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# basic education

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.**

**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.

**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

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)**

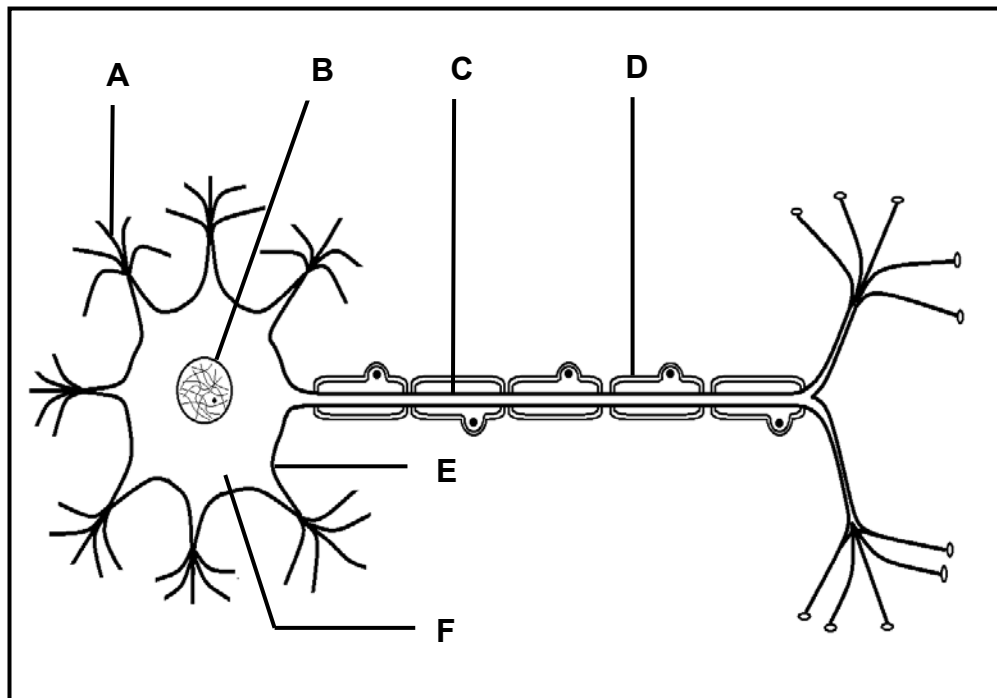
1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

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)

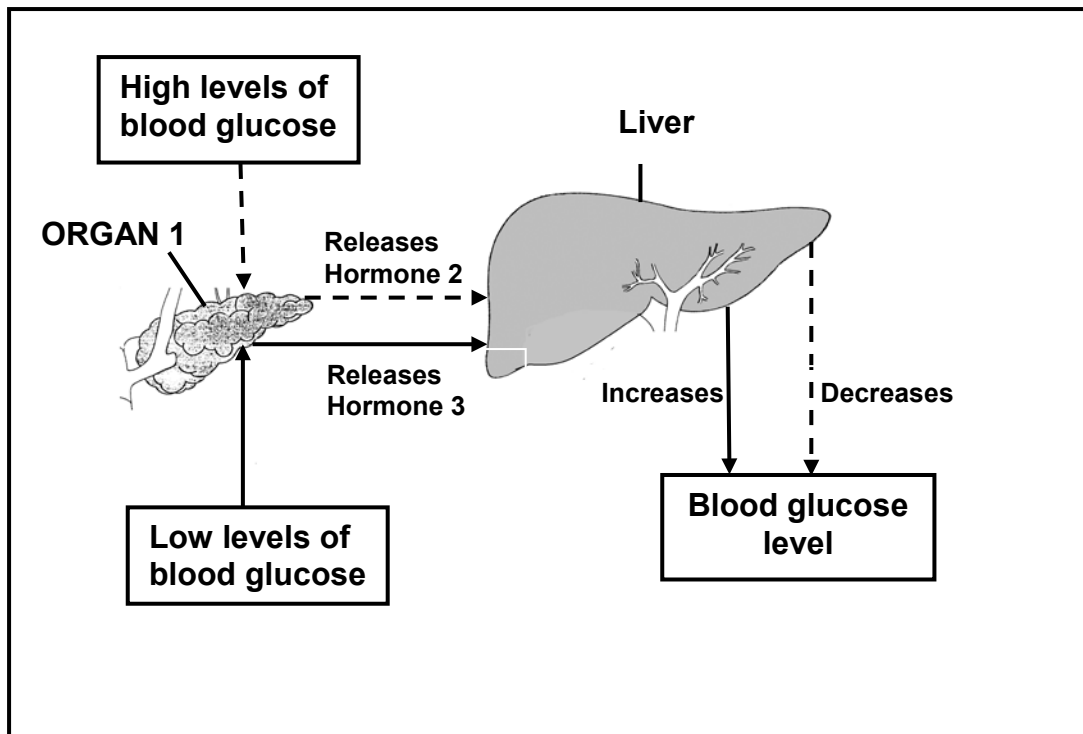
**(6)**

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)**

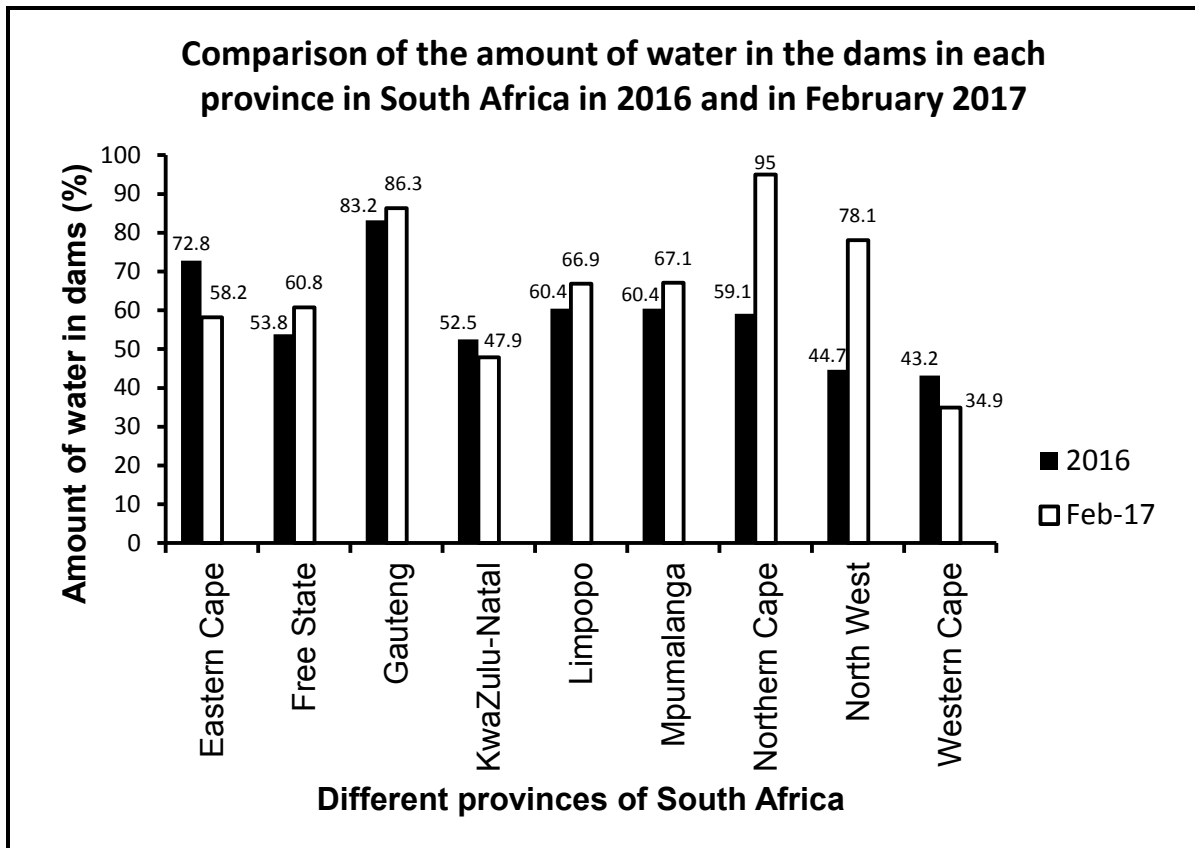
**TOTAL SECTION A: 50**



**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**

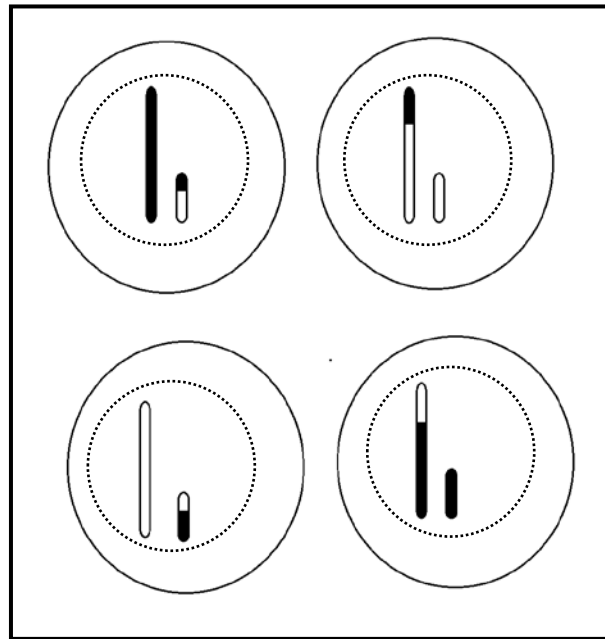
A crop-destroying caterpillar species (commonly known as the army worm) endemic to North and South America is spreading rapidly in Africa, including South Africa and is raising concerns about food security.

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.

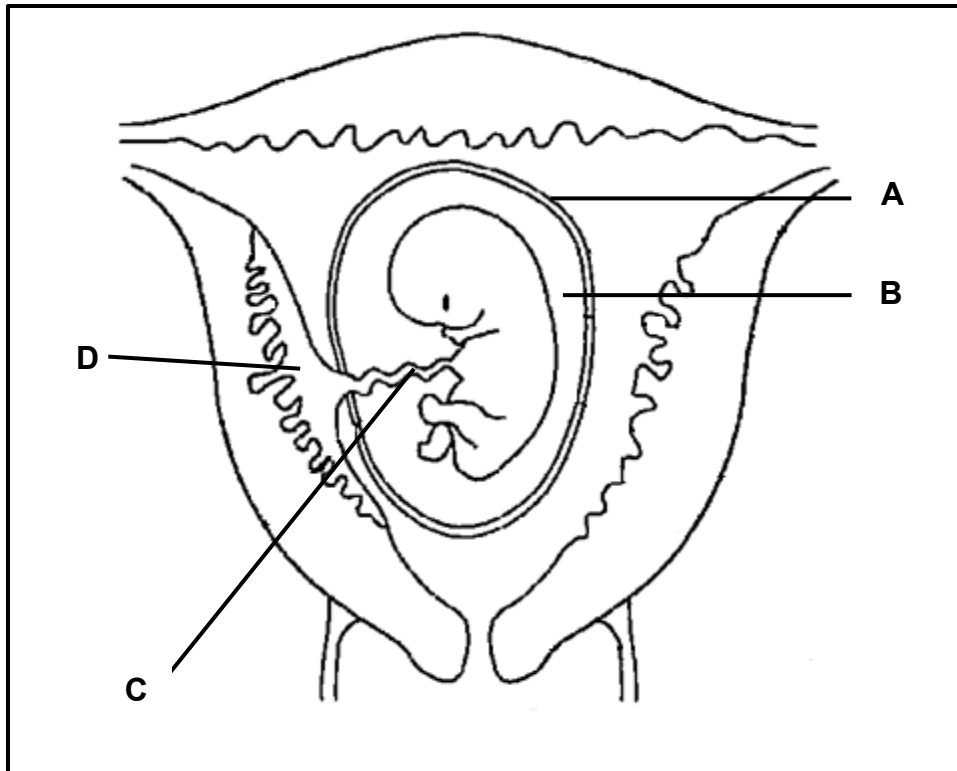
- 2.2.1 Define *food security*. (2)
- 2.2.2 Give ONE phrase in the extract which implies that the army worm is an alien species on the African continent. (1)
- 2.2.3 According to the passage, state TWO ways in which the army worm could have been introduced into Africa. (2)
- 2.2.4 Refer to the passage 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)

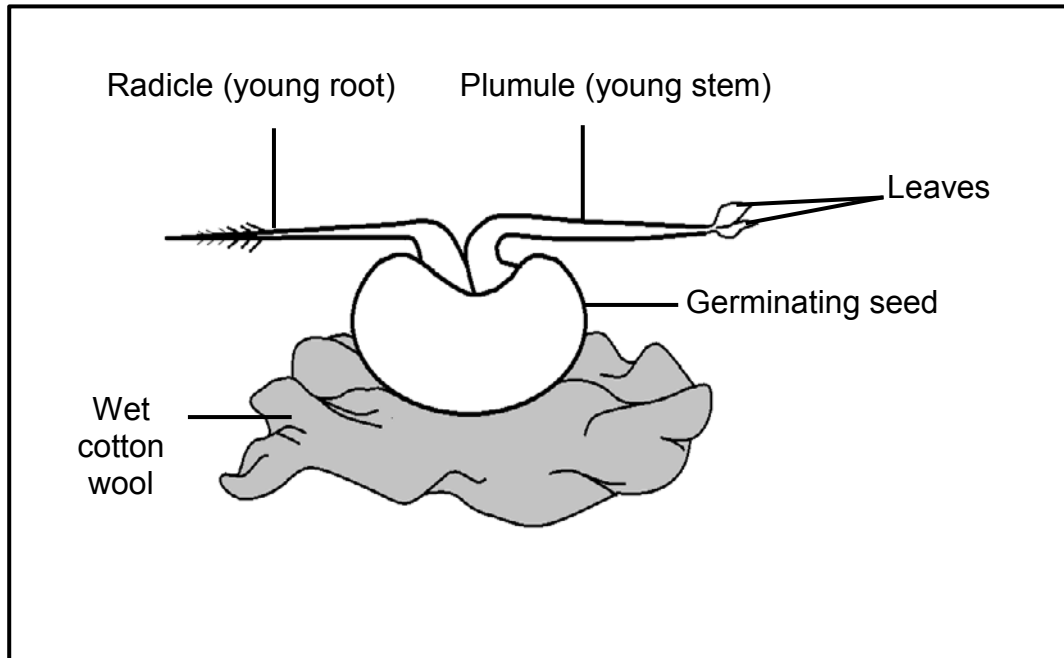
2.4.3 Name ONE system in the baby's body that takes over the function of part **D** once the baby is born. (1)

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

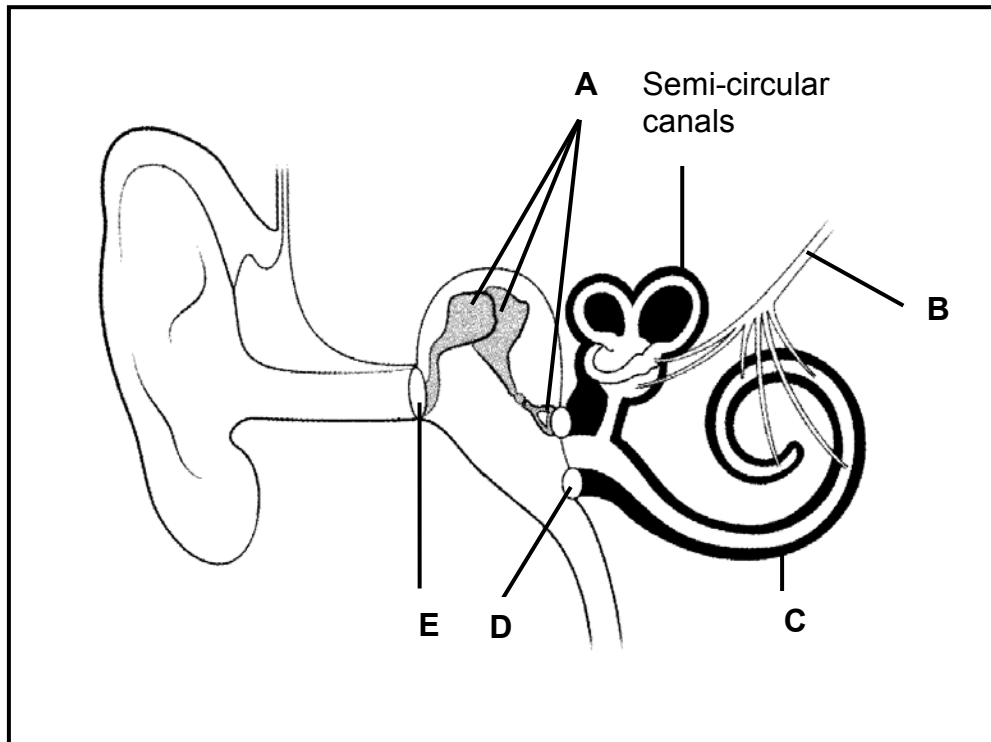
The table below shows the results of the investigation.

GROUP	DIET	AVERAGE MASS OF RATS (g)		AVERAGE OXYGEN CONSUMPTION (ml/kg/min)
		INITIAL	AFTER THREE WEEKS	
<b>A</b>	<b>X</b>	319	321	4,0
<b>B</b>	?	320	309	10,0
<b>C</b>	?	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: (1)
- (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**