GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PREPARATORY EXAMINATION

2020

10831

LIFE SCIENCES

PAPER 1

TIME: 2½ hours

MARKS: 150

17 pages

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

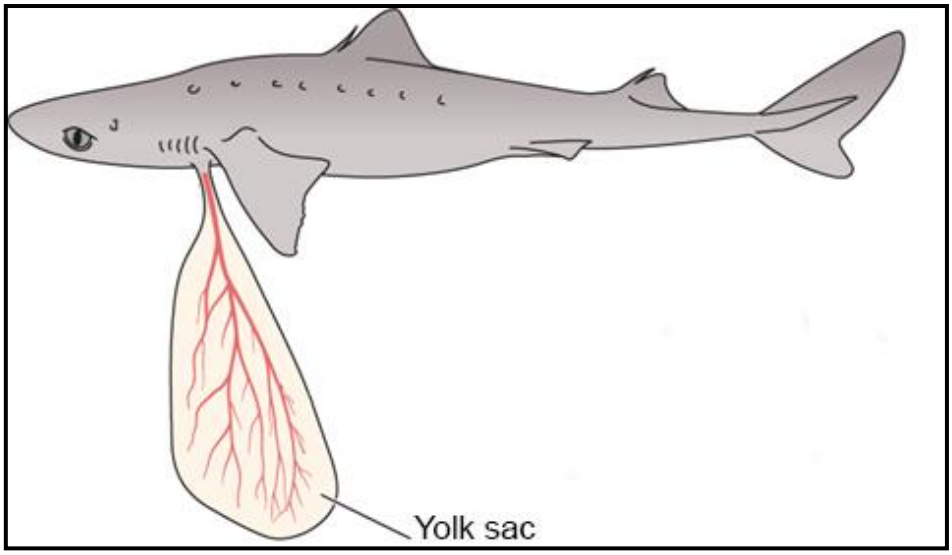
1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a new page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.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

SECTION A

QUESTION 1

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

Questions 1.1.1 and 1.1.2 are based on the diagram below of a shark pup that was born prematurely.



1.1.1 Which of the following best represents the type of fertilization and method of reproduction seen in sharks?

A Internal fertilization and ovipary
B External fertilization and vivipary
C Internal fertilization and ovovivipary
D External fertilization and ovipary

1.1.2 The function of the yolk sac is ...

A to protect the developing embryo.
B to nourish the developing embryo.
C to store waste from the embryo.
D to regulate the body temperature of the embryo.

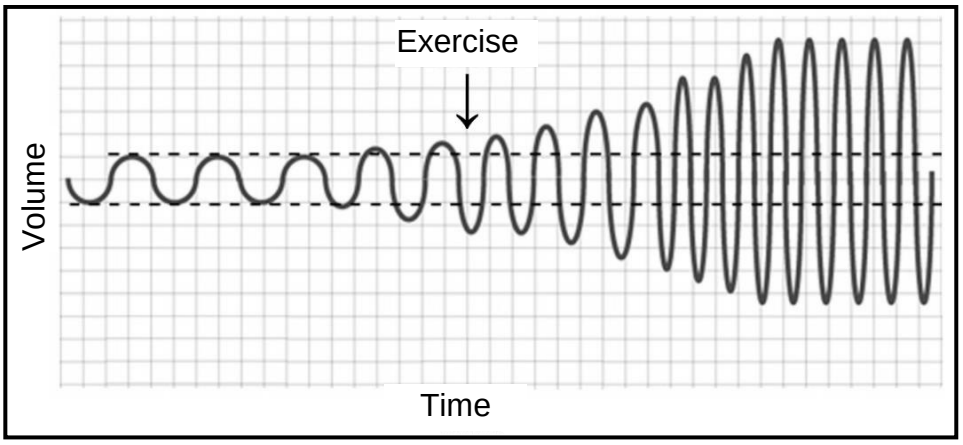
1.1.3 If no individual of a species exists, the species is said to be ...

A extant.
B endangered.
C extinct.
D vulnerable.

1.1.4 The correct order of the parts through which spermatozoa pass is ...

A vas deferens → epididymis → ureter.
B vas deferens → seminal vesicles → urethra.
C epididymis → vas deferens → urethra.
D epididymis → vas deferens → ureter.

QUESTIONS 1.1.5 and 1.1.6 are based on the graph below which is known as a spirometer trace and is used to determine the volume of air a person inhales and exhales, as well as their breathing rate (the number of breaths over a period of time).



1.1.5 The spirometer trace shows that exercise causes the ...

A breathing rate to increase while breathing depth remains constant.
B breathing rate to increase while breathing depth decreases.
C breathing rate to decrease while breathing depth increases.
D breathing rate and breathing depth to increase.

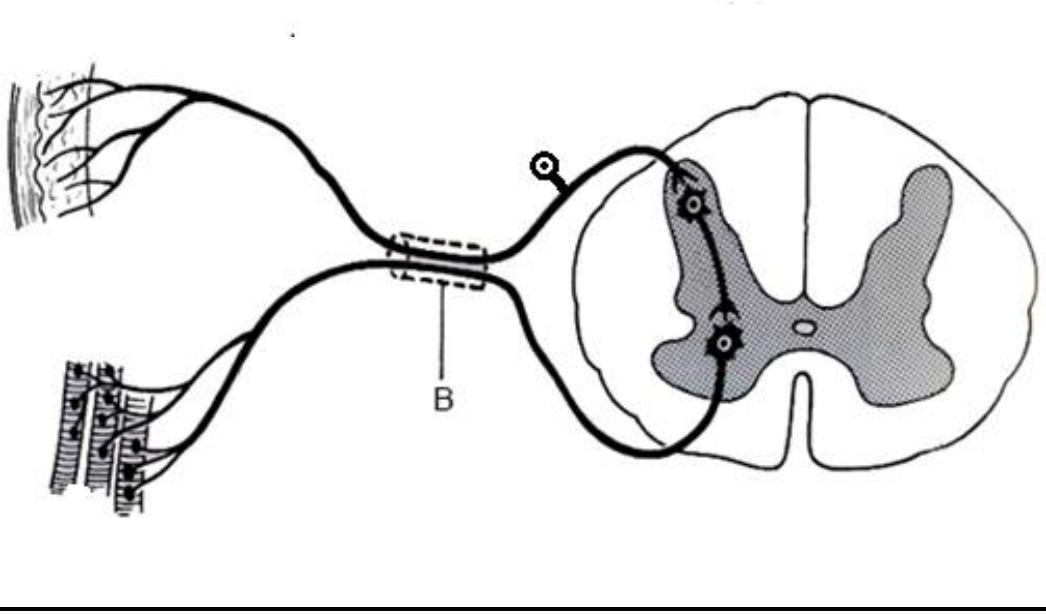
1.1.6 Which of the following is responsible for the change in the spirometer trace during exercise?

A Decreased respiration in muscle cells
B Increase in the pH levels of blood
C Increased energy required by muscle cells
D Decrease in the carbon dioxide levels in blood

1.1.7 Water quality is reduced by ...

A eutrophication.
B purification.
C desalination.
D evaporation.

QUESTIONS 1.1.8 and 1.1.9 are based on the diagram of a reflex arc shown below.



1.1.8 Study the list of characteristics below.

(i) Forms part of the peripheral nervous system
(ii) Contains the axon of the motor neuron and dendrite of a sensory neuron
(iii) Contains the axon of the sensory neuron and dendrite of a motor neuron

Which of the characteristics listed above apply to Part **B**?

A i, ii and iii
B i and ii
C i only
D ii and iii

1.1.9 The interneuron ...

A is located in the grey matter of the spinal cord.
B transmits an impulse from the motor neuron to the sensory neuron.
C transmits the impulse from the receptor directly to the effector.
D is an effector.

1.1.10 In order to stimulate the development of side branches in a plant, a person would regularly trim the top of a plant.

The reason why more side branches form, is due to ...

A an apical dominance.
B the presence of Auxin.
C the absence of apical dominance.
D the presence of Abscisic Acid.

(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 planting of the same crop species year after year

1.2.2 A hollow ball of cells formed in the fallopian tube after fertilization

1.2.3 Cells in the retina that are sensitive to light

1.2.4 The hormone responsible for increasing blood glucose levels

1.2.5 The illegal removal of plants or animals from their natural environment

1.2.6 The variety of living organisms on earth

1.2.7 Fluid surrounding the developing foetus in the uterus

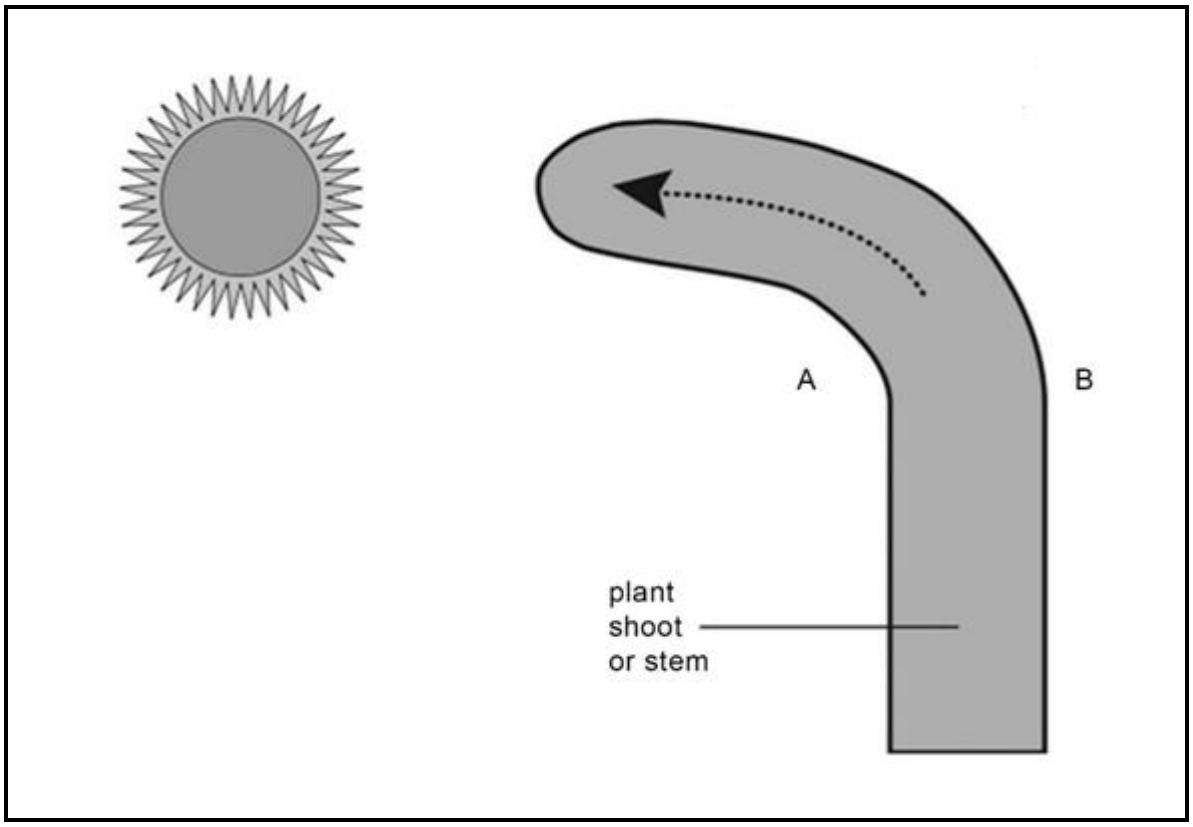
(7 x 1) **(7)**

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 Causes plants to drop their leaves	A Abscisic Acid B Gibberellins
1.3.2 Young birds are born with eyes open.	A Altricial development B Precocial development
1.3.3 Respiratory control centre	A Hypothalamus B Hypophysis

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

1.4 The image below shows the growth response of a young shoot to light.



1.4.1 What is the growth response shown above called? (1)

1.4.2 Name the hormone responsible for this growth response in the shoot. (1)

1.4.3 On which side (**A** or **B**) of the shoot will the hormone accumulate the most? (1)

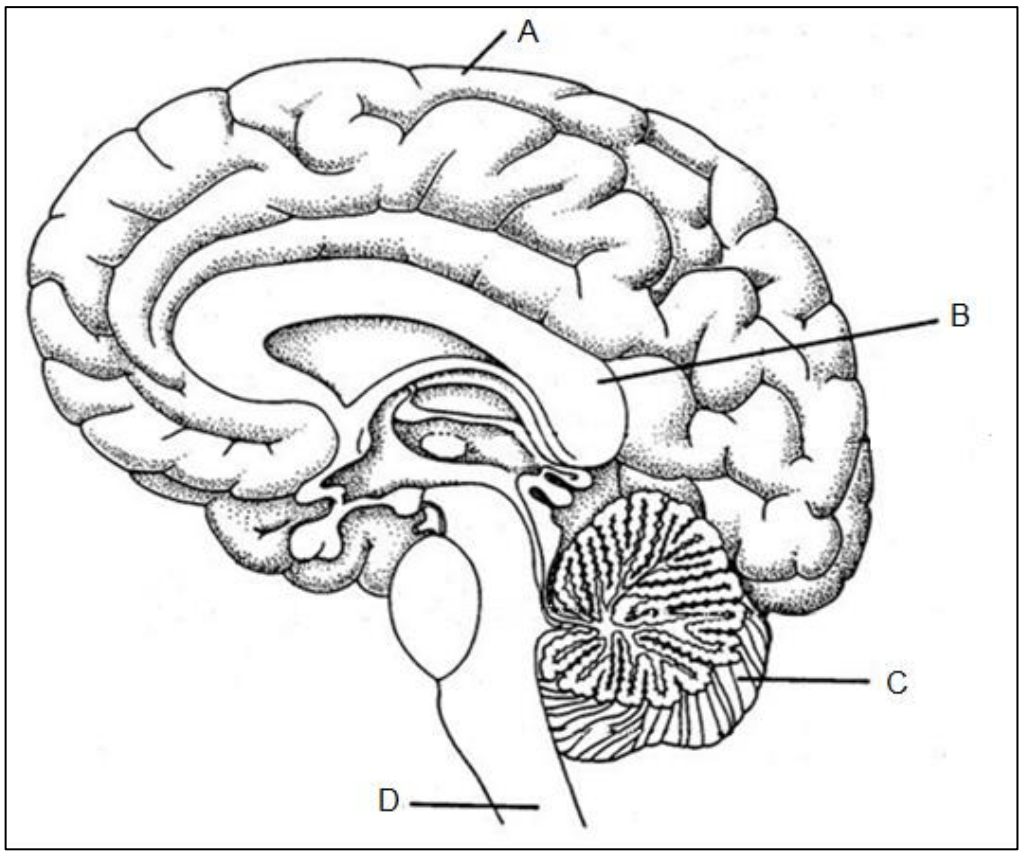
1.4.4 Which side (**A** or **B**) of the shoot will experience the least cell elongation? (1)

1.4.5 Name ONE other growth response caused by the hormone mentioned in QUESTION 1.4.2. (1)

1.4.6 In which plant organ is the growth response named in QUESTION 1.4.5 positive? (1)

1.4.7 If the tip of the shoot was covered with foil, how would the growth of the shoot be affected? (1)
(7)

1.5 The diagram below shows the internal structure of the brain.



Write down the LETTER of the part which:

1.5.1 Is involved in higher mental function (1)

1.5.2 Contains the centre that controls muscle tone and balance (1)

1.5.3 Has centres which determine what emotions we experience (what we feel) (1)

1.5.4 Has white matter on the outside and grey matter on the inside (1)

1.5.5 Joins the two hemispheres of the brain (1)
[5]

1.6 The pictures below show various threats to the environment.



Picture 1



Picture 2



Picture 3

1.6.1 What are the causes of land degradation shown in …

(a) Picture **1**?
(b) Picture **2**?
(c) Picture **3**? (3)

1.6.2 Name ONE greenhouse gas that is released by the activities shown in Pictures **1** and **2** respectively. (2)
(5)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Diabetes insipidus (dilute urine) is a disease caused by a lack of ADH secretion into plasma.

Scientists wanted to determine the effect of this disease on the volume of urine that a person produces per day. The investigation was carried out on 5 male participants over a period of 30 days. The males were of similar age and weight. Their average daily urine production was calculated and recorded in the table below.

NOTE: Normal daily urine production is between 600 mℓ – 1800 mℓ.

Individual	Average volume of urine produced in ℓ/day
1	2,9
2	1,5
3	1,3
4	1,0
5	1,2

2.1.1 Which individual would the scientists suspect of having Diabetes insipidus? (1)

2.1.2 Give a reason for your answer to QUESTION 2.1.1. (1)

2.1.3 What does the word *plasma* tell you about the type of gland that releases ADH? (1)

2.1.4 Identify the dependent variable for this investigation. (1)

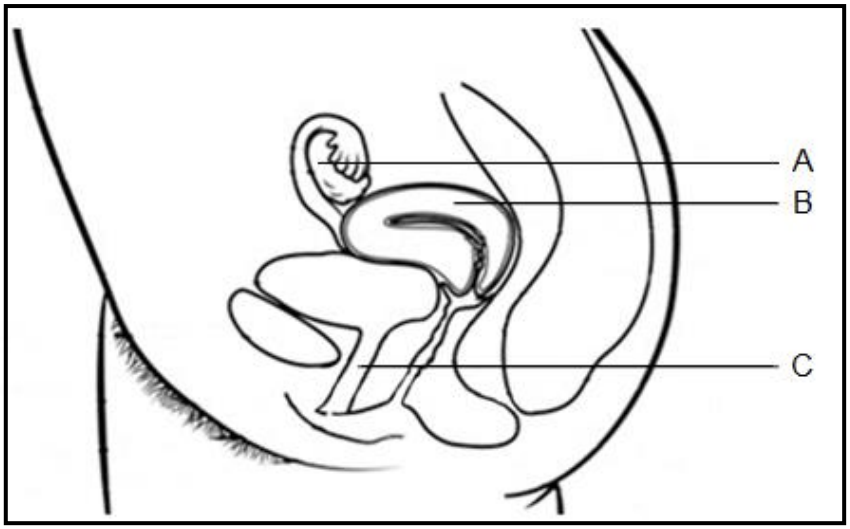
2.1.5 Identify TWO factors that should be kept constant during the investigation. (2)

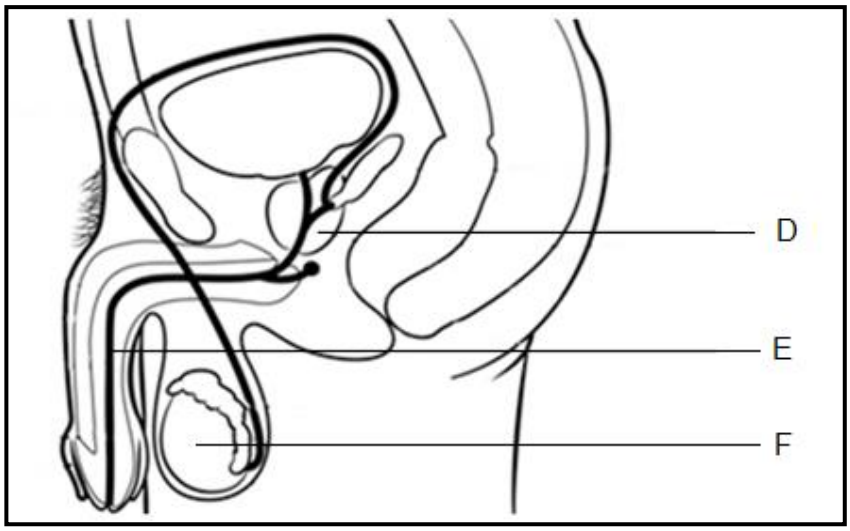
2.1.6 Provide ONE precaution (safety measure) that the scientists needed to take when they conducted this investigation. (1)

2.1.7 State TWO ways in which the scientists improved the reliability of their investigation. (2)

2.1.8 Draw a pie chart of the information in the table. Show ALL calculations**.** (6)
(15)

2.2 The diagrams below show the female and male reproductive systems.





2.2.1 What is the function of the structure labelled **D**? (1)

2.2.2 Name the hormones secreted by:

(a) **A**
(b) **F** (2)

2.2.3 Tabulate TWO differences between the structures labelled **C** and **E**. (5)

2.2.4 Explain TWO ways in which the part labelled **B** is structurally adapted its function, during the gestation period. (4)

2.2.5 Vasectomy is a surgical procedure for male sterilization or permanent contraception. During the procedure, the male vas deferens is cut and tied or sealed.

Explain how a vasectomy affects male fertility (ability to produce offspring). (2)
(14)

2.3 The diagrams below show different phases of meiosis.

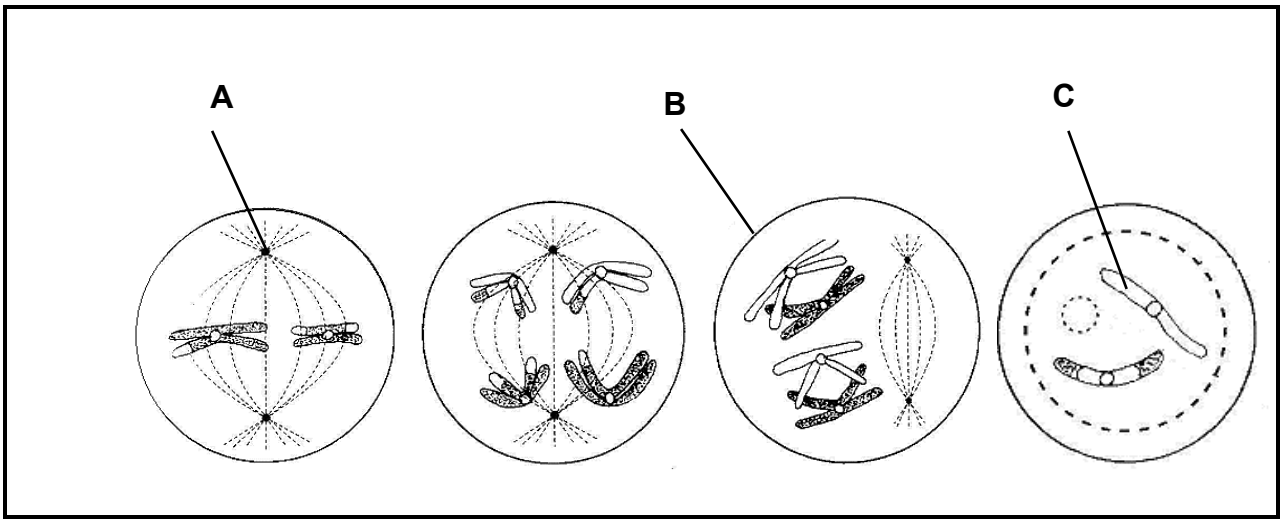


Diagram 1 **Diagram 2** **Diagram 3** **Diagram 4**

2.3.1 Name the parts labelled **A** to **C**. (3)

2.3.2 What is the process called through which ova are produced? (1)

2.3.3 Which diagram (**1**, **2**, **3** or **4**) indicates the process in meiosis which leads to genetically varied ovums? (1)

2.3.4 Name and describe the process identified in QUESTION 2.3.3. (4)

2.3.5 If the phases shown in the diagrams above represented meiosis in humans, what would the chromosome number be in …

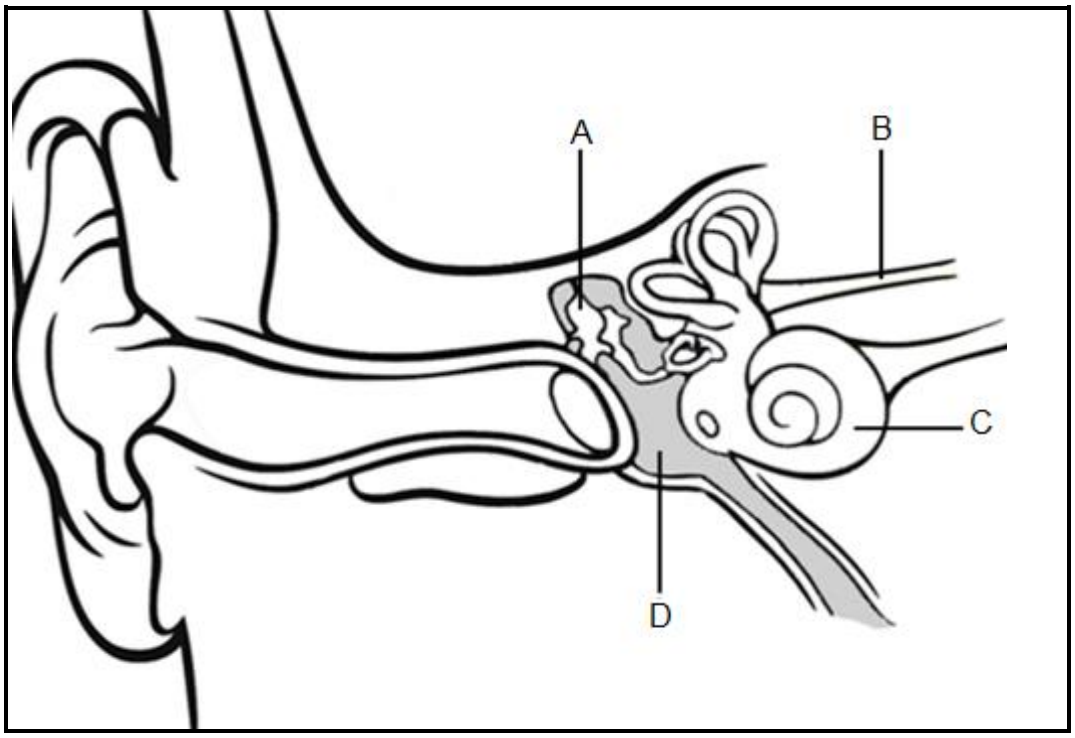
(a) Diagram **1**?
(b) Diagram **2**? (2)

(11)

[40]

QUESTION 3

3.1 The diagram below shows parts of the human ear.



3.1.1 Identify the structures labelled **A** and **C**. (2)

3.1.2 Give ONE possible treatment for a bacterial infection in the part labelled **D**. (1)

3.1.3 Explain how damage to the part labelled **B** would affect the person's hearing and balance. (4)
(7)

3.2 Study the cartoon below showing farmers using pesticides on their farms.



3.2.1 Which type of pest control mechanism is shown in the cartoon above? (1)

3.2.2 Name ONE other control mechanism that the farmers could have used to reduce the pest population. (1)

3.2.3 Define the following terms.

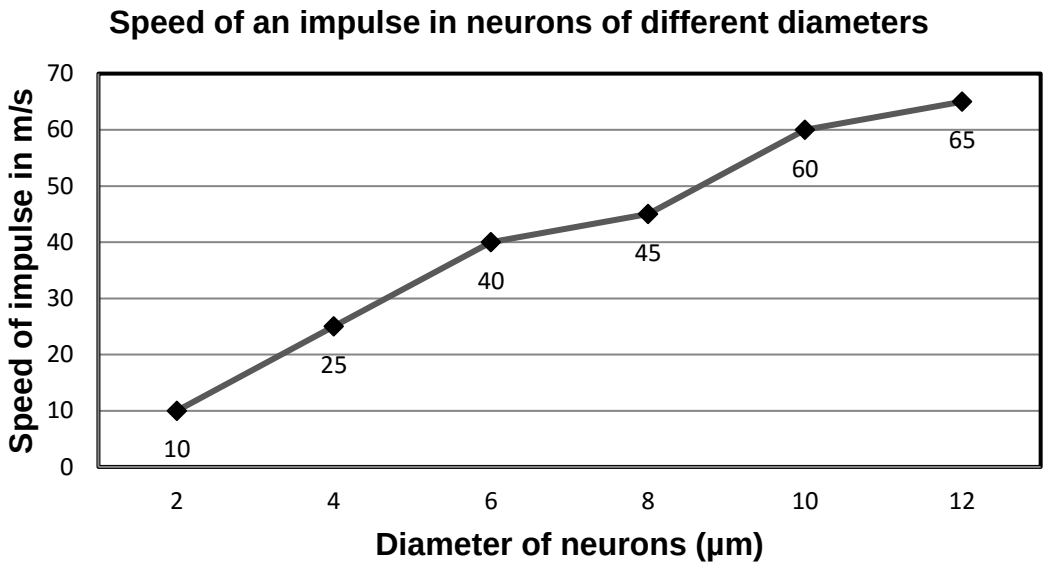
(a) *Food security*
(b) *Alien invasive plant* (4)

3.2.4 Explain how the use of pesticides can:

(a) Decrease food security
(b) Decrease biodiversity (4)

3.2.5 Describe how the use of genetically modified crops would affect the farmers' pesticide usage. (3)
(13)

3.3 The graph below shows the speed of an impulse travelling through neurons of different diameters. The diameter of the neurons was measured in micrometres or µm. The speed of a nerve impulse was measured in metres per second or m/s.



3.3.1 Use the graph to calculate the percentage increase in the speed of an impulse, between a neuron with a diameter of 6 µm and one with a diameter of 8 µm. Show ALL calculations. (3)

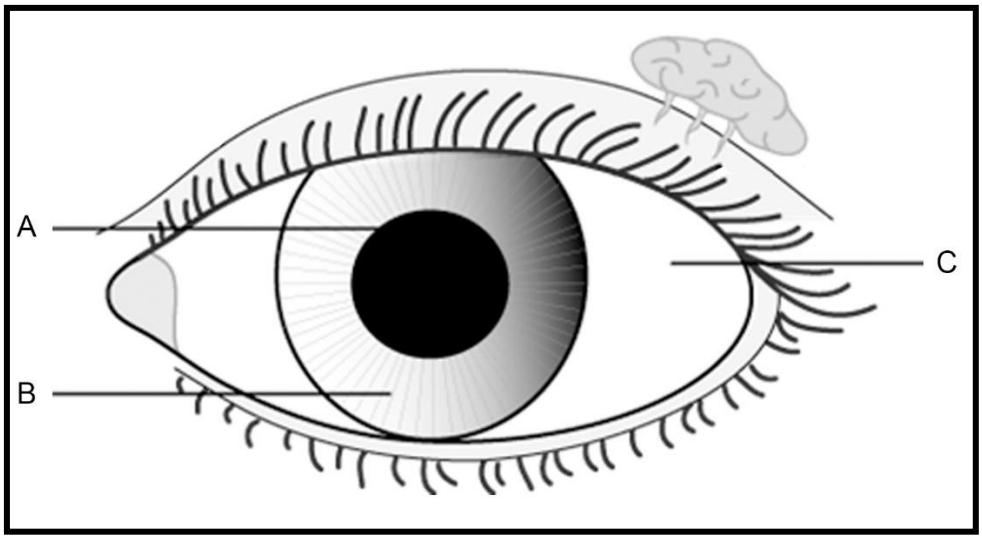
3.3.2 Which other structure in a neuron can increase the speed at which an impulse travels? (1)

3.3.3 What is the relationship between the diameter of a neuron and a reflex action? (2)

3.3.4 Name the functional gap found between two adjacent neurons, across which impulses can be transmitted chemically. (1)

3.3.5 Draw a labelled diagram of a sensory neuron and indicate the direction in which the impulse travels. (5)
(12)

3.4 Study the diagram below of an eye seen from the front and answer the questions that follow.



3.4.1 Give the name and function of the part labelled **C**. (2)

3.4.2 Explain how parts **A** and **B** are involved in the pupillary mechanism when a person walks into a house after being outside in the bright sun. (4)

3.4.3

A drunk driver was pulled over by a police officer one night. The alcohol in the driver's system inhibits the function of the neurotransmitter chemical called acetylcholine, which transfers an impulse chemically from one neuron to the next.

Explain what a police officer will observe if he shines a bright light into the drunk driver's pupils. (2)
(8)

[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

The sex hormone, oestrogen, plays a double role

A female's ovarian cycle and uterine cycle form part of her menstrual cycle. According to research, oestrogen plays a role in lowering a woman's body temperature, which occurs when a woman experiences an increase in body temperature during and after ovulation. Oestrogen influences the autonomic control of skin blood flow and sweating.

Name and describe the role that different hormones play during the ovarian and uterine cycles, from the time menstruation has taken place until ovulation takes place.

Also describe how oestrogen could bring about the lowering of a woman's body temperature during ovulation.

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

TOTAL: 150

END