Province of the
EASTERN CAPE
EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Departement van Onderwys
Porofensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

GRADE 12



LIFE SCIENCES P1

MARKS: **150**

TIME: **2½ hours**

This question paper consists of 15 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answer to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. ALL drawings must be done in pencil and labelled in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass where necessary.
11. All calculations to be rounded off to TWO decimal spaces.
12. Write neatly and legibly.

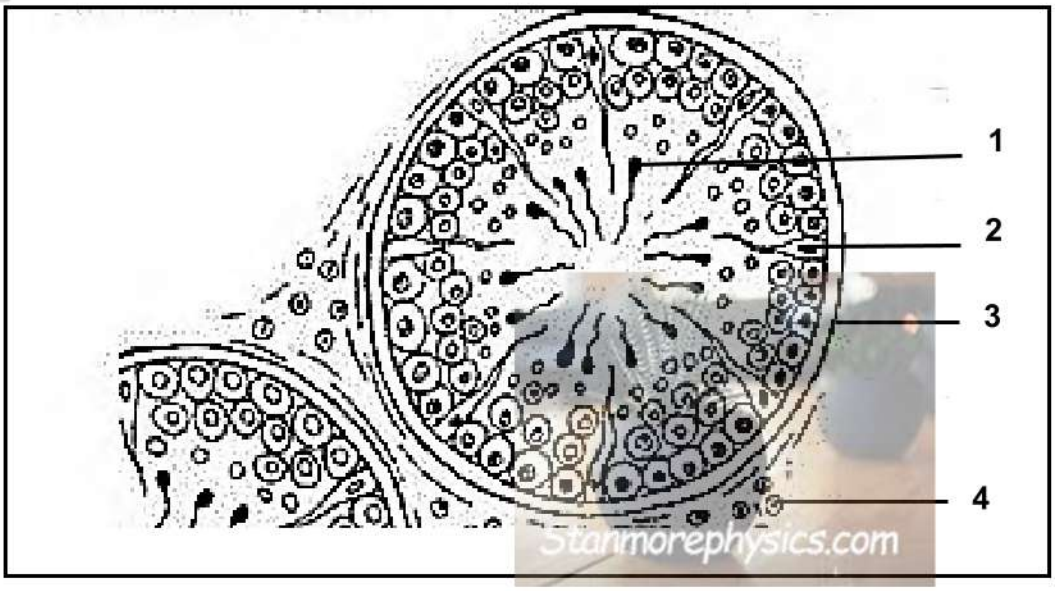
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SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, for example 1.1.10 D.

1.1.1 Study the diagram below showing a cross section through a testis.



The correct labels for 1–4 in the above diagram are:

	1	2	3	4
A	Sperm	Sertoli cells	Seminiferous tubule	Leydig cells
B	Leydig cells	Sperm	Sertoli cells	Seminiferous tubule
C	Sperm	Leydig cells	Seminiferous tubule	Sertoli cells
D	Sertoli cells	Seminiferous tubule	Sperm	Leydig cells

1.1.2 The cause of no insulin being secreted in the blood after meal(s).

A Goitre
B Diabetes Type 1
C Diabetes Type 2
D Hypoglycaemia

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1.1.3 Study the list below.

(i) The pupil will constrict.
(ii) The suspensory ligaments will pull taught.
(iii) The pupil will dilate.
(iv) More light will be allowed into the inner eye.

Which of the above statements describes the processes that take place in the eye to form a clear image in a dimly lit room?

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

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1.1.4 A person is unable to hear due to the organ of Corti being damaged. Which of the following treatments would improve the person's hearing?

A Cochlear implant
B Grommet
C Hearing aid
D Removal of cochlea

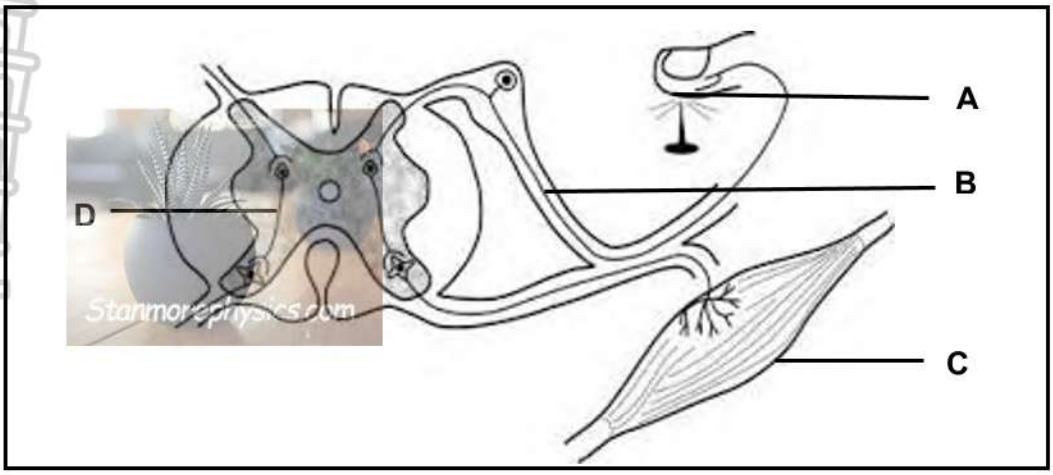
1.1.5 Which ONE of the following plant hormones is an effective weedkiller?

A Gibberellins
B Abscisic acid
C Auxin
D Ethylene

1.1.6 Which ONE of the following statements indicates the significance of a reflex action?

A It allows the cerebrum to interpret stimuli.
B It brings about a rapid, involuntary response.
C It prevents the person from feeling pain.
D It allows time for interpretation and a co-ordinated response.

1.1.7 The diagram below represents a reflex arc.



If part **B** is damaged …

A no pain will be felt, and the person will not be able to pull their finger away.
B pain will be felt, and the person will be able to pull their finger away.
C pain will be felt, and the person will not be able to pull their finger away.
D no pain will be felt, and the person will be able to pull their finger away.

1.1.8 Study the statements below.

(i) Less aldosterone will be secreted.
(ii) More sodium ions will be reabsorbed into blood.
(iii) More sodium ions will form part of the urine.
(iv) Sodium ions will remain in the renal tubule.

If sodium concentration in the blood is high, which of the above statements are TRUE?

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

1.1.9 The parasympathetic nervous system is responsible for the …

A increased blood flow to skeletal muscle.
B fight or flight response.
C returning of heart rate to normal.
D cranial nerves.

(9 x 2) (18)

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1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.9) in the ANSWER BOOK.

1.2.1 Responsible for detecting a stimulus and generating an impulse

1.2.2 Extra-embryonic membrane that allows for gaseous exchange in the amniotic egg

1.2.3 A gland or muscle that brings about a response to stimuli

1.2.4 Widening of blood vessels to increase blood flow

1.2.5 The type of lens required to correct short-sightedness

1.2.6 Glands found exclusively in mammals that under the influence of prolactin secrete milk

1.2.7 The layer of the eye which contains photoreceptors

1.2.8 The location of the osmoreceptors in the body

1.2.9 The microscopic gap between two neurons allowing impulses to be transmitted from one to the next

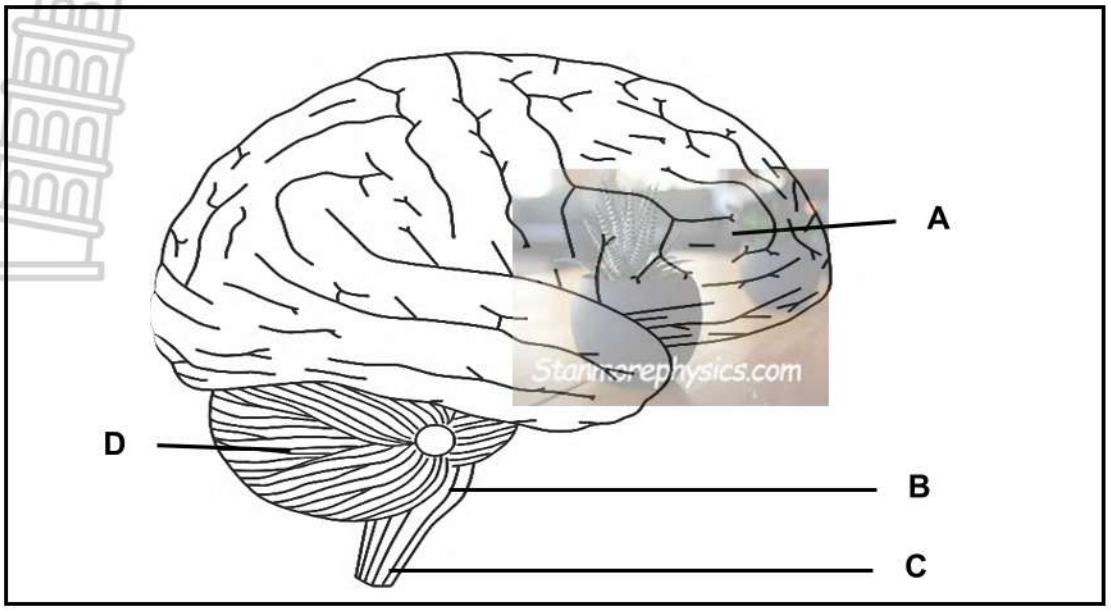
(9 x 1) (9)

1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B**, or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **BOTH A and B**, or **NONE** next to the question numbers (1.3.1 to 1.3.4) in the ANSWER BOOK.

	COLUMN I		COLUMN II
1.3.1	Role(s) of the placenta	A: B:	Maintenance of pregnancy Protects the foetus against mechanical injury
1.3.2	Functions of abscisic acid in plants	A: B:	To promote flowering To enable root development
1.3.3	Hormone(s) responsible for osmoregulation	A: B:	Aldosterone Anti-diuretic hormone
1.3.4	The loss of memory due to degeneration of nerve tissue	A: B:	Alzheimer's disease Multiple sclerosis

(4 x 2) (8)

1.4 The diagram below depicts parts of the central nervous system.



1.4.1 State the LETTER and NAME of the part most likely affected if a person experiences the following after an injury:

(a) Inability to write smoothly (2)

(b) Slurred speech (2)

(c) Irregular breathing and heart rate (2)

1.4.2 Explain TWO ways part **C** is protected against injury. (4)

1.5 Draw a fully labelled diagram of a sensory neuron. (5)
[50]

TOTAL SECTION A: 50

SECTION B

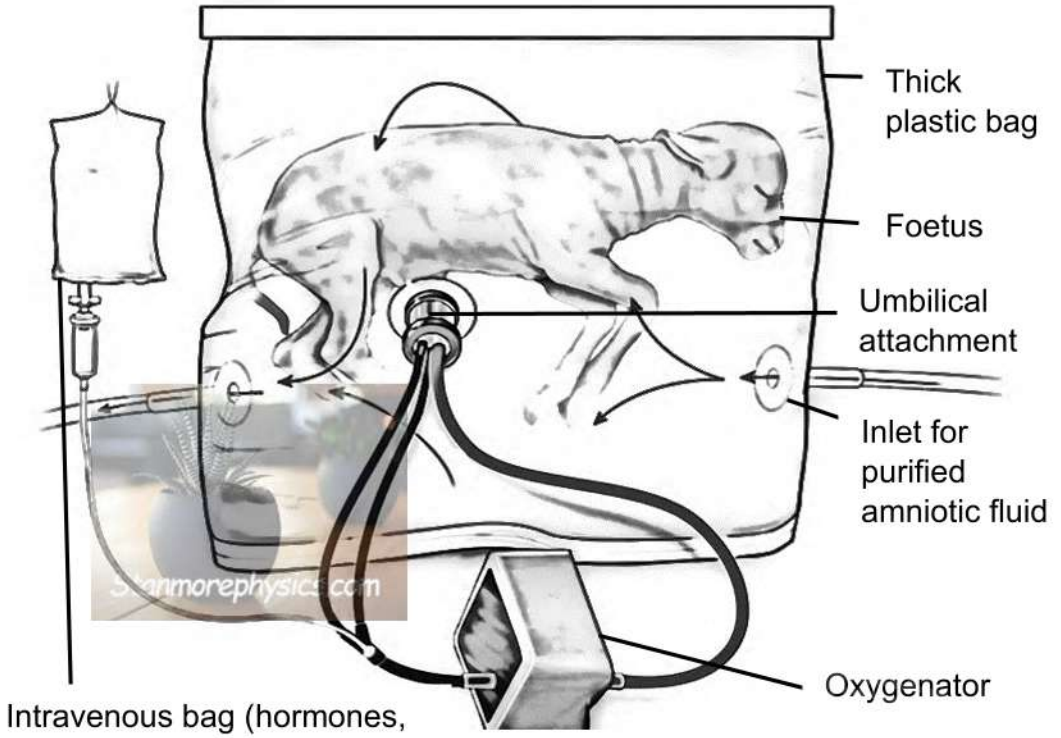
QUESTION 2

2.1 Read the extract below.

In South Africa, 84 000 preterm births occur annually. Preterm babies are those who are born alive before the full 40 weeks of pregnancy.

10% of these babies born are likely to die or experience acute respiratory, neurological, and eye problems compared to full-term babies due to being under-developed.

The 'biobag' in the diagram below, aims to create an artificial uterus for the developing foetus to continue its development in. Studies have shown this 'biobag' can be used to provide a lamb with all the necessary conditions to gestate to full term.



2.1.1 Calculate the number of premature babies, born in South Africa that are likely to die or experience acute respiratory, neurological, and eye problems. (3)

2.1.2 Identify ONE component of the biobag and explain how it would act as the:

(a) Amnion (2)

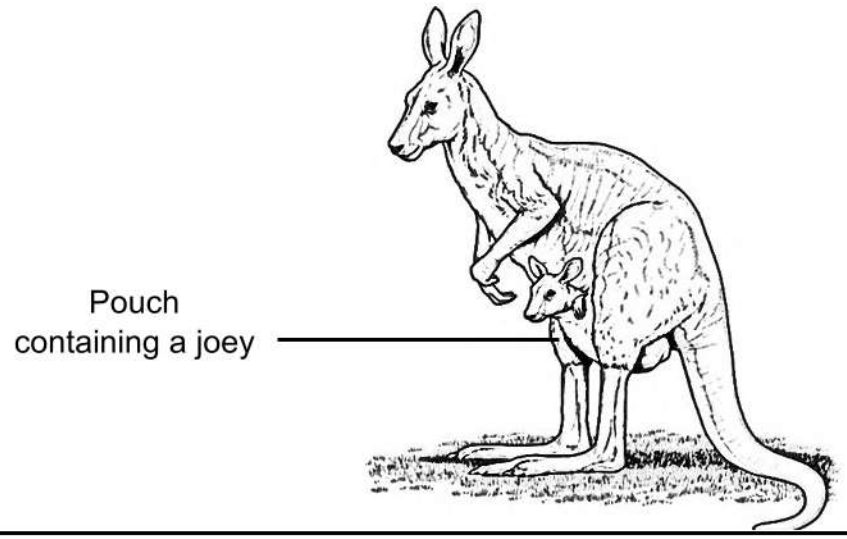
(b) Placenta (2)

2.1.3 Describe how the 'biobag' could eliminate risks of underdeveloped organs in preterm babies. (3)

2.1.4 List TWO ethical issues that would need to be considered before the introduction of this reproductive technology on human trials. (2)

2.2 Read the extract below.

The red kangaroo is the largest of all kangaroo species and is endemic to Australia. During copulation the male releases semen inside of the female's body and gestation takes 33 days until birth. The blind, naked and stumped legged baby kangaroo must crawl its way up the mother's fur to a pouch where it attaches onto a teat, that provides nourishment, and remains protected there for the next 190 days until becomes a joey. At 235 days the joey is ready to leave the mother's pouch full-time.



2.2.1 Identify the type of fertilisation that takes place in the red kangaroo. (1)

2.2.2 Give ONE reason for your answer in QUESTION 2.2.1. (1)

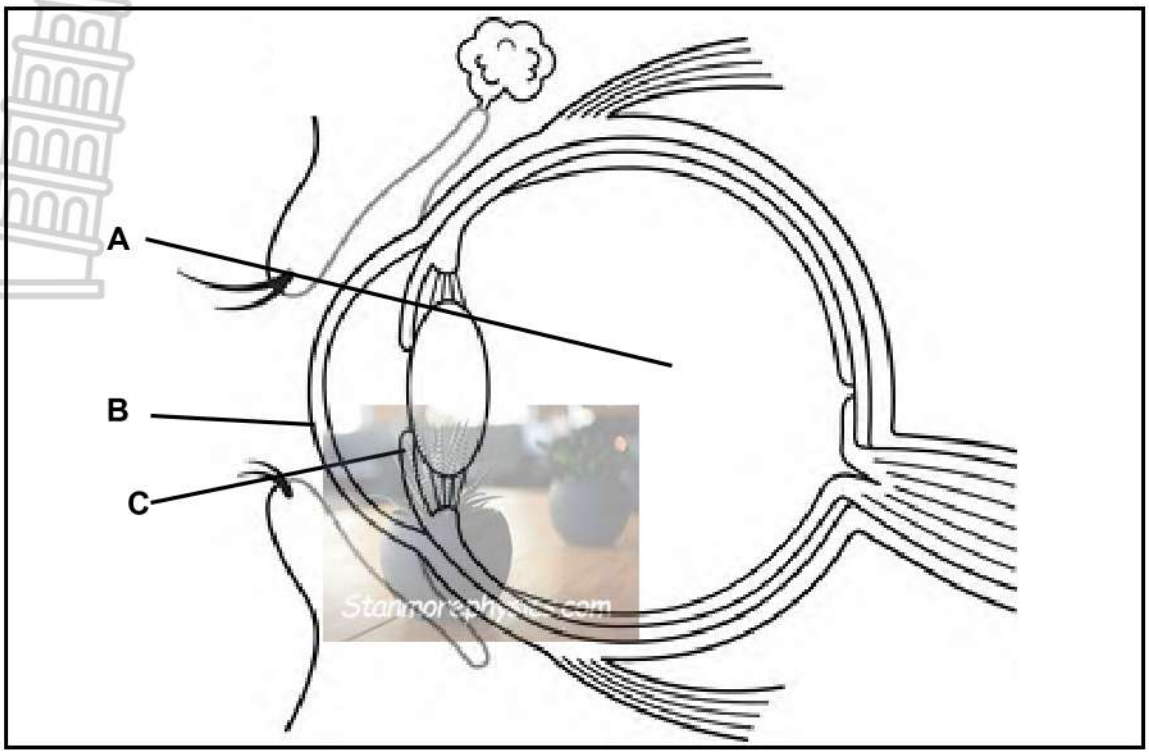
2.2.3 Identify the reproductive strategy used by the red kangaroo where its young are born alive. (1)

2.2.4 Discuss ONE parental strategy the red kangaroo displays that ensures a high survival rate of its young. (2)

2.2.5 Why would you describe the red kangaroo as altricial? (2)

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2.3 The diagram below shows a cross section of the eye.



2.3.1 Give the NAME and ONE FUNCTION of the each of the following parts:

(a) **A** (2)

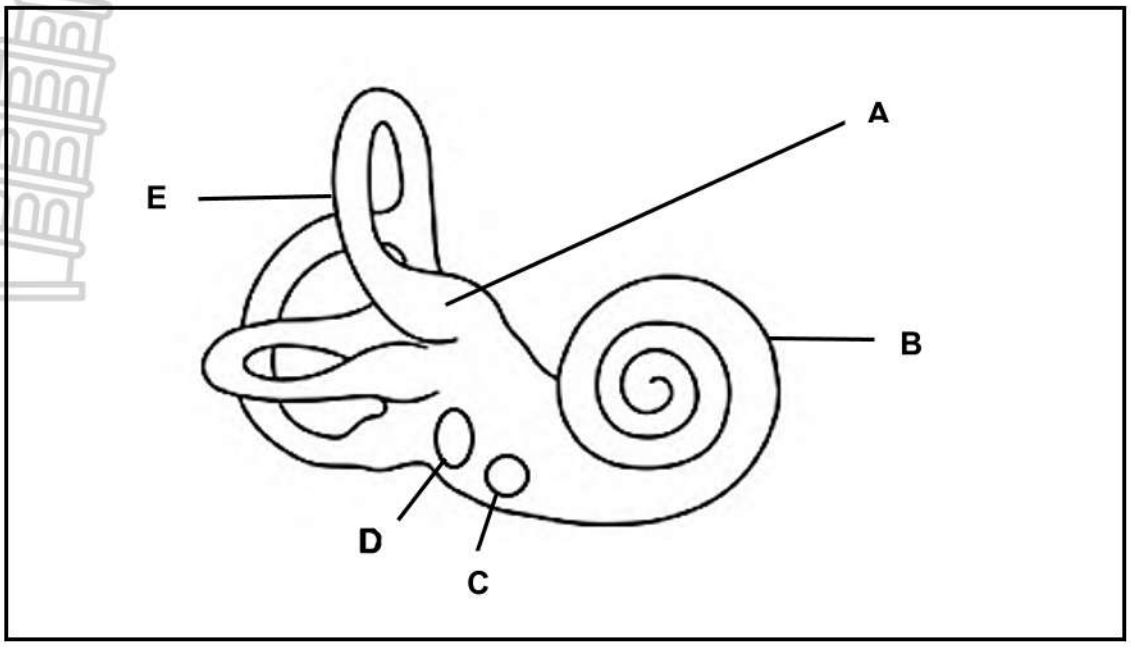
(b) **B** (2)

2.3.2 Polycoria is a disease that affects part **C**. A person suffering from this disease has more than one pupil. Each pupil has its own set of circular muscles.

Briefly discuss how this disease will affect vision. (3)

2.3.3 Describe the changes that occur in the eye when a person focuses on an object that is three metres away. (5)

2.4 The diagram below shows the structure of the inner ear.



2.4.1 Give the LETTER and NAME of the part that:

(a) Collects vibrations from ossicles and converts them into pressure waves (2)

(b) Contains the organ of Corti (2)

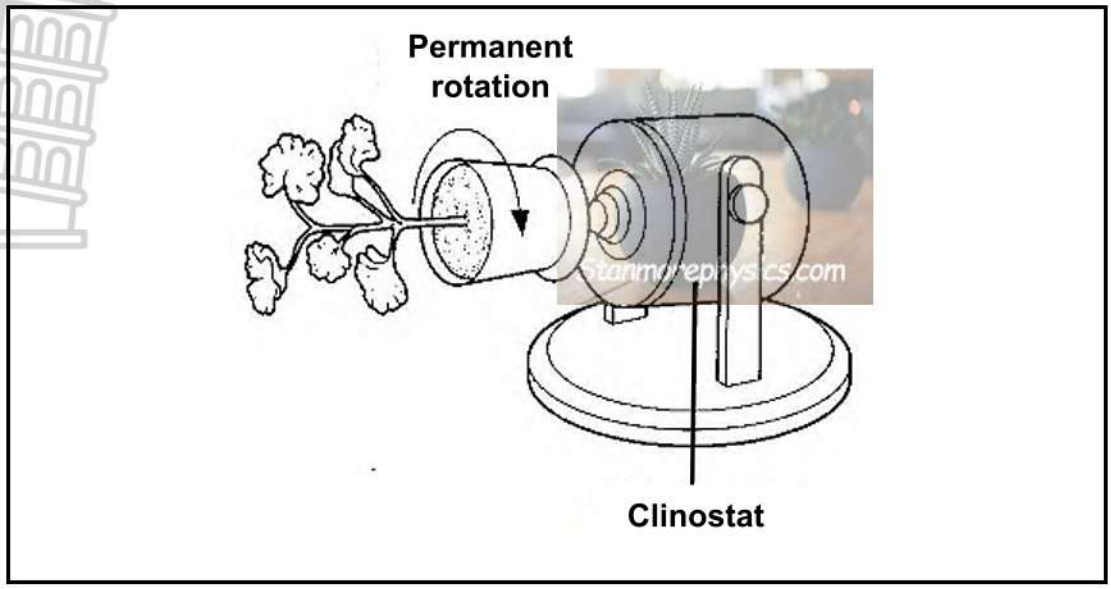
2.4.2 Top ice-figure skaters can spin up to six revolutions on their body's axis per second.



Describe the role of part **A** in the maintenance of balance of their body while spinning. (4)

2.4.3 Describe ONE structural suitability of part **B** to perform its function. (2)

2.5 The experiment below shows a plant that was placed on a rotating clinostat in a dark room.



2.5.1 Identify the tropism that is tested in this experiment. (1)

2.5.2 Explain the direction of growth expected to be seen in the root. (3)

2.5.3 Describe why the stem of a plant will grow towards a unilateral light. (3)

2.5.4 Name TWO defence mechanisms used by plants to protect them from being eaten by animals. (2)

[50]

QUESTION 3

3.1 Researchers investigated the effect of microplastic bioaccumulation on male fertility levels in rats. Microplastics are plastics that have broken down into micrometre sizes, they cannot be broken down and excreted by the body and therefore will increase in the blood over time. This is known as bioaccumulation.

The investigation was conducted as follows:

- 60 male rats, all Albino Wistar sp. were equally divided into three groups.
- Rats in all three groups were healthy and fed the same diet.
- Group 1 was fed drinking water with 0,0 µm/ℓ microplastics daily.
- Group 2 was fed contaminated drinking water consisting of 4 µm/ℓ of microplastics daily.
- Group 3 was fed contaminated drinking water consisting of 10 µm/ℓ microplastics daily.
- Scientists then ran the investigation over a period of 90 days.
- Every 30 days scientists extracted blood samples and tested testosterone levels (ng/mℓ) from 10 rats at random within each group and an average per group was calculated.

Results were as follows:

	TESTOSTERONE LEVEL (ng/mℓ)		
	GROUP 1 0,0 µm/ℓ	**GROUP 2 4 µm/ℓ**	**GROUP 3 10 µm/ℓ**
DAY 0	28 ng/mℓ	25 ng/mℓ	26 ng/mℓ
DAY 30	26 ng/mℓl	19 ng/mℓ	17 ng/mℓ
DAY 60	27 ng/mℓ	14 ng/mℓ	8 ng/mℓ
DAY 90	26 ng/mℓ	10 ng/mℓ	3 ng/mℓ

3.1.1 Explain ONE way the researchers ensured the reliability of their investigation. (2)

3.1.2 Identify ONE way the researchers could have increased the validity of their results from the research design above. (1)

3.1.3 How was the dependent variable measured in the investigation? (1)

3.1.4 Explain why Group 1 was important in this investigation. (3)

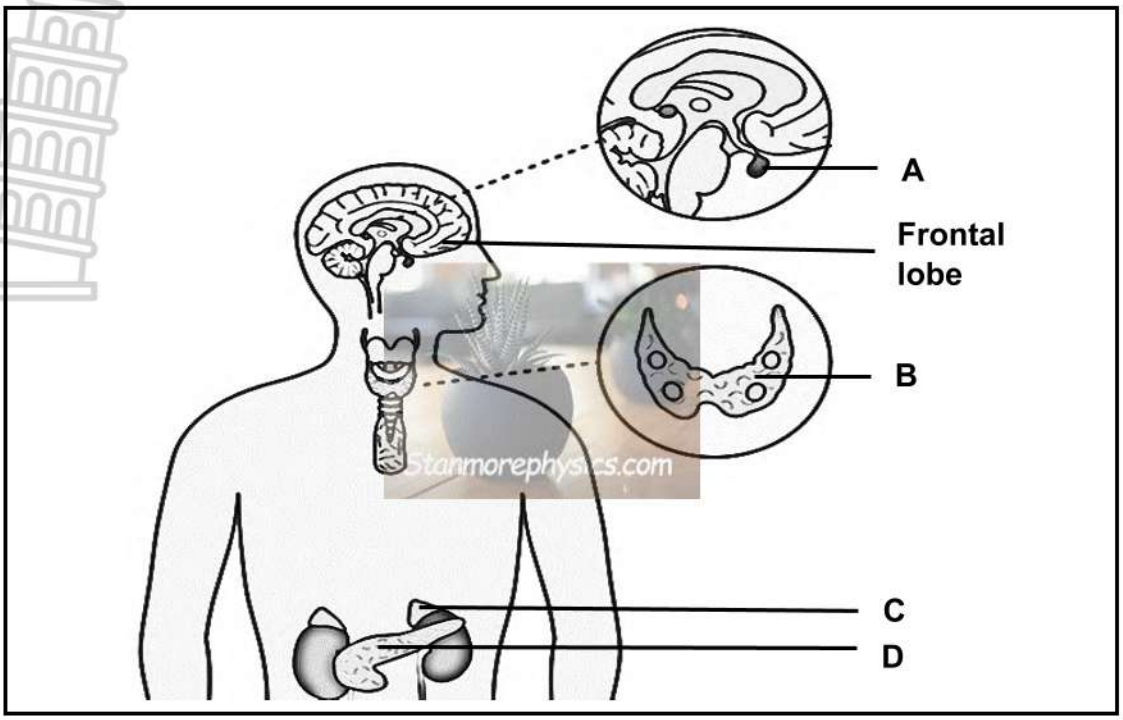
3.1.5 State the conclusion for the investigation. (2)

3.1.6 Describe the process of spermatogenesis. (4)

3.1.7 How would spermatogenesis be affected in Group 3 after 90 days? (2)

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3.2 The diagram below represents the endocrine glands of the human body.



3.2.1 Identify glands:

(a) **C** (1)

(b) **D** (1)

3.2.2 What is the function of the 'negative feedback mechanism' that regulates gland **B**? (2)

3.2.3 Explain why gland **D** can be described as both an endocrine and exocrine gland. (4)

3.2.4 Describe how gland **C** may increase glucose and oxygen supply to skeletal muscles in an emergency. (5)

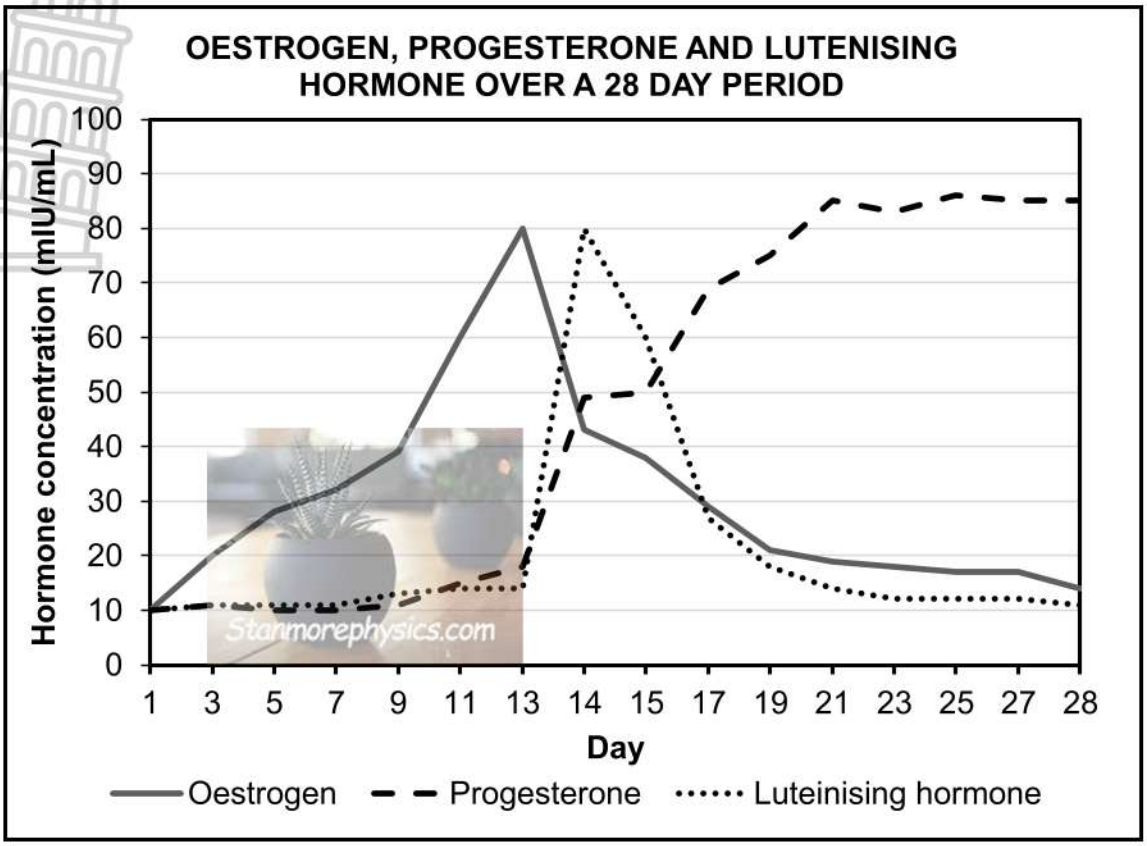
3.2.5 Due to a tumour growing in the frontal lobe of the brain, excess levels of growth hormone (GH) may be secreted.

(a) Which part of the brain is responsible for secreting growth hormone (GH)? (1)

(b) Name ONE condition excess levels of growth hormone (GH) would cause in adults. (1)

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3.3 The graph below shows the changes in female hormones during the menstrual cycle.



3.3.1 Identify the structures that secrete:

(a) Oestrogen from day 1–13 (1)

(b) Progesterone from day 13–20 (1)

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

3.3.3 Give a reason for your answer to QUESTION 3.3.2. (1)

3.3.4 Explain why progesterone levels remain high after day 21. (2)

3.3.5 Why is it not possible for a female to develop another Graafian follicle during pregnancy? (4)

3.4 During periods of intense exercise, carbon dioxide levels in the blood and the body's temperature increases.

3.4.1 Describe the homeostatic control of carbon dioxide when it is too high in the blood. (7)

3.4.2 Describe what would be the effect on the athlete's body if it is unable to reduce its temperature. (3)

[50]

TOTAL SECTION B: 50
GRAND TOTAL: 150

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