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NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES PAPER 1

PRE-TRIAL

2024

MARKS: 150

TIME: 2 ½ HOURS

THIS QUESTION PAPER CONSIST OF 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 your 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. 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 may 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 numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, for example **1.1.11 A**.

1.1.1 Which combination of reproductive strategies applies to organisms that lay amniotic eggs?

- A. Ovipary and external fertilisation
- B. Ovovivipary and external fertilisation
- C. Ovovivipary and internal fertilisation
- D. Ovipary and internal fertilisation

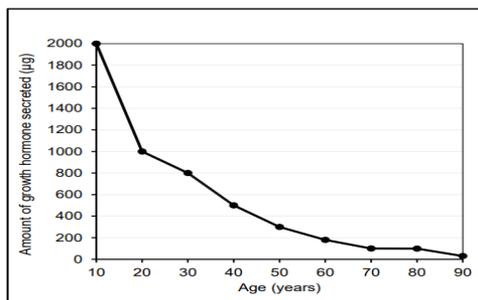
1.1.2 The process by which ova are produced from the germinal epithelium of the ovaries is known as ...

- A. gametogenesis.
- B. oogenesis.
- C. spermatogenesis.
- D. ovulation.

1.1.3 The part of the human ear that amplifies vibrations.

- A. Pinna
- B. Ossicles
- C. Round window
- D. Organ of Corti

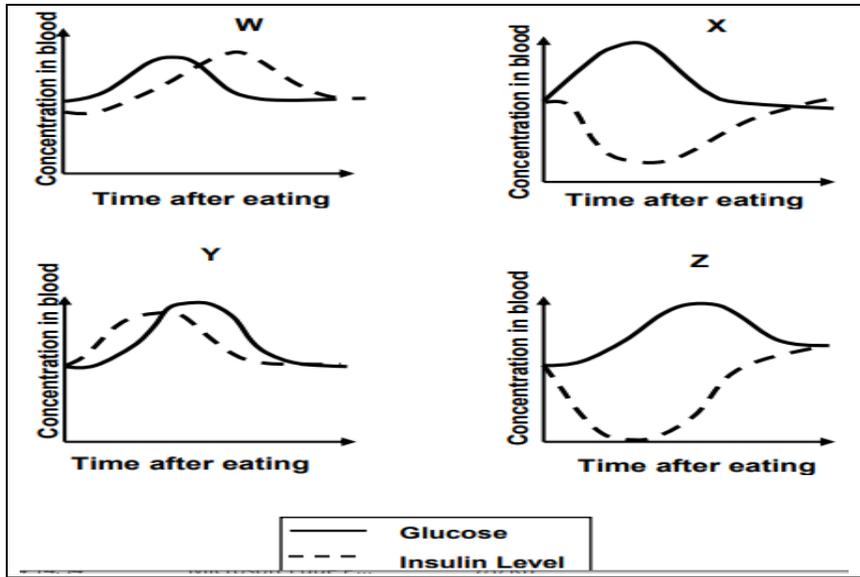
1.1.4 The graph below shows the relationship between the secretion of growth hormone and age.



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 is not affected by age.

1.1.5 The graphs below represent possible blood glucose and insulin levels in a person.



Which ONE of the graphs represents the blood glucose and insulin levels of a person without diabetes mellitus after a meal?

- A. W
- B. X
- C. Y
- D. Z

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

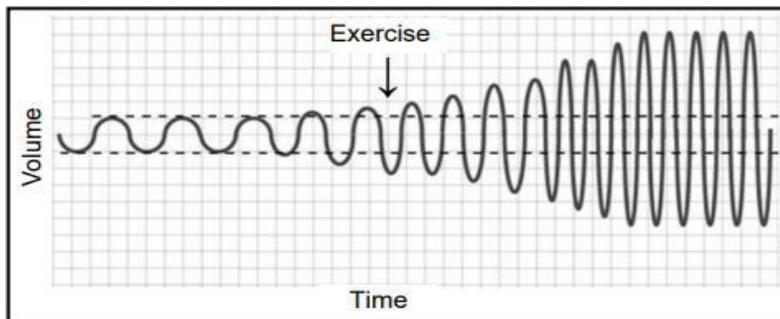
The reason why more side branches form, is due to ...

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

1.1.7 The interneuron ...

- A. is 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.

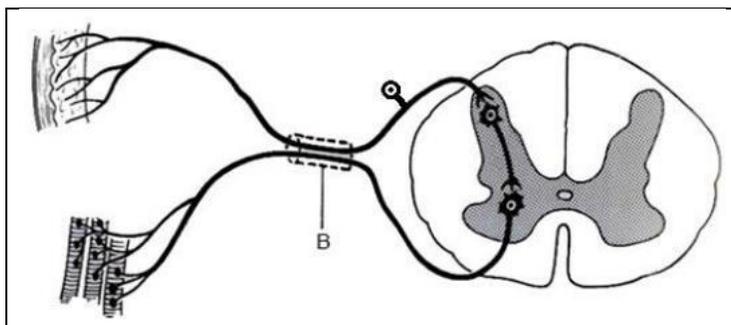
QUESTIONS 1.1.8 Is based on the graph below which is known as a spirometer trace and is used to determine the volume of air a person inhales and exhales, as well as their breathing rate (the number of breaths over a period of time).



1.1.8 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.

QUESTIONS 1.1.9 IS based on the diagram of a reflex arc shown below.



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 motorneuron

1.1.9 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

(18)

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1–1.2.8) in the ANSWER BOOK.

- 1.2.1 The structure that provides nutrients to the developing embryo in oviparous organisms
- 1.2.2 The type of fertilisation where the ovum is fertilised inside the female reproductive organs
- 1.2.3 That part of the nervous system which consists of cranial and spinal nerves
- 1.2.4 The hormone that stimulates milk production for breastfeeding in humans
- 1.2.5 The growth of a plant in response to gravity
- 1.2.6 The connecting tube between the middle ear and the pharynx
- 1.2.7 An organ in the human body that functions as an exocrine and an endocrine gland
- 1.2.8 Cells in the retina that are sensitive to light

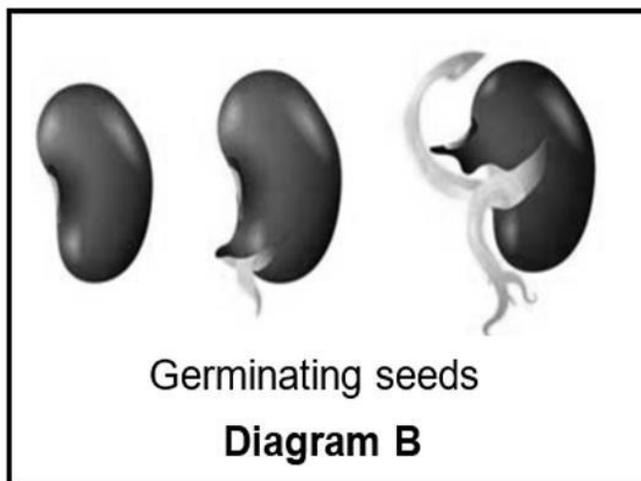
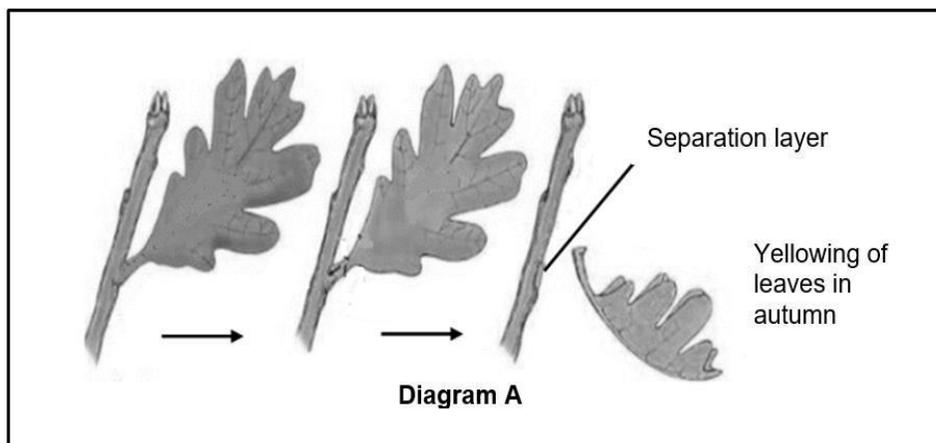
[8]

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 Function(s) of the allantois in an amniotic egg	A: Acts as a shock absorber B: Prevents dehydration
1.3.2 Component(s) of the autonomic nervous system	A: Sympathetic section B: Parasympathetic section
1.3.3 Hormone secreted by the pituitary gland	A: Aldosterone B: Growth hormone

(6)

1.4 The effects of different plant hormones are illustrated in the diagrams.



1.4.1 Identify the plant hormone responsible for the specific result in:

(a) Diagram **B** (1)

1.4.2 (a) Name the plant hormone responsible for the inhibition of the growth of lateral branches in Diagram A (1)

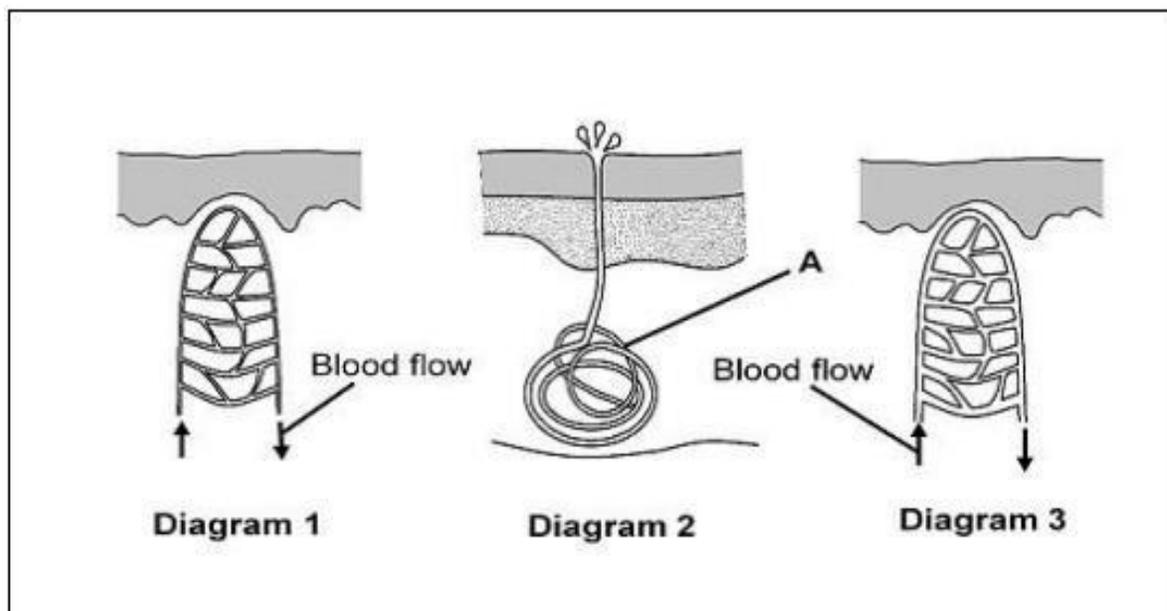
(b) Name TWO places in plants where the hormone mentioned in QUESTION 1.4.2 (a) are produced. (2)

(c) Give Two more function of the hormone mentioned in QUESTION 1.4.2 (a). (2)

1.4.3 Give TWO characteristics of plant hormones. (2)

(8)

1.5 The diagram below represents parts of the human skin.



1.5.1 Give the NAME of the part labelled **A**. (1)

1.5.2 Identify which diagram(s) (**1**, **2** or **3**) represent(s):

(a) The body's response to high environmental temperatures (2)

(b) Vasoconstriction (1)

1.5.3 Would the skin release more heat through radiation in **Diagram 1** or **Diagram 3**? (1)

1.5.4 Which part of the brain controls thermoregulation in humans? (2)

1.5.5 Define homeostasis (1)

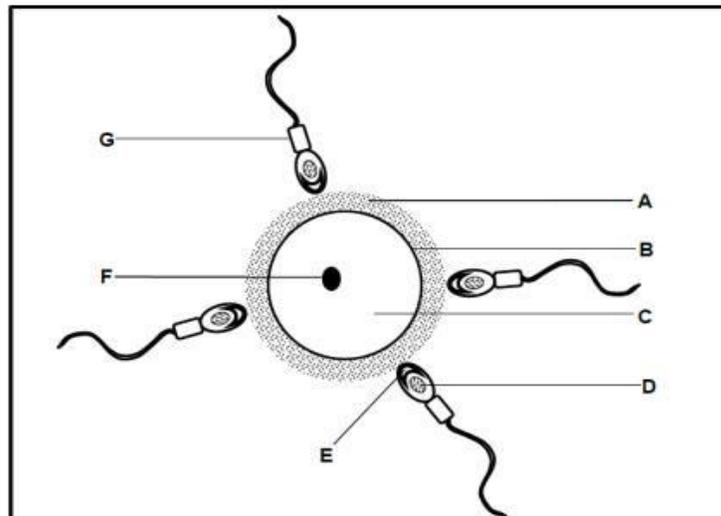
1.5.6 Discuss how homeostasis will be maintained in **Diagram 3** (1)

[10]

TOTAL SECTION A: 50

SECTION B**QUESTION 2**

2.1 The schematic diagram below represents a human ovum that is about to be fertilised. The diagram is not drawn to scale.



2.1.1 Identify part:

- (a) A (1)
- (b) G (1)
- (c) C (1)
- (d) F (1)

2.1.2 Name the part that:

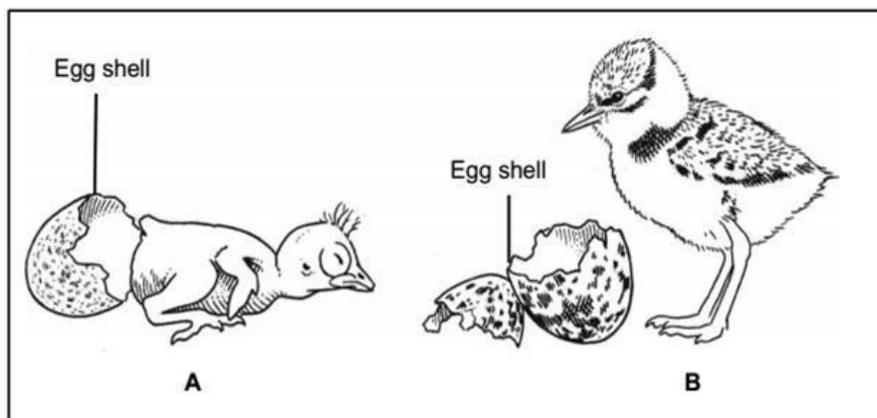
- (a) Contains mitochondria (1)
- (b) Will be damaged if the sperm is unable to move towards the egg (1)
- (c) Will be damaged if the sperm is unable to penetrate the egg (1)
- (d) Will enter the ovum during fertilisation (1)

2.1.3 Name the following:

- (a) The cells that secrete a male sex hormone (1)
- (b) The hormone that stimulates the development of secondary sexual characteristics in males (1)

(10)

2.2 The diagrams below represent one-day old hatchlings **A** and **B**. The diagrams are not drawn to scale.



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

2.2.2 The diagram represents ovipary. When development was still taking place inside the shell from which substance did the chick obtain:

(a) Organic food (1)

(b) Water (1)

2.2.3 Name the type of development in the hatching of chick **B**. (1)
(5)

2.3 An investigation was carried out to determine the influence of alcohol on the volume of urine produced.

Twelve (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 after drinking the fluid.

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

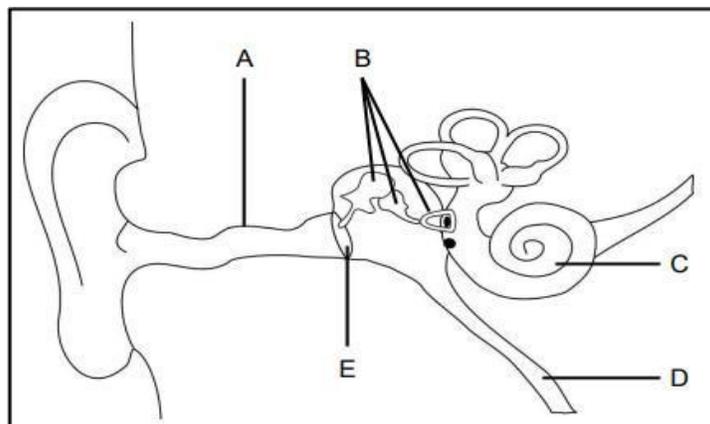
2.3.1 State:

- 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)

2.3.2 Based on the results, +. (4)

(11)

2.4 Study the diagram below, then answers the questions that follow.



2.4.1 Write down the letter only of the part which:

(a) amplifies the vibrations from the tympanic membrane (1)

(b) contains the receptors for hearing (1)

2.4.2 Otosclerosis is a genetic form of hearing loss caused by the stirrup becoming immovable.

Explain how this condition may cause hearing loss. (3)

2.4.3 Two devices used to treat deafness are hearing aids and cochlear implants.

The way in which they function is given in the table below:

Device	Method of functioning
Hearing aid	Receives, transmits and amplifies sound vibrations
Cochlear implant	Receives sound vibrations and converts them into an electrical impulse which is transmitted directly to the auditory nerve

By referring to the diagram above, give the letter/s and name/s of the parts where the defect may occur:

(a) when a hearing aid is used (2)

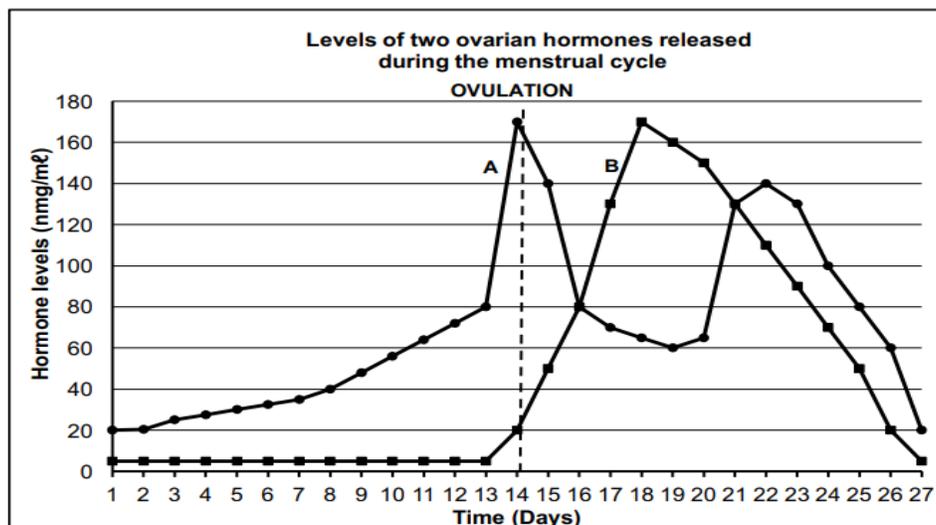
(b) when a cochlear implant is used (1)

2.4.4 The vestibular branch of the auditory nerve transmits impulses from the semi-circular canals to the cerebellum.

Explain the consequence if this nerve is infected by a virus. (2)

(10)

2.5 Study the graph below.



2.5.1 Identify:

(a) Hormone A (1)

(b) Hormone B (1)

2.5.2 What effect does an increase in hormone A have on the endometrium? (3)

2.5.3 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)

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

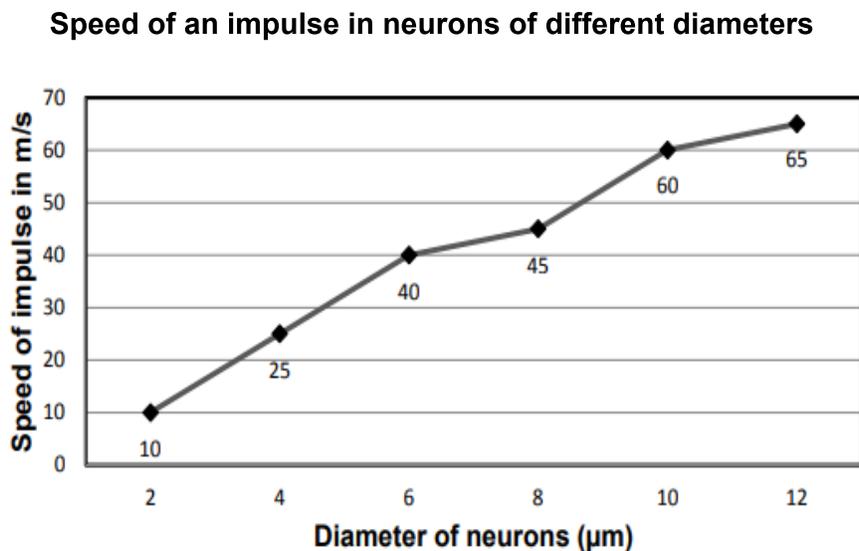
2.5.5 Explain evidence in the graph that indicates that no fertilisation took place during the menstrual cycle shown above. (3)

(14)

[50]

Question 3

3.1 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.



3.1.1 Use the graph to calculate the percentage increase in the speed of an impulse, between a neuron with a diameter of $6\ \mu\text{m}$ and one with a diameter of $8\ \mu\text{m}$. Show ALL calculations. (3)

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

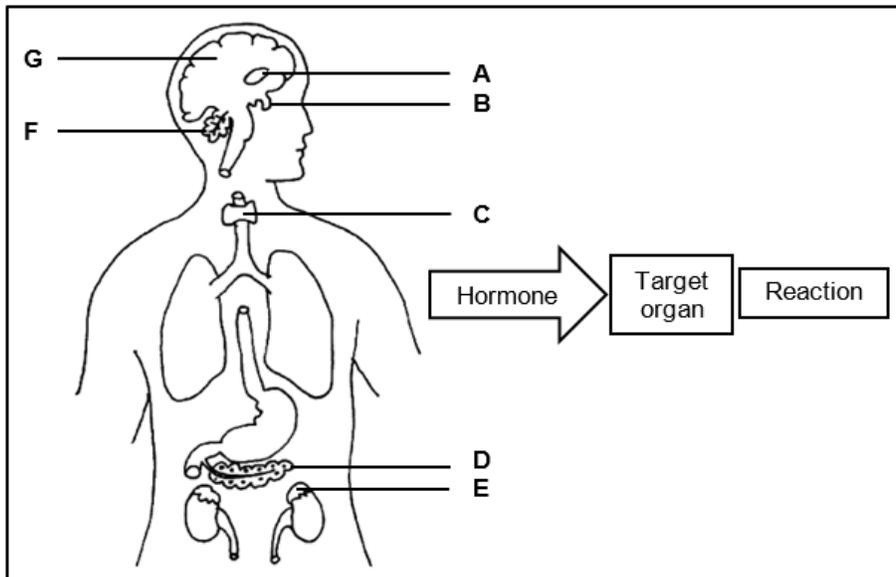
3.1.3 What is the relationship between the diameter of a neuron and a reflex action? (2)

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

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

(12)

3.2. Study the diagram below.



3.2.1 Provide labels for the following parts of the brain:

- (a) G (1)
- (b) F (1)
- (c) B (1)

3.2.2 Name the target organ of the hormone secreted by:

- (a) **E**, to control salt levels (1)
- (b) **A**, for osmoregulation (1)

3.2.2 Give the LETTER of the part, and the NAME of the hormone it secretes, that results in the following reactions:

- (a) Stimulates the conversion of glycogen to glucose (2)
- (b) Controls growth (2)
- (c) Controls basic metabolic rate (2)

(11)

3.3 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

3.3.1 What is meant by a reflex arc? (2)

3.3.2 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)

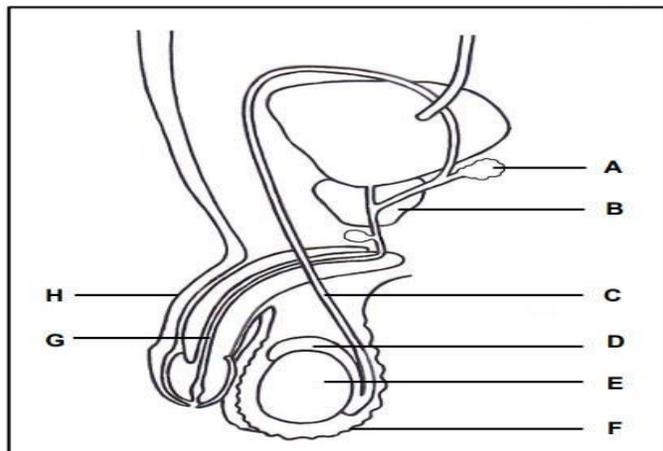
3.3.3 Describe ONE difference between the causes of hyporeflexia and hyperreflexia. (2)

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

3.3.5 Explain how damage to the part named in QUESTION 3.3.4 can lead to the symptoms of multiple sclerosis, as stated in the extract. (3)

(11)

3.4. The diagram below shows the parts of the male reproductive system.



3.4.1 Identify part:

- | | |
|-------|-----|
| (a) C | (1) |
| (b) F | (1) |
| (c) H | (1) |
| (d) G | (1) |

3.4.2 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) |

3.4.3 Give the LETTERS of TWO parts that contribute to the formation of semen. (2)

3.4.4 Explain the consequences for reproduction if section C is surgical be tied off. (2)

3.4.5 Explain why it would still be possible for an HIV-positive man to infect another person during intercourse even if part C has been discontinued. (2)

(16)

[50]

TOTAL SECTION A: 50

TOTAL SECTION B:100

GRAND TOTAL :150