basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P1

MAY/JUNE 2024

LIFE SCIENCES: Paper 1

10831E

MARKS: 150

TIME: 2½ hours

X05

This question paper consists of 18 pages.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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

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SECTION A

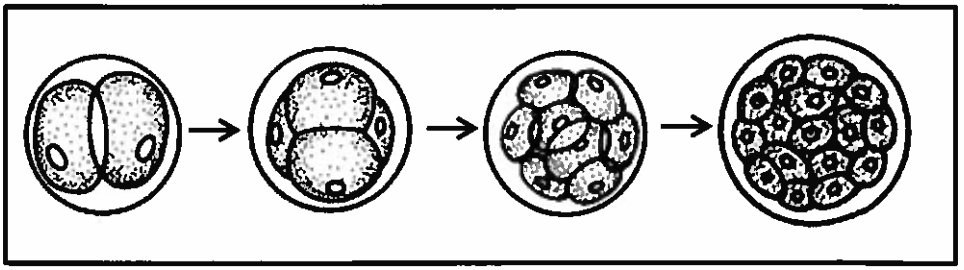
QUESTION 1

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

1.1.1 Which ONE of the following is a reproductive strategy in birds where the young are born fully dependent on the parents?

A Precocial development
B Altricial development
C Ovovivipary
D External fertilisation

1.1.2 The diagram below represents events during human reproduction.



In which part of the female reproductive system will the events shown in the diagram above occur?

A Fallopian tube
B Cervix
C Vagina
D Ovary

1.1.3 The following is a list of components associated with the nervous system:

(i) Parasympathetic nervous system
(ii) Spinal nerves
(iii) Sympathetic nervous system
(iv) Cranial nerves

Which ONE of the following combination of components forms part of the peripheral nervous system?

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

QUESTIONS 1.1.4 AND 1.1.5 ARE BASED ON THE GRAPH BELOW SHOWING THE AVERAGE AMOUNT OF GROWTH HORMONE SECRETED IN HUMANS AT DIFFERENT AGES.



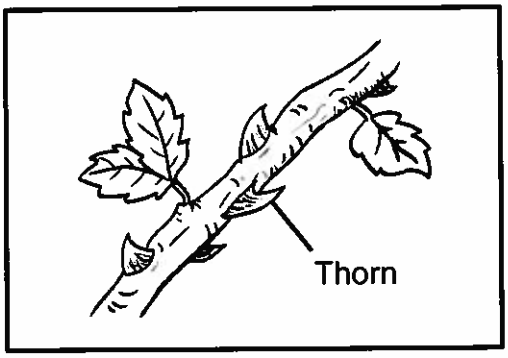
1.1.4 Which ONE of the following statements describes the trend in the graph?

A The secretion of the growth hormone increases with age.
B The level of the growth hormone decreases more rapidly in the age group 50–70 years when compared to the age group 10–40 years.
C The level of the growth hormone decreases more rapidly in the age group 10–40 years when compared to the age group 50–70 years.
D The secretion of the growth hormone decreases at the same rate at all ages.

1.1.5 The percentage decrease in the level of growth hormone between the ages of 20 and 40 years is …

A 20%.
B 60%.
C 150%.
D 250%.

1.1.6 The diagram below shows a part of the stem of a plant.



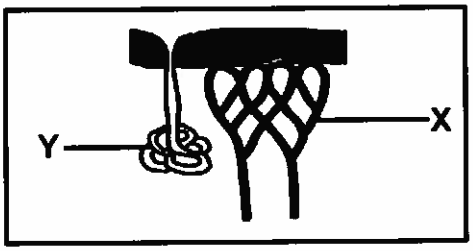
Which ONE of the following is shown by the stem of this plant?

A Apical dominance
B Dormancy of lateral buds
C Plant defence mechanism
D Fruit development

1.1.7 Which ONE of the following combinations is CORRECT for a visual defect of the eye?

	VISUAL DEFECT	NATURE	TREATMENT
A	Astigmatism	An irregular shaped cornea	Corrective lenses
B	Long-sightedness	Eyeball is longer than normal	Lens replacement surgery
C	Cataracts	Lens becomes inelastic	Lens replacement surgery
D	Short-sightedness	Eyeball is shorter than normal	Laser surgery

1.1.8 The diagram below shows structures in the skin that are involved in temperature regulation.



Which ONE of the following describes the role of structures **X** and **Y** on a hot day?

A **X** dilates and **Y** produces less sweat
B **X** dilates and **Y** produces more sweat
C **X** constricts and **Y** produces less sweat
D **X** constricts and **Y** produces more sweat

1.1.9 The direction of the transmission of an impulse through a neuron is from the ...

A cell body through the axon to the dendrites.
B dendrites through the cell body to the axon.
C axon through the cell body to the dendrites.
D dendrites through the axon to the cell body. (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 1.2.8) in the ANSWER BOOK.

1.2.1 The blood vessel in the neck that contains receptors which are sensitive to carbon dioxide levels in the blood

1.2.2 A reproductive strategy where the development of the foetus occurs inside the uterus of the mother

1.2.3 Photoreceptors that react to low light intensity and are responsible for black and white vision

1.2.4 The structure that develops from the remains of the Graafian follicle in the ovary

1.2.5 The part in the male that stores sperm cells until maturation

1.2.6 The part of the ear that receives sound waves from the auditory canal

1.2.7 The structure in males that secretes testosterone

1.2.8 A hormone that stimulates the production of milk in humans (8 x 1) **(8)**

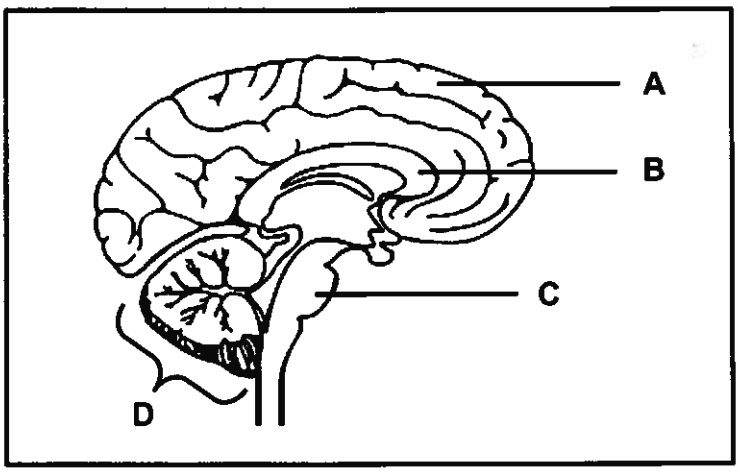
1.3 Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	A plant hormone that stimulates the germination of seeds	A: Abscisic acid B: Gibberellins
1.3.2	A hormone in humans that is produced in the reproductive system	A: Oestrogen B: Testosterone
1.3.3	A device that is responsible for the drainage of fluid from the middle ear	A: Grommets B: Hearing aids

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

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



1.4.1 Name the TWO components of the central nervous system shown in the diagram. (2)

1.4.2 Identify part:

(a) **B** (1)

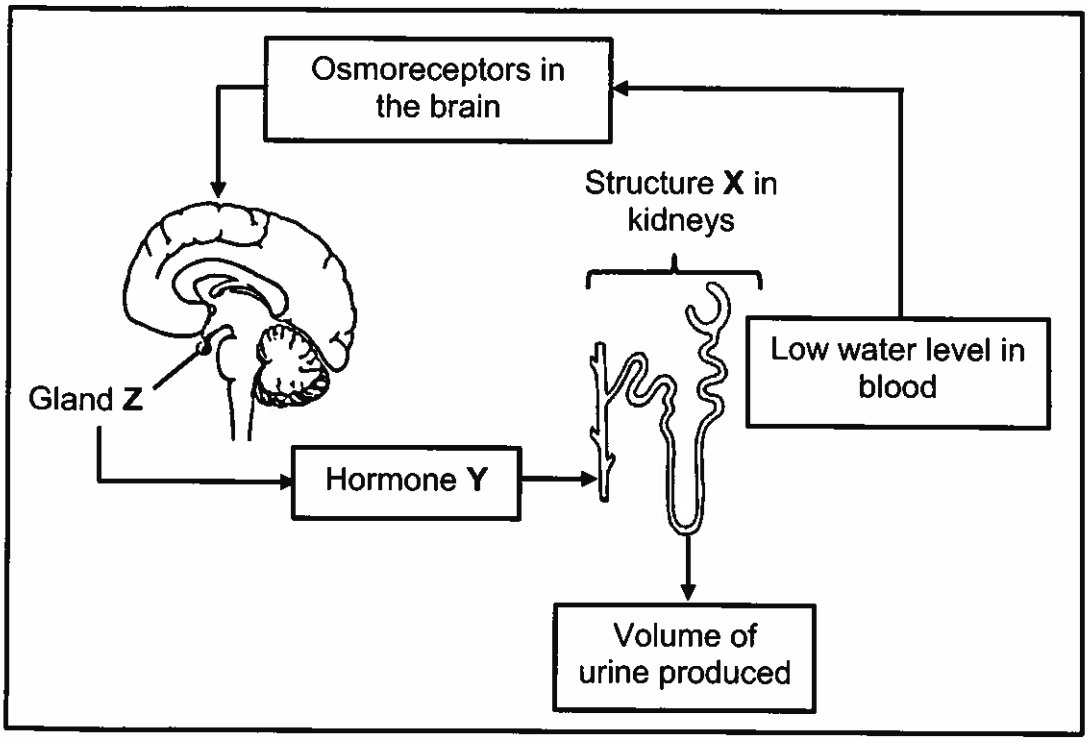
(b) **D** (1)

1.4.3 Give the LETTER and NAME of the part that controls:

(a) The heartbeat (2)

(b) Voluntary actions (2)
(8)

1.5 The diagram below represents a homeostatic mechanism in the human body when water levels are low.



1.5.1 Identify:

(a) The part of the brain where the osmoreceptors are located (1)

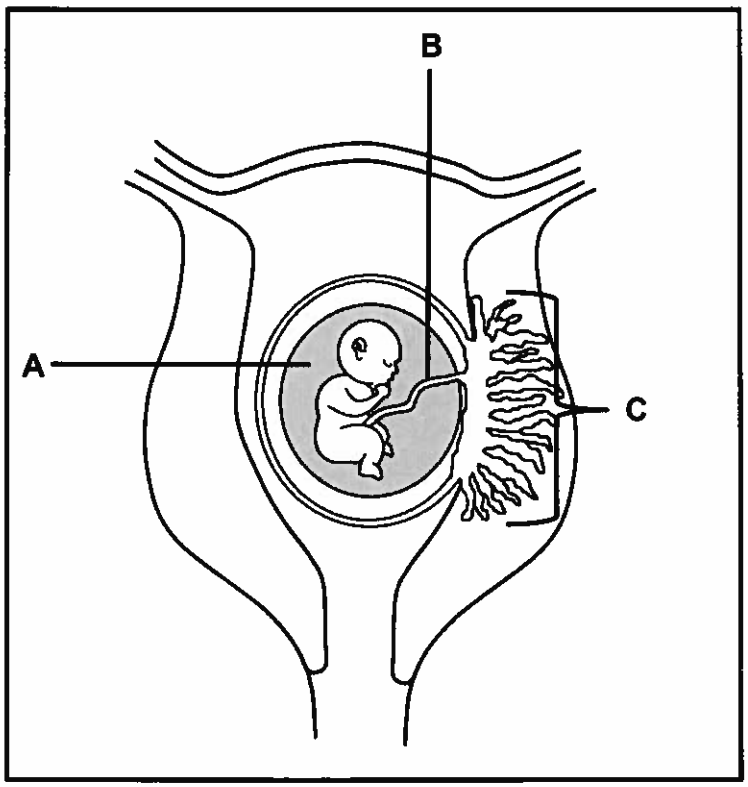
(b) Gland **Z** (1)

(c) Hormone **Y** (1)

(d) Structure **X** (1)

1.5.2 State whether the volume of urine produced will increase or decrease for this individual. (1)
(5)

1.6 The diagram below represents a stage in human foetal development.



1.6.1 Identify:

(a) Fluid **A** (1)

(b) Structure **C** (1)

1.6.2 Name:

(a) The blood vessel in part **B** that transports oxygen to the developing foetus (1)

(b) TWO structures that play a role in the formation of structure **C** (2)
(5)

TOTAL SECTION A: 50

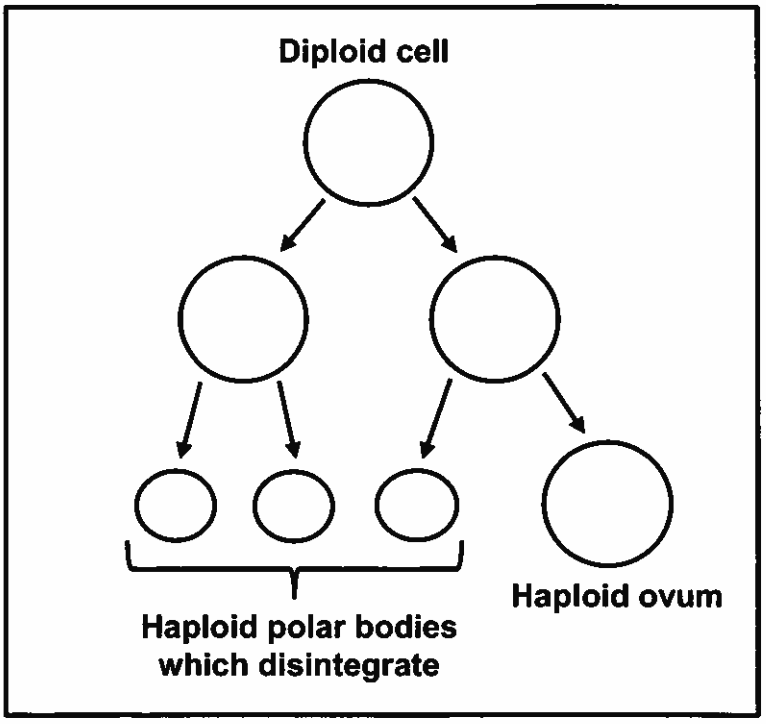
SECTION B

QUESTION 2

2.1 Scientists reported that a female crocodile in a zoo laid an egg with a developing embryo. There were no male crocodiles in the zoo for 16 years. This form of reproduction is called parthenogenesis.

During parthenogenesis, a haploid ovum fuses with one of the haploid polar bodies to form a zygote.

The diagram below shows the process of formation of an ovum in vertebrates.



2.1.1 Name the type of meiotic division shown in the diagram above. (1)

2.1.2 Name the type of egg that was laid by the crocodile. (1)

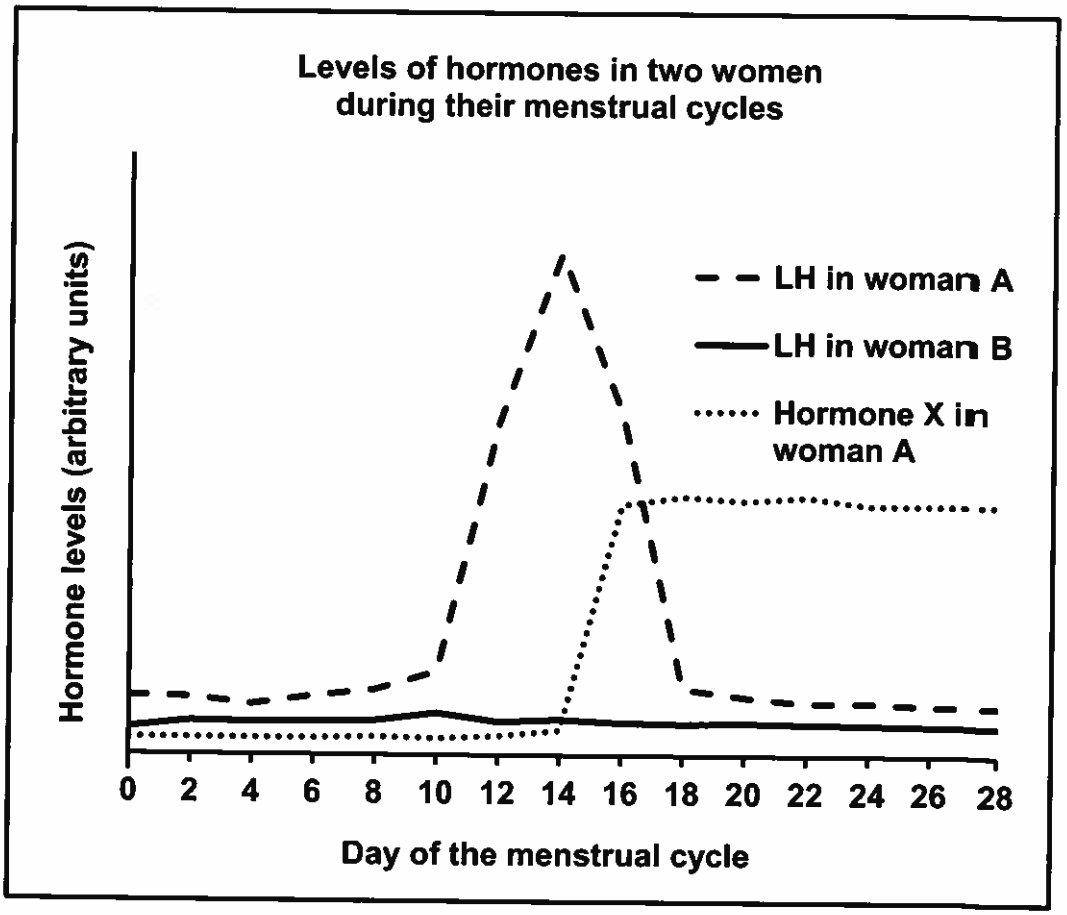
2.1.3 Crocodiles lay their eggs on land.

Explain ONE way in which the type of egg named in QUESTION 2.1.2 is structurally suited to survive the conditions on land. (2)

2.1.4 Explain ONE advantage of parthenogenesis. (2)
(6)

2.2 Sheehan's syndrome is a condition that results in females having very low levels of the luteinising hormone (LH).

The graph below shows the hormone levels of two different women during a 28-day menstrual cycle. Woman **A** has normal luteinising hormone (LH) levels while woman **B** suffers from Sheehan's syndrome.



2.2.1 State TWO functions of LH during the menstrual cycle. (2)

2.2.2 Besides LH, name ONE other hormone that is secreted by the pituitary gland during the menstrual cycle. (1)

2.2.3 Give the name of hormone **X**. (1)

2.2.4 Use the information in the graph to explain how the level of hormone **X** will be different in woman **B**. (4)

2.2.5 What evidence in the graph suggests that woman **A** is pregnant? (1)
(9)

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2.3 Scientists conducted an investigation to determine the relationship between age and fertility in men.

This investigation was done from 1999 to 2017 using 1 294 healthy men from the age group 16–65.

Men with occupations (working in environments) involving exposure to excessive heat were excluded during the selection of participants.

The procedure was as follows:

- Semen was collected after 5 days of no sexual activities.
- A specialised microscope was used to determine the sperm count (number of normal sperm per mℓ of semen) and progressive motility (ability of sperm to swim effectively in a straight line).
- An electron microscope was used to determine sperm necrosis (immature/dead sperm per fresh semen sample).

2.3.1 Identify in this investigation the:

(a) Independent variable (1)

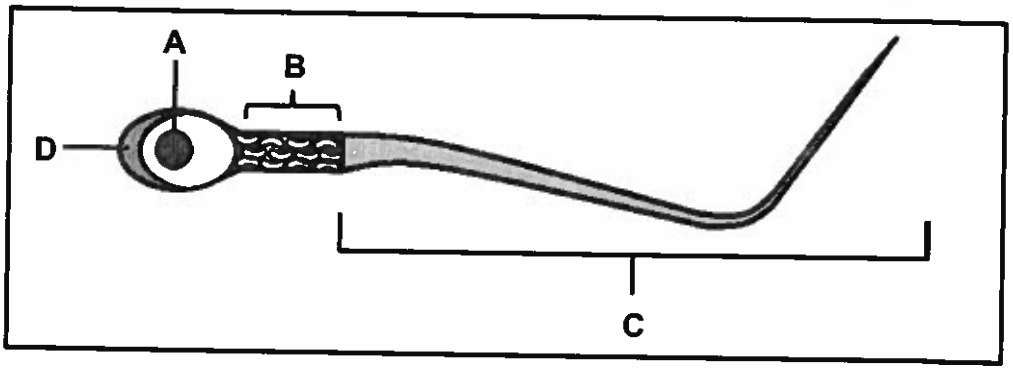
(b) Dependent variable (1)

2.3.2 State THREE ways in which the dependent variable was determined. (3)

2.3.3 Give TWO reasons why the investigation can be considered to be reliable. (2)

2.3.4 Explain why men with occupations involving exposure to excessive heat were excluded from the investigation. (3)
(10)

2.4 The diagram below shows the structure of a sperm cell.



2.4.1 Name:

(a) The organelles found in large numbers in part **B** (1)

(b) Part **D** (1)

2.4.2 Name the part of the testes where spermatogenesis takes place. (1)

2.4.3 Explain the role of the following parts during fertilisation:

(a) **A** (2)

(b) **D** (2)

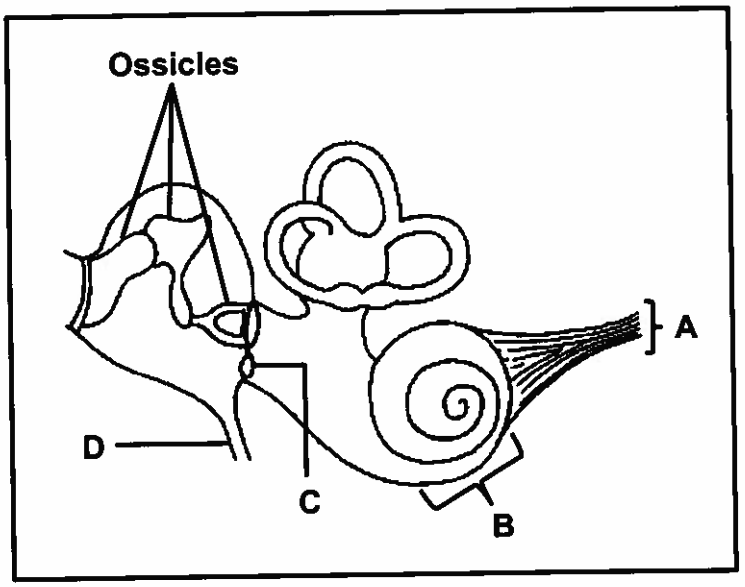
2.4.4 Describe the functional relationship between the organelles in part **B** and structure **C** during reproduction. (2)

2.4.5 On average a sperm moves at a speed of 5 mm per minute inside the female reproductive system and it takes approximately 45 minutes for a sperm to reach the ovum for fertilisation.

Calculate the distance (in mm) that a sperm needs to move to reach the ovum. Show ALL workings. (2)
(11)

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2.5 The diagram below represents a part of the ear.



2.5.1 Identify part:

(a) **A** (1)

(b) **B** (1)

2.5.2 State the function of part:

(a) **C** (1)

(b) **D** (1)

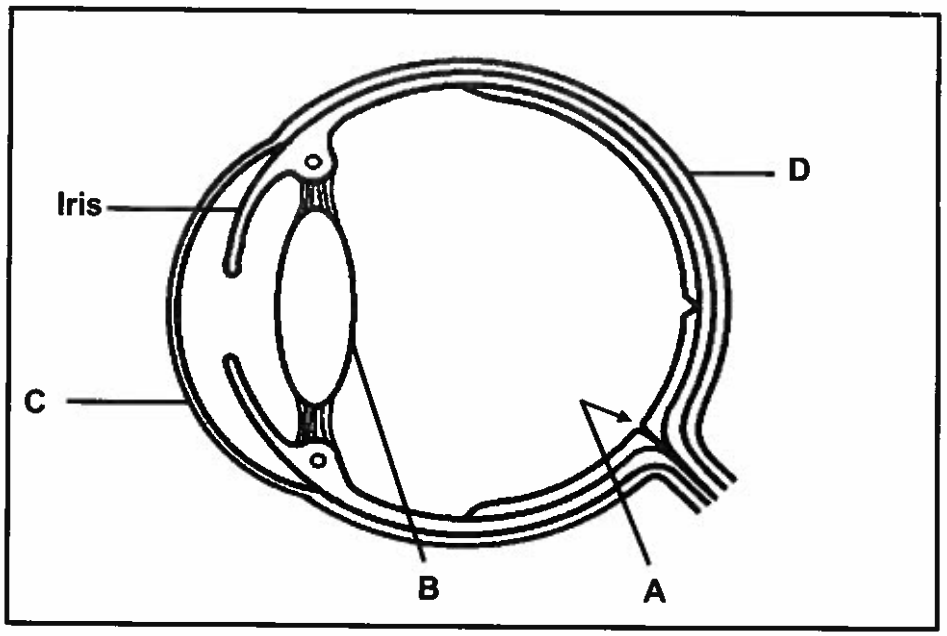
2.5.3 Otosclerosis is a medical condition that prevents the ossicles from vibrating.

Explain how this condition will affect hearing. (4)
(8)

2.6 Describe the role of the ear in maintaining balance. **(6)**
[50]

QUESTION 3

3.1 The diagram below represents the structure of a human eye.



3.1.1 Identify part:

(a) **A** (1)

(b **C** (1)

(c) **D** (1)

3.1.2 Describe how the muscles in the iris enable a person to see in dim light. (4)

3.1.3 Name the process that occurs in the eye when a person focuses on objects at different distances. (1)

3.1.4 Explain how the shape of part **B** enables a person to read a book. (3)
(11)

3.2 Read the extract below.

THE DIFFERENCE BETWEEN HYPOREFLEXIA AND HYPERREFLEXIA

Hyporeflexia is a condition where the skeletal muscles have a decreased reflex response. It is caused by damage to parts of a reflex arc. The damage is usually to the motor neurons, which send messages from the spinal cord to the skeletal muscles. This can be due to a medical condition called Guillain-Barré syndrome.

Hyperreflexia is the result of damage to the motor neurons that send messages from the brain to the spinal cord. People suffering from multiple sclerosis (MS) usually demonstrate hyperreflexia and have loss of muscle control.

3.2.1 What is meant by a *reflex arc*? (2)

3.2.2 From the extract, state ONE:

(a) Medical condition that causes hyporeflexia (1)

(b) Similarity in the causes of hyporeflexia and hyperreflexia (1)

(c) Symptom of hyporeflexia (1)

3.2.3 Describe ONE difference between the causes of hyporeflexia and hyperreflexia. (2)

3.2.4 Name the part of a neuron that degenerates, leading to multiple sclerosis. (1)

3.2.5 Explain how damage to the part named in QUESTION 3.2.4 can lead to the symptoms of multiple sclerosis, as stated in the extract. (3)
(11)

3.3 The blood glucose levels in a healthy person, when not eating, is between 3,9 and 7,1 mmol/L of blood.

The table below shows the blood glucose levels in a healthy person who ate only one meal.

TIME (hours)	BLOOD GLUCOSE LEVEL (mmol/L)
07:00	4,2
08:00	4,2
09:00	8,4
10:00	7,6
11:00	7,1
12:00	5,1
13:00	4,8
14:00	3,1
15:00	4,1
16:00	4,3
17:00	4,6

3.3.1 Name the:

(a) TWO hormones involved in the normal homeostatic control of blood glucose levels (2)

(b) Organ in the human body that secretes the hormones named in QUESTION 3.3.1(a) (1)

3.3.2 Between which hours of the day did the person eat? (1)

3.3.3 Using evidence from the table, give ONE reason for your answer to QUESTION 3.3.2. (2)

3.3.4 Explain the change in blood glucose levels between 14:00 and 15:00. (4)

3.3.5 Describe how blood glucose levels would have been different after 10:00 if the person suffered from diabetes mellitus. (2)
(12)

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3.4 The diagram below represents a 'fight or flight' reaction in humans.



3.4.1 Name the gland that is responsible for this reaction. (1)

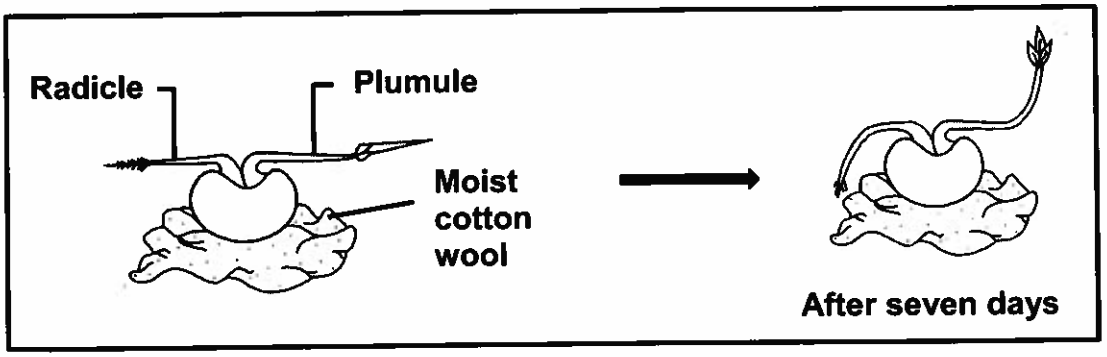
3.4.2 State the location of the gland named in QUESTION 3.4.1 in the human body. (1)

3.4.3 Explain the effect of adrenalin on the heart and the respiratory system during the situation shown in the diagram above. (5)
(7)

3.5 An experiment was set up to investigate a plant growth response to a stimulus.

A seedling has a radicle (young root) and a plumule (young stem).

This seedling was placed horizontally in a dark place and a growth response was observed after seven days, as shown in the diagram below.



3.5.1 Name the:

(a) Growth response observed after seven days (1)

(b) Plant hormone responsible for the growth response named in QUESTION 3.5.1(a) (1)

3.5.2 Explain the growth response observed in the root of the seedling. (5)

3.5.3 Explain how a control set-up will be different from the above set-up. (2)
(9)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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