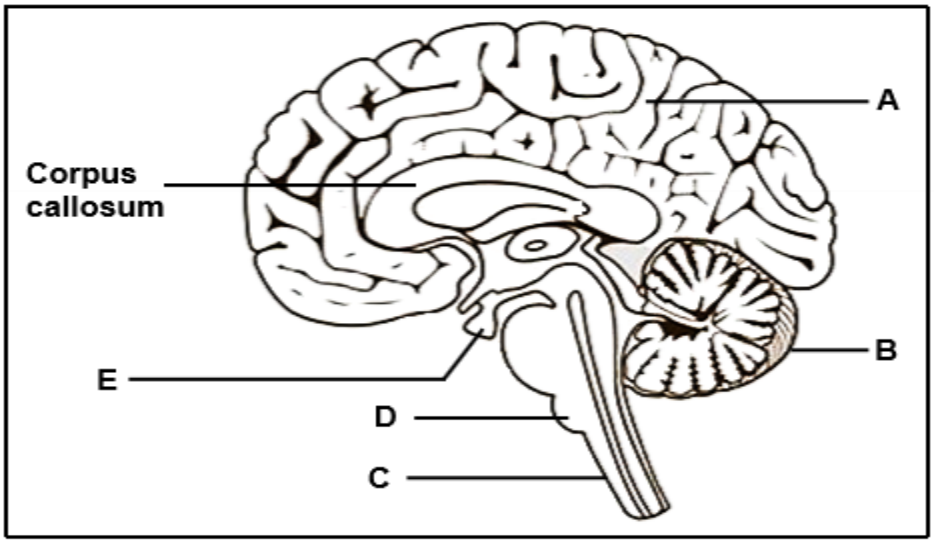
(a) Responsible for the growth of the follicle under normal conditions (1)

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

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

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

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



2.4.1 Identify:

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

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

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

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

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

Explain why:

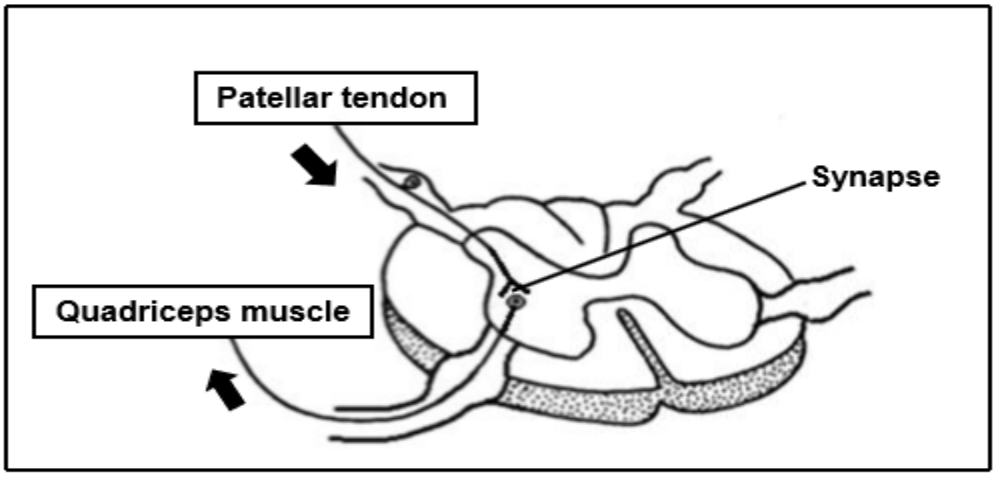
(a) The learner could still breathe properly (2)

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

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

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

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



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

2.5.2 State:

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

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

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

QUESTION 3

3.1 Read the extract below.

ALZHEIMER'S DISEASE AND EXERCISE

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

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

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

They:

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

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

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

3.1.2 From the extract, state:

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

(b) A genetic risk factor (1)

(c) TWO functions of the hippocampus (2)

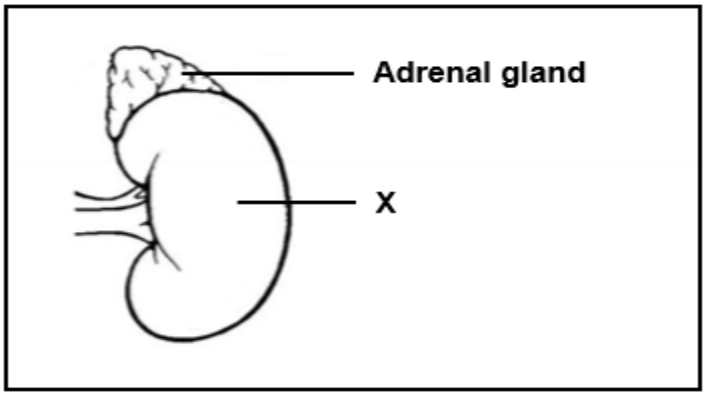
3.1.3 Name TWO factors that were considered when selecting the participants for this investigation. (2)

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

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

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

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



3.2.1 Identify:

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

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

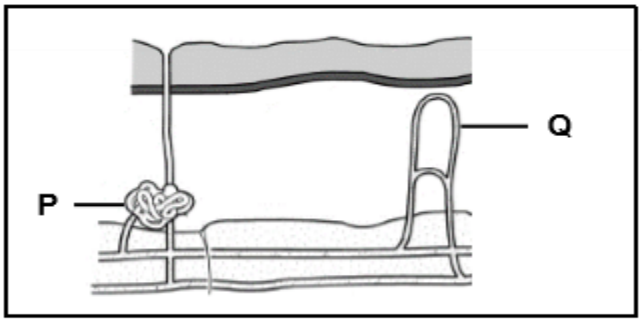
3.2.2 State TWO characteristics of the type of glands that belongs to the system identified in QUESTION 3.2.1(b). (2)

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

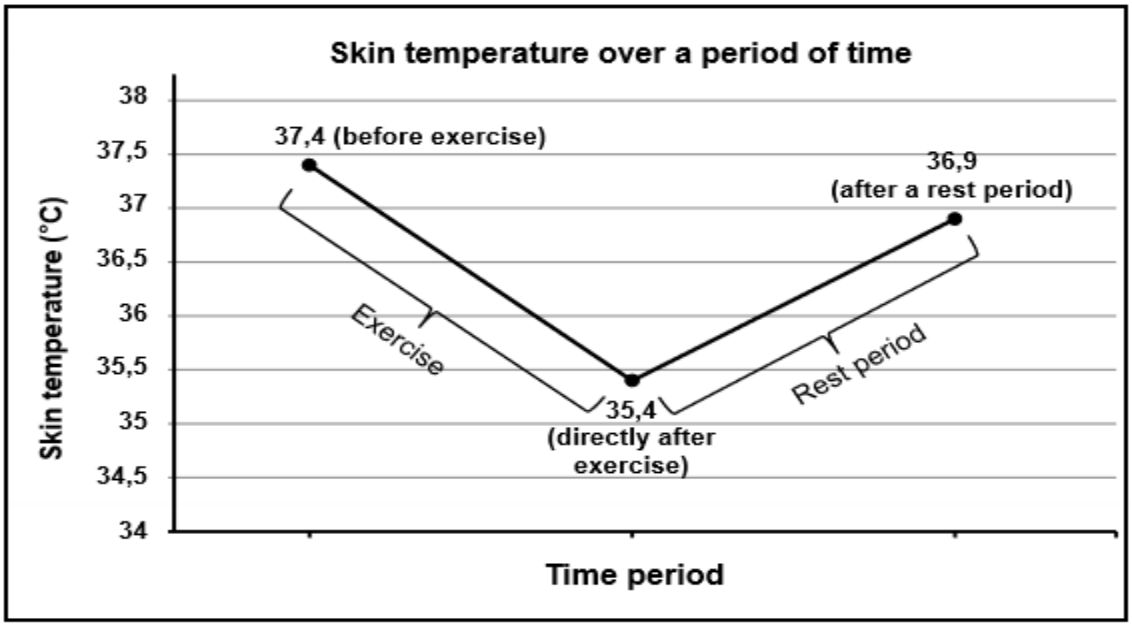
3.2.4 Explain the effect that a secretion of the pituitary gland will have on organ **X** when a person experiences dehydration. (5)
(14)

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

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



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



3.3.1 Name the:

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

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

3.3.2 From the diagram, identify the following parts:

(a) **P** (1)

(b) **Q** (1)

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

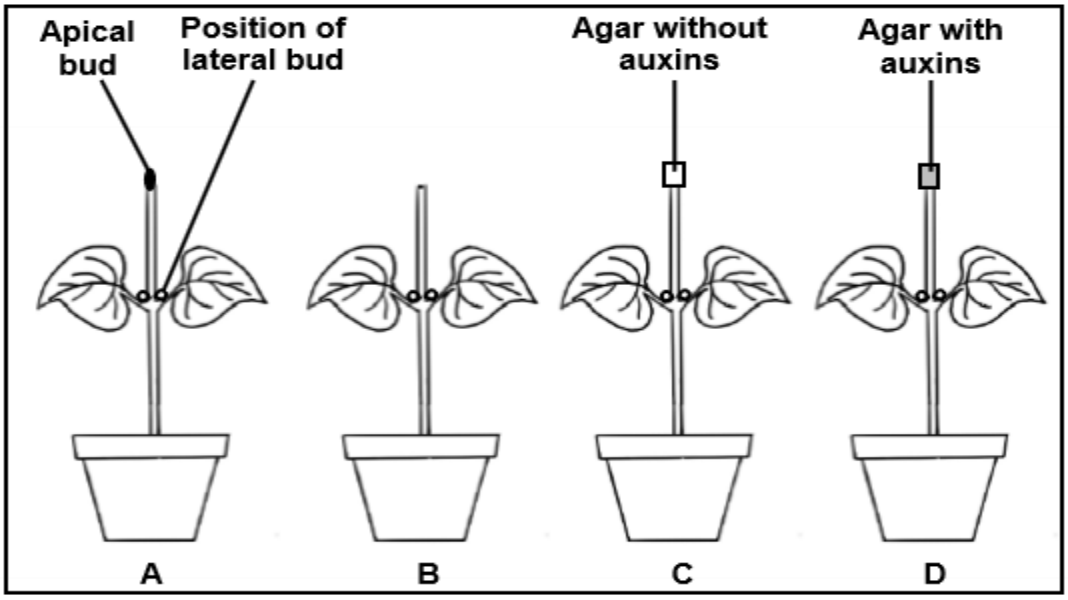
3.3.4 Explain the roles of part **P** and **Q** in the change in skin temperature from before exercise to directly after exercise. (6)
(13)

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

The procedure was as follows:

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

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



The results are shown in the table below.

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

3.4.1 For this investigation, state the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.4.2	Explain why all the plants were exposed to the same environmental conditions.	(2)
3.4.3	Explain why agar without auxins was used in plant **C**.	(3)
3.4.4	State a conclusion for this investigation.	(2)
		(9)
		[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2023

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 10 pages.

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SECTION A

QUESTION 1

1.1	1.1.1	D✓✓		
	1.1.2	D✓✓		
	1.1.3	A✓✓		
	1.1.4	C✓✓		
	1.1.5	C✓✓		
	1.1.6	B✓✓		
	1.1.7	A✓✓		
	1.1.8	B✓✓		
	1.1.9	A✓✓		
	1.1.10	C✓✓	(10 x 2)	**(20)**
1.2	1.2.1	Vivipary✓		
	1.2.2	Urethra✓		
	1.2.3	Peripheral✓ nervous system		
	1.2.4	Glycogen✓		
	1.2.5	Placenta✓		
	1.2.6	Choroid✓		
	1.2.7	Myelin sheath✓		
	1.2.8	Epididymis✓	(8 x 1)	**(8)**
1.3	1.3.1	B only✓✓		
	1.3.2	Both A and B✓✓		
	1.3.3	A only✓✓	(3 x 2)	**(6)**
1.4	1.4.1	(a) Semi-circular canals✓		(1)
		(b) Round window✓		(1)
	1.4.2	(a) D✓ Eustachian tube✓		(2)
		(b) C✓ Cochlea✓		(2)
	1.4.3	(a) F✓		(1)
		(b) A✓		(1)
				(8)
1.5	1.5.1	(a) Zygote✓		(1)
		(b) Morula✓		(1)
		(c) Blastocyst✓/blastula		(1)
	1.5.2	(a) Fertilisation✓		(1)
		(b) Endometrium✓		(1)
	1.5.3	Mitosis✓		(1)
	1.5.4	23✓		(1)
	1.5.5	Chorion✓		(1)
				(8)
			TOTAL SECTION A:	**50**

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SECTION B

QUESTION 2

2.1 2.1.1 External✓ fertilisation (1)

2.1.2 - The eggs will dry out✓
- because they have no shells✓/are not amniotic eggs /have no amnion (2)

2.1.3 - The male and female bodies are in close contact✓
so that sperm can be released directly onto the ova✓

OR

- Many/up to 6 000 ova are released✓
since fertilisation is external✓ Any (1 x 2) (2)
(Mark the first ONE only)

2.1.4 - Many/up to 6 000 ova are released✓
since fertilisation is external✓/increasing the chance that some will be fertilised

OR

- The male and female bodies are in close contact✓
so that sperm can be released directly onto the ova✓
(Mark the first ONE only) Any (1 x 2) (2)
(7)

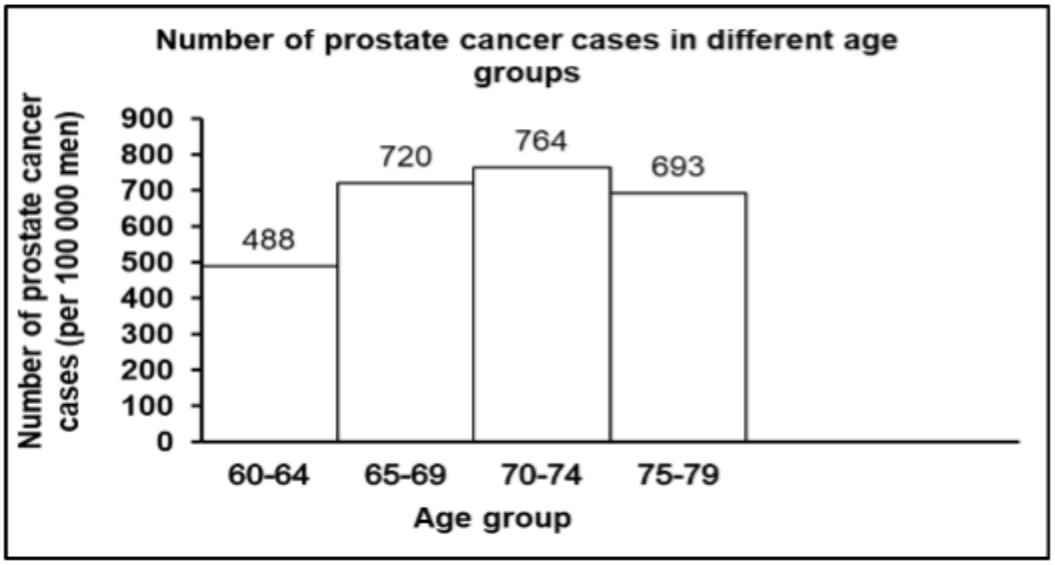
2.2 2.2.1 (a) Seminal vesicle✓ (1)

(b) Testosterone✓ (1)

2.2.2 - It is alkaline✓
to neutralise the acidic conditions of the vagina✓
- It contains mucus✓/provides medium
to facilitates the movement of the sperm✓
- It contains nutrients✓
to supply the sperm with energy✓ Any (1 x 2) (2)
(Mark first ONE only)

2.2.3 (a) (70 – 74) ✓ (1)

(b)



Criteria for marking of the graph:

Criteria	Mark allocation
Histogram is drawn (**T**)	1
Caption of the graph includes both variables (**C**)	1
Correct labels on the X-axis and Y-axis with correct unit on the Y-axis (**L**)	1
Correct scale for Y-axis and bars of equal width with no spaces for X-axis **(S)**	1
Plotting (**P**) correctly done for: 1- 3 age groups All 4 required age groups **only**	 1 2

(6)
(11)

If a bar graph or line graph is drawn, marks will be lost for:
- Type of graph
- Scale

If axes are transposed:
- Can get all marks if labels are also swopped and bars are horizontal
- If labels are not corresponding, then:
  - ➢ Marks will be lost for labels and scale
  - ➢ Plotting can get credit if coordinates are correct for given labels

2.3 2.3.1 (a) - (Graafian) follicle✓ and
- Corpus luteum✓ (2)
(Mark first TWO only)

(b) - (Intense) pain✓
- Internal bleeding✓ (2)
(Mark first TWO only)

	2.3.2	(a) FSH✓		(1)
		(b) Oestrogen✓ **OR** LH✓ **OR** FSH✓		(1)
	2.3.3	The Graafian follicle keeps on producing oestrogen✓/fails to rupture **OR** The increased secretion of oestrogen stimulates the secretion of LH✓ **OR** Excess production of FSH can cause the failure to ovulate✓/ Graafian follicle to rupture		(1)
	2.3.4	- The corpus luteum does not degenerate✓and - keeps on secreting progesterone✓ - This will inhibit the pituitary gland✓ - from secreting FSH✓ - Therefore no follicle will develop✓ and - no ovulation✓ will take place	Any	(5) **(12)**
2.4	2.4.1	(a) Spinal cord✓		(1)
		(b) Pituitary gland✓/hypophysis		(1)
	2.4.2	A✓		(1)
	2.4.3	Between the two hemispheres of the cerebrum✓✓		(2)
	2.4.4	(a) - Part **D**/ medulla oblongata which controls breathing✓ - was not injured✓		(2)
		(b) - The learner (occasionally) lost balance✓ - due to no coordination of voluntary movements✓ by part **B**		(2)
		(c) - The loss of memory indicates a possible injury to part **A**✓/the cerebrum - which is also responsible for hearing ✓/ (interpretation of) sound		(2) **(11)**
2.5	2.5.1	- A rapid involuntary/automatic response✓ - to a stimulus✓		(2)
	2.5.2	(a) It ensures that the impulse is transmitted in one direction✓ **(Mark first ONE only)**		(1)
		(b) It is important for balance✓/movement		(1)

2.5.3
- The impulse is transmitted from the receptors in the patellar tendon✓ through the
- sensory neuron✓ and the
- synapse✓to the
- motor neuron✓ and to the
- quadriceps✓muscle (5)

(Correct sequence is required) **(9)**
[50]

QUESTION 3

3.1 3.1.1
- Degeneration✓/wasting away of nerve tissue
- Plaque/proteins formed around the nerve tissue✓ Any (1)

(Mark first ONE only)

3.1.2 (a) Worsening ability to remember new information✓ (1)
(Mark first ONE only)

(b) Family history✓ (1)

(c)
- Learning ability✓
- Orientation✓ (2)

(Mark first TWO only)

3.1.3 They:
- Were all females✓/considered gender
- Were between the ages of 65 and 75✓/considered age group/age
- Did not show symptoms of Alzheimer's disease✓ Any (2)

(Mark first TWO only)

3.1.4 They:
- Used 37 participants✓
- Conducted the investigation three times a week✓
- Conducted the investigation for three months✓ Any (2)

(Mark first TWO only)

3.1.5
- Investigation did not establish the relationship between exercise and development of Alzheimer's disease✓
- since no changes in the nervous tissue were measured✓/ period was short

OR

- There was no control group✓
- to show that it is the exercise that improve blood flow✓/higher order-thinking abilities

OR

- People who did not show symptoms of Alzheimer's disease were used✓
- therefore, results do not show prevention of development of Alzheimer's disease✓ Any (1 x 2) (2)

3.1.6
- Exercise can improve blood flow to the brain✓ and
- it can maintain the volume of the hippocampus✓ which will
- prevent a decrease in higher order thinking✓/cognitive abilities/learning abilities (3)

(14)

3.2 3.2.1 (a) Kidney✓ (1)

(b) Endocrine✓ system (1)

3.2.2
- It releases hormones✓
- directly into the blood✓/and it is ductless (2)

(Mark first TWO only)

3.2.3
- Low salt levels are detected by receptor cells✓ in the kidney
- Adrenal glands are stimulated✓ to secrete
- more aldosterone✓
- which stimulates the renal tubules✓
- to be more permeable to salt✓
- This increases the reabsorption of salt✓ and
- the salt levels in the blood increase✓/return back to normal

Any (5)

3.2.4
- The secretion of ADH✓
- will increase✓
- which will increase the permeability✓
- of the renal tubules✓ in **X**
- so that more water is reabsorbed✓ from the filtrate (5)

(14)

3.3 3.3.1 (a) Thermoregulation✓ (1)

(b) Hypothalamus✓ (1)

3.3.2 (a) Sweat gland✓ (1)

(b) Capillary✓/blood vessel (1)

3.3.3 $\left.\frac{(37,4 - 35,4)}{37,4}\right\}$ ✓ x 100✓ = 5,35✓% (3)

3.3.4
- Skin temperature decreased✓/lowers from 37,4 °C to 35,4 °C
- because part **Q** dilated✓/vasodilated
- causing more blood to flow to the (surface of the) skin✓ and
- part **P** became (more) active✓/produced more sweat
- causing more heat to be lost✓ to the environment
- through evaporation✓/ radiation/ convection (6)

(13)

3.4	3.4.1	(a)	(Presence/absence of) auxins✓	(1)
		(b)	Growth of lateral branches✓	(1)
	3.4.2		- To ensure that the results are caused only by the presence of auxins✓ which - increases the validity✓ of the investigation	(2)
	3.4.3		- It acts as a control✓ - to show that the results of Plant **D**✓ - are caused by the (presence of) auxins✓ - and not the agar jelly✓ Any	(3)
	3.4.4		The presence of auxins slows down the growth of lateral branches✓✓ **OR** The absence of auxins stimulated the growth of lateral branches✓✓	(2) **(9)** **[50]**

TOTAL SECTION B: 100
GRAND TOTAL: 150

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