



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**SENIOR CERTIFICATE/  
NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P1**

**NOVEMBER 2020(2)**

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 16 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 numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

- 1.1.1 Which part controls the amount of light entering the eye?
- A Cornea
  - B Iris
  - C Choroid
  - D Lens
- 1.1.2 Which ONE of the following refers to an aquifer?
- A An increase in the temperature of water bodies as a result of water from industries
  - B Planting of the same crop on the same area repeatedly
  - C An underground permeable rock saturated with water
  - D The release of water with chemicals from mines
- 1.1.3 The structure in the amniotic egg that removes waste products:
- A Yolk sac
  - B Chorion
  - C Amnion
  - D Allantois
- 1.1.4 Which ONE of the following is CORRECT with regard to astigmatism?
- A Light cannot pass through the cornea
  - B Light cannot pass through the lens
  - C Refraction of light rays by the cornea is uneven
  - D The lens cannot become more rounded
- 1.1.5 Which structures secrete progesterone during pregnancy?
- A Adrenal gland and corpus luteum
  - B Corpus luteum and placenta
  - C Thyroid gland and Graafian follicle
  - D Pituitary gland and Graafian follicle

- 1.1.6 Which ONE of the following shows the correct sequence of an impulse from the receptor in a simple reflex arc?
- A Sensory neuron through the dorsal root → motor neuron through the ventral root → effector  
 B Motor neuron through the dorsal root → sensory neuron through the ventral root → effector  
 C Sensory neuron through the dorsal root → effector → motor neuron through the ventral root  
 D Effector → interneuron through the dorsal root → motor neuron through the ventral root
- 1.1.7 Which ONE of the following would be a disadvantage when a biological method is used to control alien plant invasion?
- A Able to control alien plants without the use of harmful chemicals  
 B Some part of the alien plant may be left to regrow when mechanically removed  
 C The species introduced might be alien in the area and outcompete the indigenous species  
 D Chemicals might affect the indigenous plants in the area
- 1.1.8 Which ONE of the following is a consequence of the destruction of wetlands?
- A Increased biodiversity  
 B Decreased water availability  
 C Decreased global warming  
 D Increased water quality
- 1.1.9 Nocturnal animals have the ability to see clearly in the dark. They have ...
- A bigger eyes.  
 B more rods in the retina.  
 C more cones in the retina.  
 D no blind spot.
- 1.1.10 Which ONE of the following is CORRECT regarding the homeostatic control of glucose in the human body?

	<b>GLAND</b>	<b>HORMONE SECRETED</b>	<b>EFFECT ON BLOOD GLUCOSE LEVEL</b>
A	Pancreas	Insulin	Increase
B	Pituitary	Glucagon	Increase
C	Pancreas	Insulin	Decrease
D	Pancreas	Glucagon	Decrease

(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 numbers (1.2.1 to 1.2.10) in the ANSWER BOOK.

- 1.2.1 The layer in the atmosphere that protects living organisms from the ultraviolet rays of the sun
- 1.2.2 The illegal hunting and killing of animals
- 1.2.3 A condition of the cell where there is only one set of chromosomes
- 1.2.4 The response of a part of a plant to a light stimulus
- 1.2.5 A hormone that stimulates ovulation in humans
- 1.2.6 The part of the brain that connects the left and right hemispheres
- 1.2.7 The blood vessel that transports deoxygenated blood from the foetus towards the placenta
- 1.2.8 A small device that is inserted in the ear to drain fluids caused by a middle-ear infection
- 1.2.9 The branch of the autonomic nervous system that restores an increased heart rate back to normal
- 1.2.10 A structure in the eye that absorbs light to prevent internal reflection (10 x 1) **(10)**

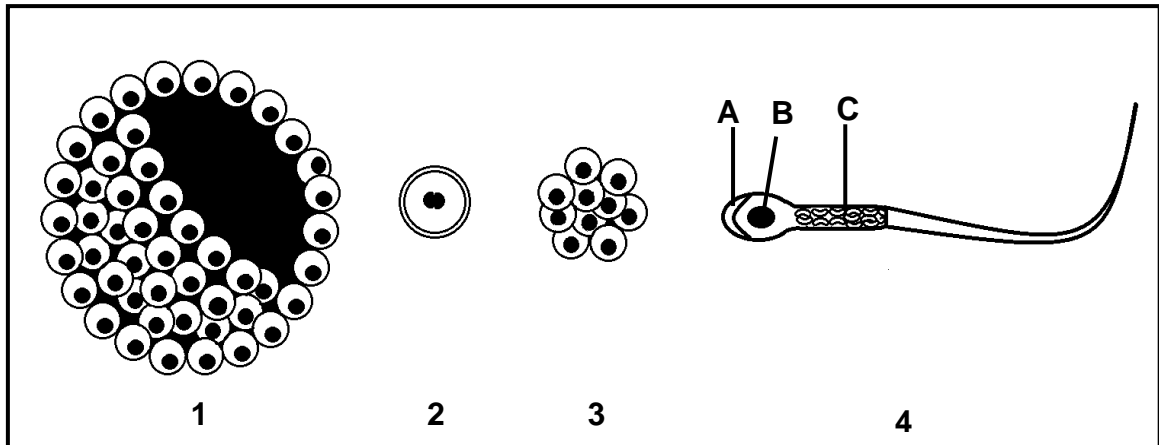
1.3 Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II
1.3.1	The functional connection between two consecutive neurons	A: Receptor B: Synapse
1.3.2	The young develops and is nourished in an amniotic egg that is retained in the mother's body	A: Ovipary B: Vivipary
1.3.3	A reproductive strategy in vertebrates where internal fertilisation occurs	A: Altricial development B: Precocial development

(3 x 2)

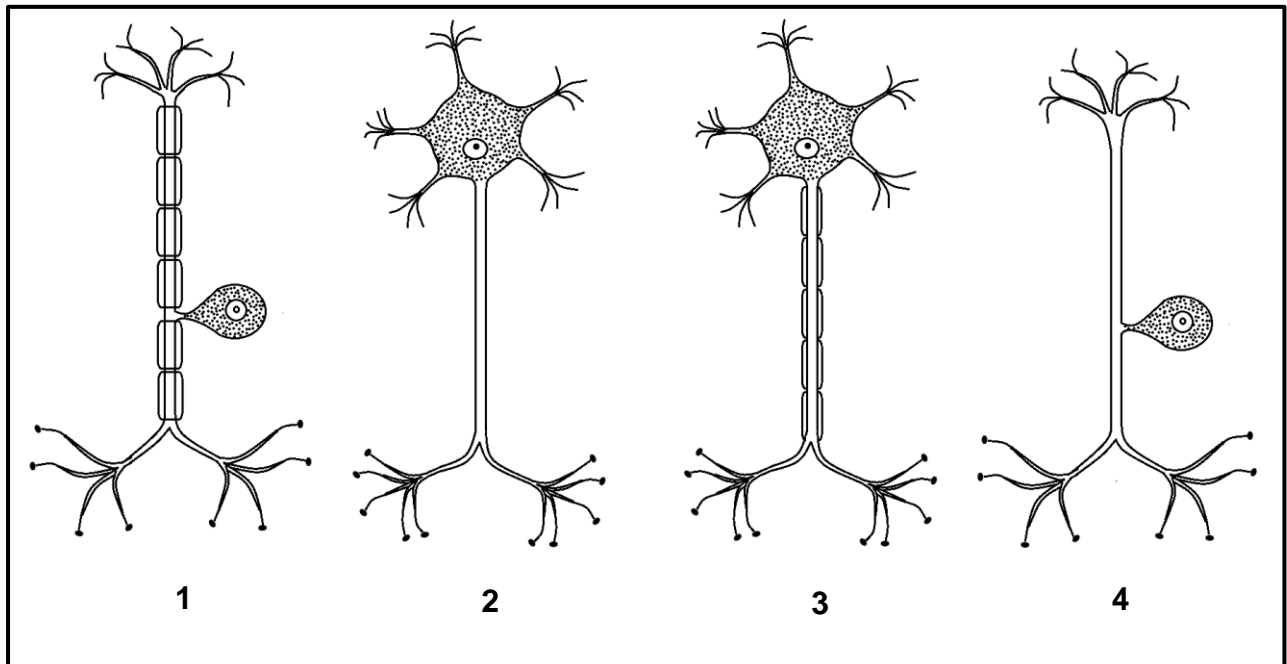
**(6)**

1.4 The diagrams below show structures formed during human reproduction.



- 1.4.1 Identify part **A**. (1)
- 1.4.2 Name the organelle found in large numbers in part **C**. (1)
- 1.4.3 Give the NUMBER (1, 2, 3 or 4) only of the diagram that represents the following: (1)
- (a) Morula (1)
  - (b) Structure that will implant in the uterus (1)
  - (c) Blastula/Blastocyst (1)
- 1.4.4 Give the LETTER and NAME of the part that will enter the ovum during fertilisation. (2)
- 1.4.5 Name the type of cell division that occurred to produce the structure in diagram 3. (1)
- (8)**

1.5 The diagrams below show different neurons.



Give only the NUMBERS (1, 2, 3 or 4) of TWO neurons that:

- 1.5.1 Transport impulses from the receptor to the central nervous system (2)
- 1.5.2 Will have a faster transmission of impulses (2)
- 1.5.3 Are damaged if a person can feel the stimulus but is unable to react (2)

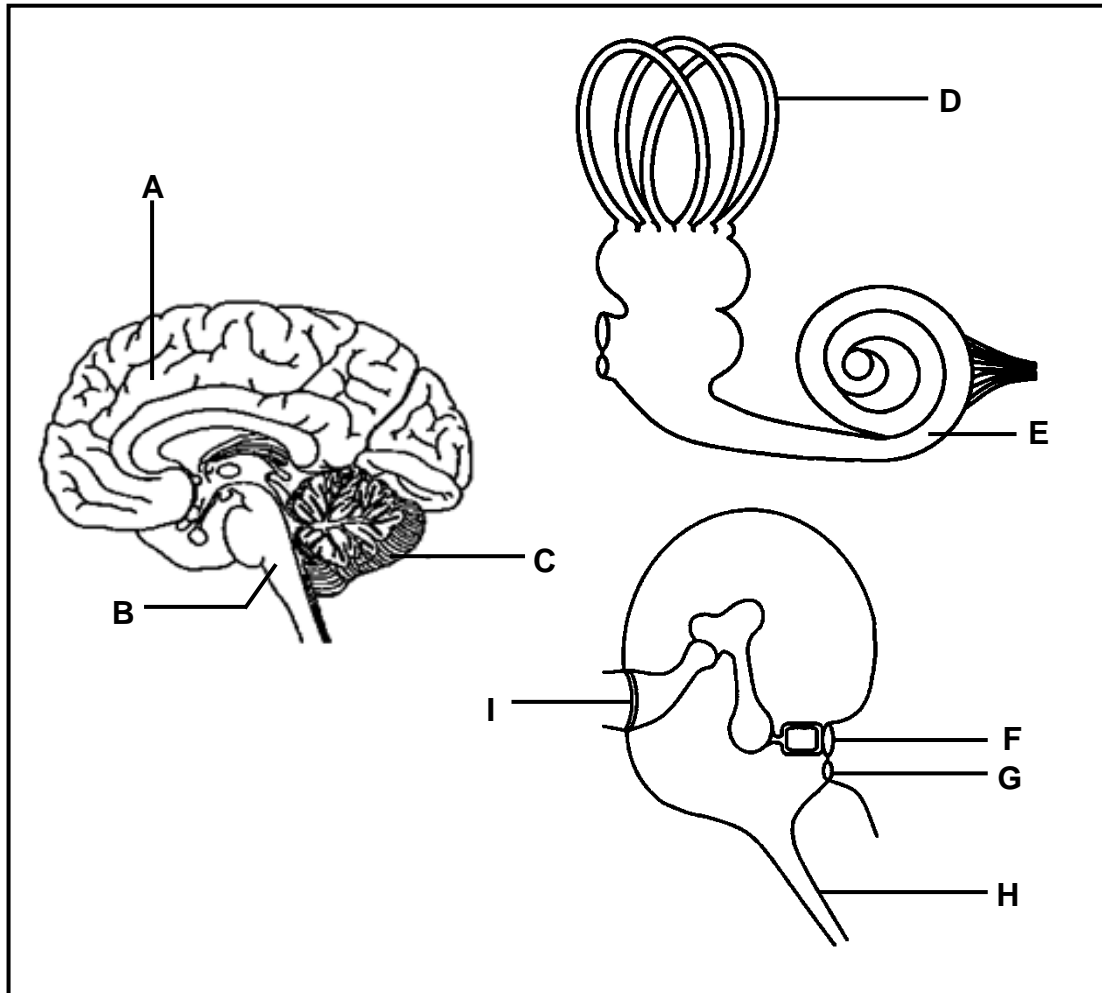
(6)

**TOTAL SECTION A: 50**

**SECTION B**

**QUESTION 2**

2.1 The diagrams below show different parts of the brain and the ear.



2.1.1 Identify part:

- (a) **A** (1)
- (b) **B** (1)
- (c) **H** (1)

2.1.2 Give the LETTER and NAME of the part of the ear that absorbs excess pressure waves from the inner ear. (2)

2.1.3 Name the receptors found at part **E**. (1)

2.1.4 Explain why damage to part **B** can lead to instant death. (2)



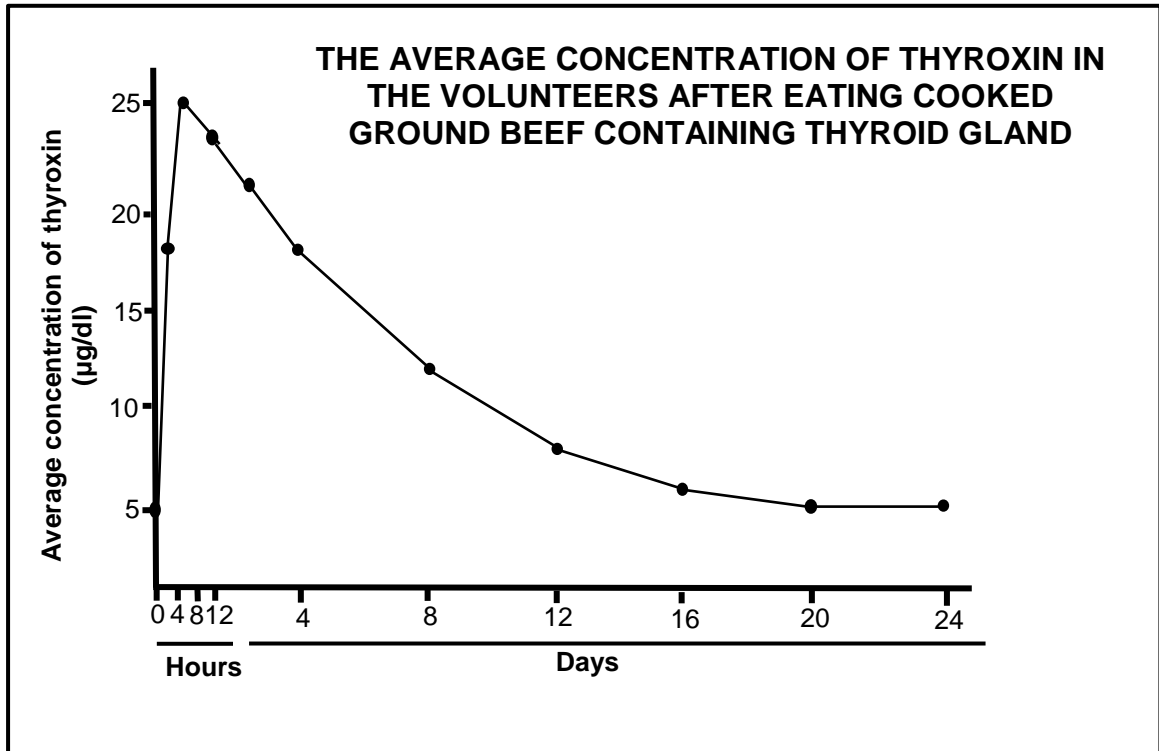
- 2.1.5 Describe how part **C** responds to impulses received from part **D**. (3)
- 2.1.6 In older people, part **F** of the ear may harden.  
Explain how this condition may lead to hearing loss. (4)  
(15)
- 2.2 Describe the accommodation of the eye for distant vision. (5)
- 2.3 Read the extract below.

### AN OUTBREAK OF THYROTOXICOSIS

Thyrotoxicosis is a medical condition caused by high levels of thyroxin in the blood. There was a sudden increase in the number of reported cases of this condition in one city. They suspected that this was due to people eating ground beef (minced meat) from a local butcher. The butcher added the thyroid glands of cattle when he produced the ground beef. Some people who ate this ground beef showed symptoms of increased heart rate, excessive sweating and weight loss.

Doctors conducted an investigation to determine if the ground beef caused the thyrotoxicosis. The normal thyroxin levels of 5 volunteers were measured. They were then given cooked ground beef from the butchery to eat. Their thyroxin concentration was measured every **4 hours on day 1** and then **once a day for the next 23 days**. The average thyroxin levels was calculated and recorded.

The results are shown in the graph below.



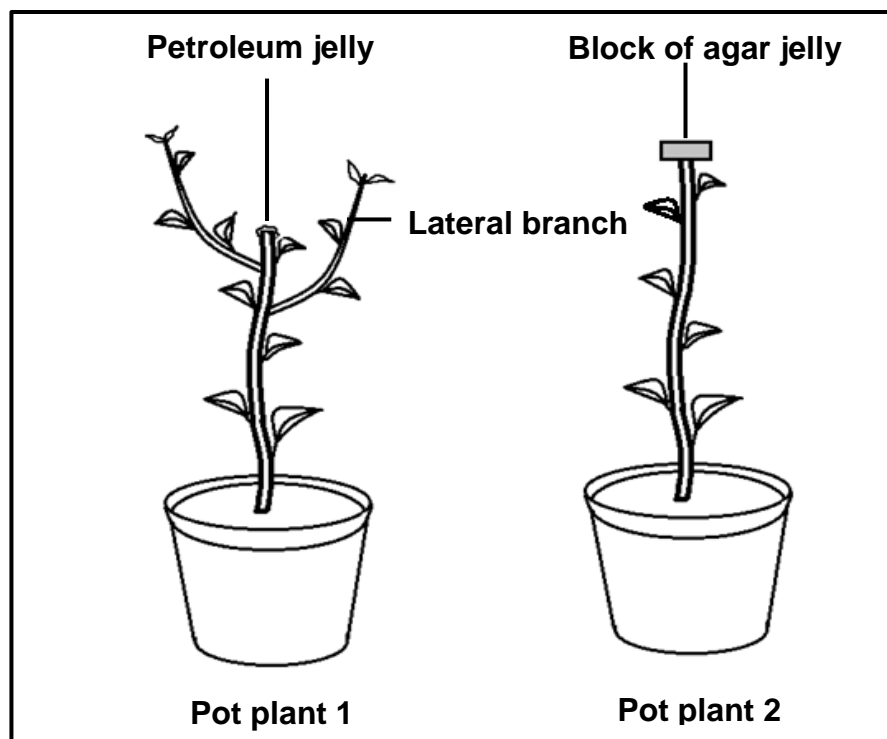
- 2.3.1 Give the average normal thyroxin concentration ( $\mu\text{g/dl}$ ) in the blood of the volunteers. (1)
- 2.3.2 Calculate the percentage increase of the average thyroxin concentration in the first 8 hours after eating the ground beef. Show ALL working. (3)
- 2.3.3 Explain why thyrotoxicosis causes weight loss. (3)
- 2.3.4 Explain the expected concentration of TSH in the blood 8 hours after eating the ground beef. (4)
- (11)**

2.4 An investigation was done to determine the effect of a plant hormone on plant growth:

The procedure was as follows:

- Two pot plants (1 and 2) of the same species and age were used.
- The apical buds of both plants were cut at the same length along the stem.
- The cut surface of plant 1 was sealed with **petroleum jelly**.
- The cut apical bud of pot plant 2 was placed on a **block of agar jelly** for 2 hours.
- The block of agar jelly was then placed on the cut surface of plant 2.
- The plants were exposed to the same environmental conditions for 2 weeks.
- The growth of both plants was observed at the end of this period.

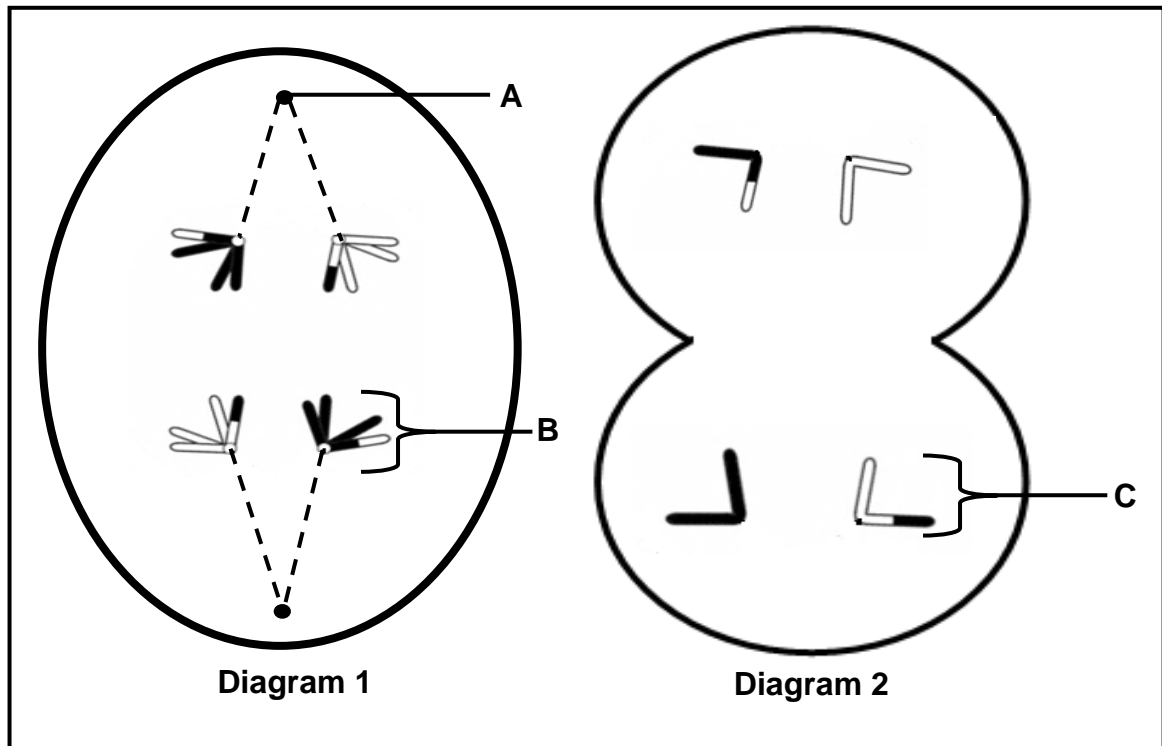
The diagrams below show the **results** obtained.



- 2.4.1 State why the apical bud was placed on a block of agar jelly for 2 hours. (2)
- 2.4.2 Describe the results obtained for plant 1. (2)
- 2.4.3 Explain how fruit farmers can use the knowledge from the results in QUESTION 2.4.2 to their benefit. (2)
- 2.4.4 Explain why the stem in pot plant 2 grew upwards. (3)
- (9)**  
**[40]**

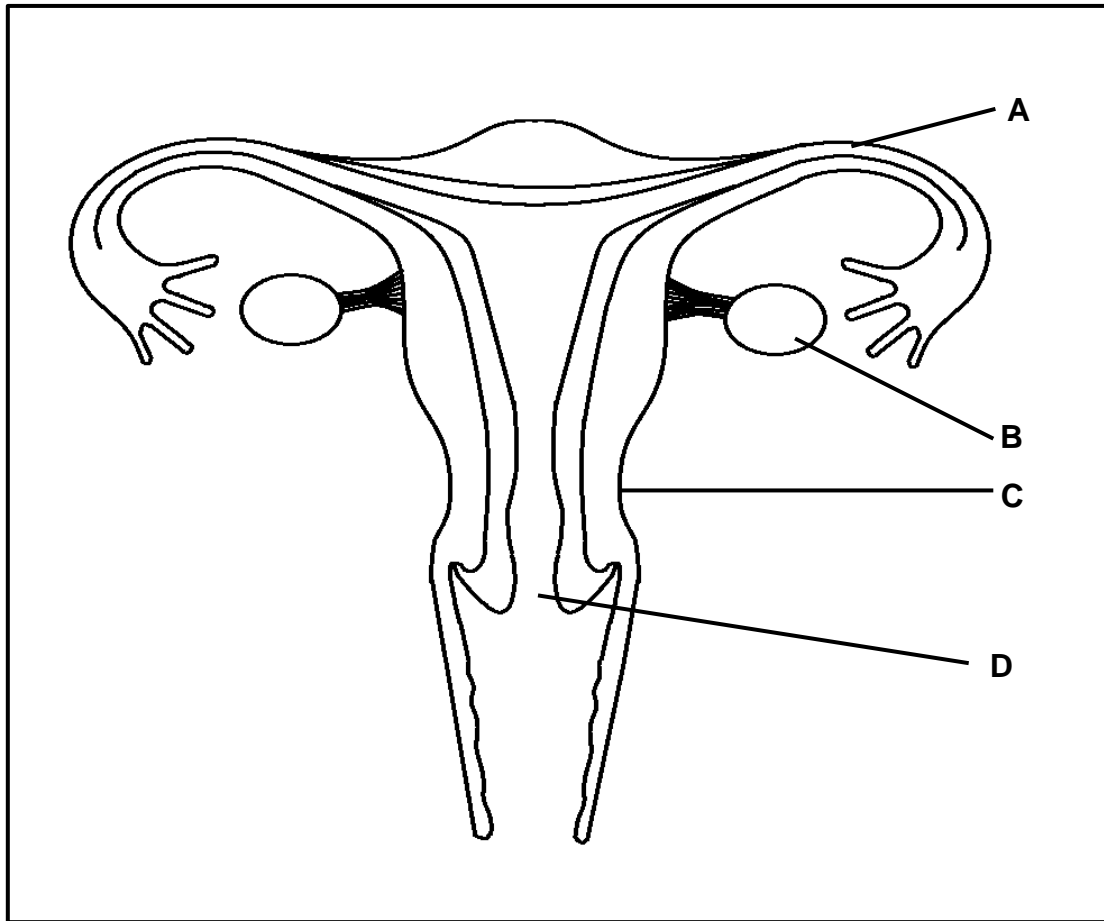
**QUESTION 3**

3.1 The diagrams below represent two phases of meiosis.



- 3.1.1 Identify part **A**. (1)
  - 3.1.2 Identify the phase represented by diagram 1. (1)
  - 3.1.3 Describe the events that took place in the phase before the one represented in diagram 2. (2)
  - 3.1.4 Name the process that causes the chromosomes to have a combination of genes as shown in the diagrams. (1)
  - 3.1.5 Give ONE reason why the process named in QUESTION 3.1.4 is important. (1)
  - 3.1.6 If this was a human cell, how many chromosomes would be present in the cell during the phase represented in diagram 1? (1)
  - 3.1.7 Structure **B** and structure **C** are both chromosomes. Explain why they are structurally different. (3)
- (10)**

3.2 The structure below represents a part of the female reproductive system.



- 3.2.1 Identify part **D**. (1)
  - 3.2.2 State ONE function of part **A**. (1)
  - 3.2.3 Describe the process of oogenesis as it occurs in part **B**. (4)
  - 3.2.4 State ONE way in which structure **C** is suited for its function during pregnancy (1)
  - 3.2.5 A person undergoes a surgical operation to remove part **B** on both sides.  
Explain why this person will not menstruate. (3)
- (10)**

3.3 Male hormone contraceptive (birth control) pills have been in development for over 50 years. The pills contain a substance called TU, which inhibits the secretion of testosterone. There is, however, no product available on the market yet, mainly due to many side effects associated with the product.

An investigation was done to determine how TU affects male fertility.

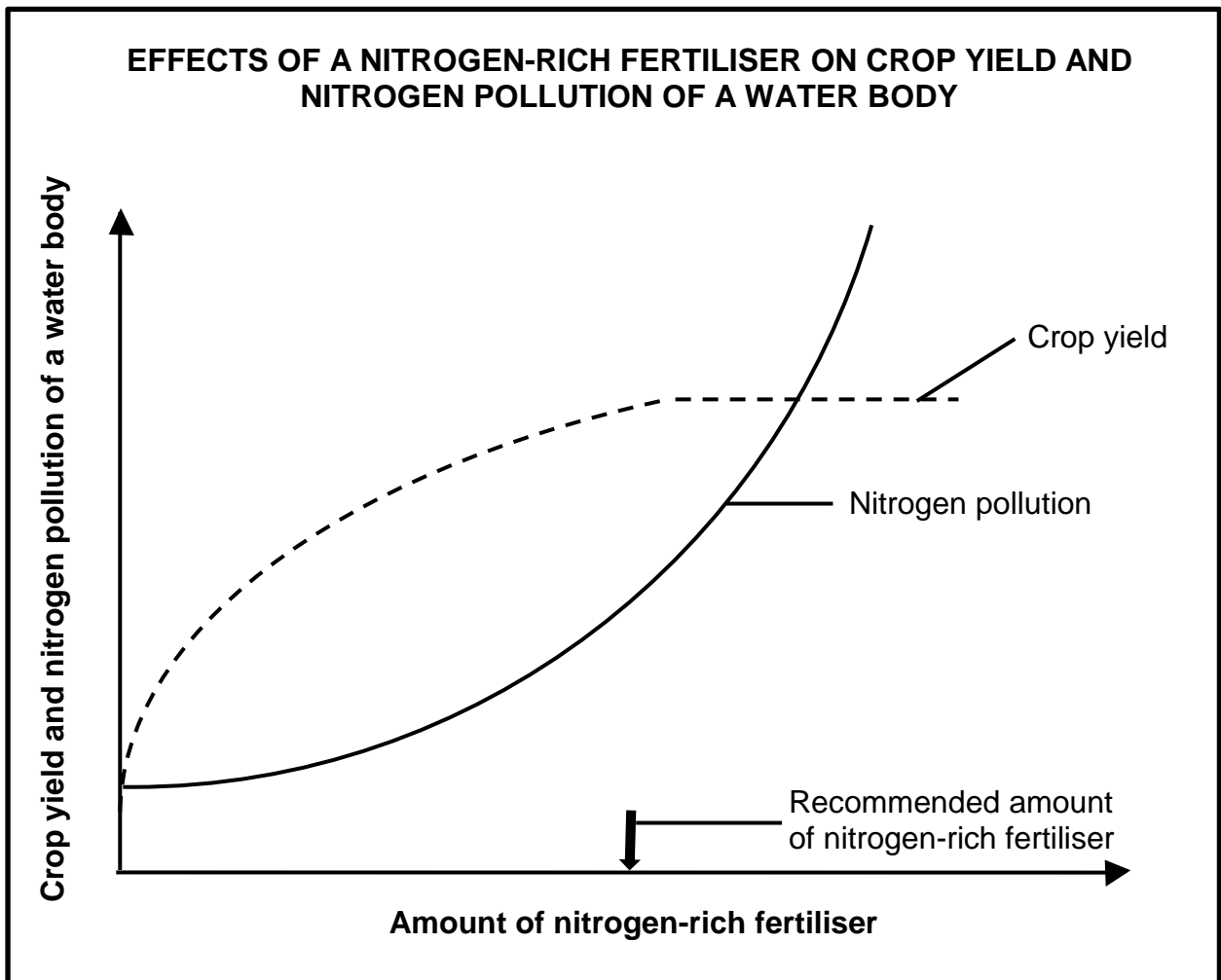
The procedure was as follows:

- 308 healthy, male volunteers were selected.
- A sperm count for each volunteer was done initially.
- Each volunteer was given 500 mg of TU monthly over a period of 12 months.
- During the period of the investigation, the volunteers were asked to wear loose-fitting trousers and underwear made of the same light fabric.
- A sperm count was done weekly over a period of 24 months.
- The average sperm count was calculated per volunteer.

**NOTE:** Sperm count refers to the total number of healthy sperm per ml of semen and is an indication of male fertility.

- 3.3.1 Identify the dependent variable in the investigation. (1)
- 3.3.2 State how the dependent variable in QUESTION 3.3.1 was measured. (1)
- 3.3.3 Name TWO other factors that should be considered when selecting volunteers. (2)
- 3.3.4 Explain how TU reduces fertility. (2)
- 3.3.5 Explain why wearing tight-fitting trousers will decrease male fertility. (2)
- 3.3.6 Suggest ONE reason for doing the sperm count for an additional 12 months after stopping the TU treatment. (1)
- 3.3.7 The contraceptive options that are currently available for men are limited to condoms and vasectomy. Vasectomy involves the cutting and tying of both the vas deferens.
- Explain how a vasectomy prevents pregnancy. (2)
- (11)**

3.4 The graph below shows the influence of a nitrogen-rich fertiliser on crop yield and nitrogen pollution of a nearby water body.



- 3.4.1 Name the process whereby excess nutrients accumulate in a water body. (1)
  - 3.4.2 Explain why it will not economically benefit the farmer to use more than the recommended amount of fertiliser. (3)
  - 3.4.3 Suggest ONE reason why farmers are advised to apply fertilisers to the soil during the dry season of the year. (1)
  - 3.4.4 Explain the effect that an increase in nitrogen pollution will have on the number of bacteria in the water. (4)
- (9)**  
**[40]**

**TOTAL SECTION B: 80**

**SECTION C****QUESTION 4**

Describe how the human body maintains the temperature and carbon dioxide concentration in the blood when they rise above normal limits.

Also, describe the importance of carbon dioxide in regulating atmospheric temperature, and why increasing levels of carbon dioxide leads to global warming.

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**