



# basic education

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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P1**

**EXEMPLAR 2014**

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 17 pages.**

## INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

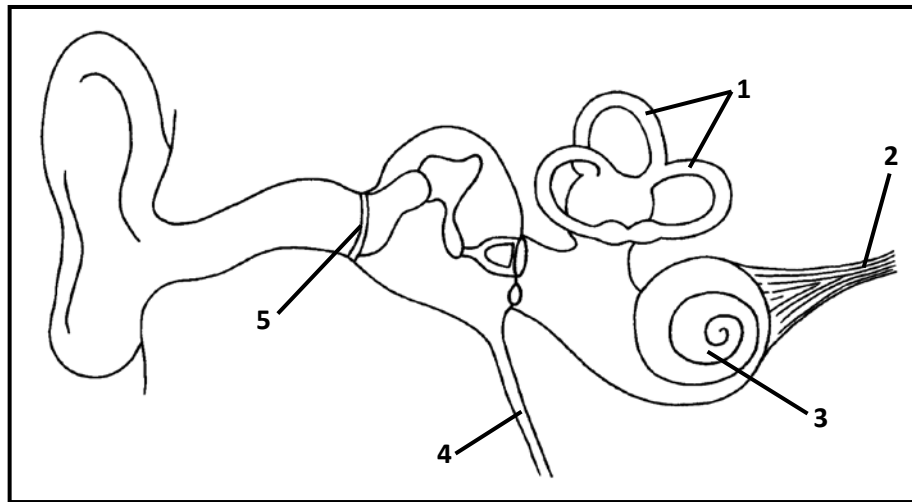
1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams 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 correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.9) in the ANSWER BOOK, for example 1.1.10 D.

**QUESTIONS 1.1.1 AND 1.1.2 REFER TO THE DIAGRAM BELOW SHOWING THE STRUCTURE OF THE HUMAN EAR.**



- 1.1.1 Which part sends vibrations to the ossicles?  
A 3  
B 1  
C 4  
D 5
- 1.1.2 Which part maintains equal pressure on either side of the tympanic membrane?  
A 4  
B 3  
C 2  
D 1

1.1.3 Below is a set of events following fertilisation in humans.

1. The embryo is embedded in the uterine wall in humans.
2. A zygote is formed in the Fallopian tube.
3. Cell division occurs to form a ball of several hundred cells.
4. The blastocyst remains free for several days in the uterus.

Which ONE of the following represents the correct order in which the above events occur?

- A 2, 3, 4, 1
- B 2, 1, 3, 4
- C 3, 2, 4, 1
- D 1, 3, 2, 4

1.1.4 The following are effects of the secretion of different hormones:

1. An increase in the blood glucose level
2. An increase in the heart rate
3. An increase in the amount of digestive enzymes
4. An increase in blood flow to the skeletal muscles

Which ONE of the following combinations of the above effects is due to adrenalin?

- A 1, 3 and 4
- B 2, 3 and 4
- C 1, 2 and 4
- D 1, 2, 3 and 4

1.1.5 The control centre in the body that will be activated when an athlete is dehydrated is the ...

- A cerebellum.
- B cerebrum.
- C corpus callosum.
- D pituitary gland.

1.1.6 The following blood vessels carry blood to or from the placenta in humans:

1. Mother's artery
2. Mother's vein
3. Umbilical artery
4. Umbilical vein

Which blood vessels contain blood with a larger amount of oxygen and nutrients?

- A 1 and 3 as compared to 2 and 4
- B 1 and 4 as compared to 2 and 3
- C 2 and 3 as compared to 1 and 4
- D 2 and 4 as compared to 1 and 3

1.1.7 Which ONE of the following is an advantage of the testes being held in the scrotum, outside the body cavity?

- A More sperm can be stored in the scrotum.
- B Sperm formation is more efficient at temperatures below the normal body temperature.
- C The testes are better protected in the scrotum than in the body cavity.
- D There is more time for prostate secretions to be added to the sperm.

1.1.8 Meiosis in a diploid cell results in ...

- A four identical gametes.
- B four haploid gametes.
- C two different diploid gametes.
- D four gametes having the same chromosome number as the parent cell.

1.1.9 The list below gives some of the stages involved in gamete and zygote formation.

- 1. Prophase I
- 2. Prophase II
- 3. Metaphase I
- 4. Fertilisation

Which ONE of the following combinations of the above stages contributes to genetic variation?

- A 1, 2 and 3
- B 1, 3 and 4
- C 2 and 3
- D 3 and 4

(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 number (1.2.1 to 1.2.9) in the ANSWER BOOK.

- 1.2.1 The period of development of an embryo in the uterus between fertilisation and birth
- 1.2.2 Disease characterised by a lack of insulin production
- 1.2.3 Tube that connects the pharynx and the middle ear
- 1.2.4 A process by which nutrients become highly concentrated in a body of water, leading to increased growth of organisms such as algae
- 1.2.5 A stage in the development of humans in which the embryo consists of a layer of cells surrounding a cavity
- 1.2.6 The structure at the tip of a sperm cell containing enzymes and which makes contact with the egg cell during fertilisation
- 1.2.7 The gland in the male reproductive system of humans that produces an alkaline fluid to counteract the acid environment of the vagina
- 1.2.8 The duct leading from the testis to the urethra in human males
- 1.2.9 The process by which the ovum is formed through meiosis in the ovary

(9 x 1)

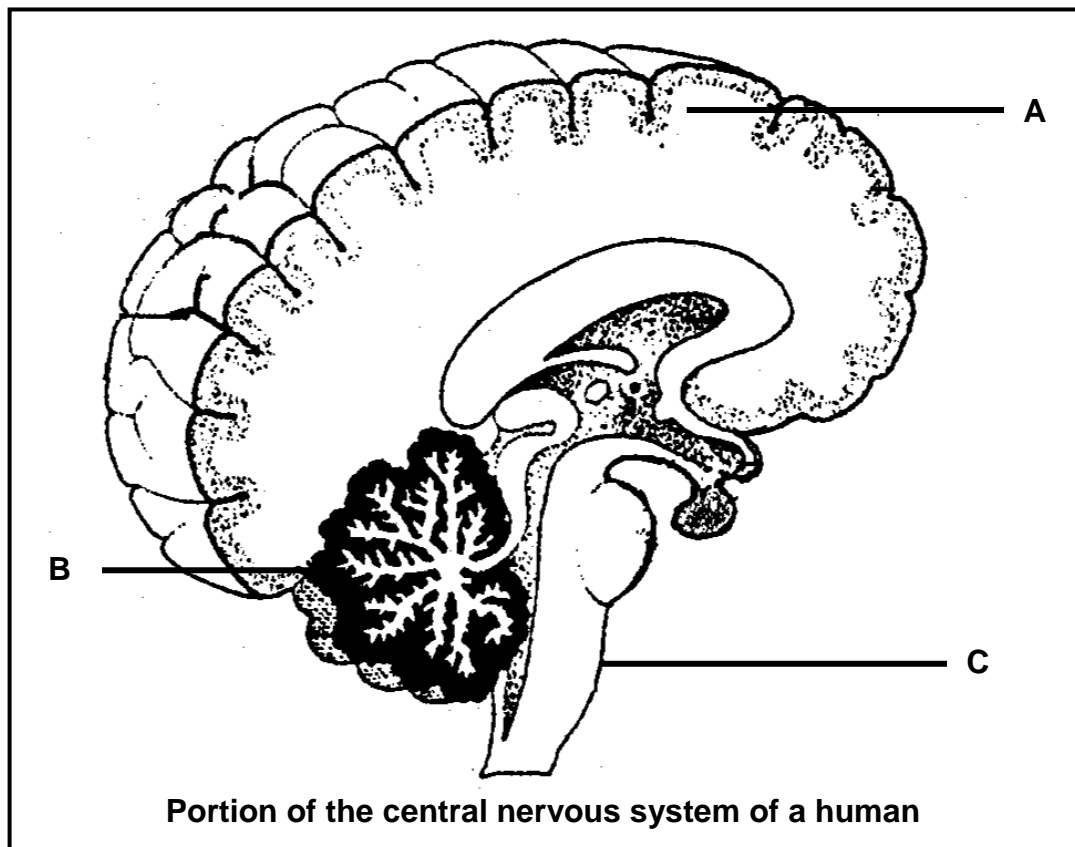
**(9)**

- 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 1.3.6) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Type of development resulting in offspring that are capable of moving around soon after hatching	A Precocial B Altricial
1.3.2 Converts glucose to glycogen	A Glucagon B Adrenalin
1.3.3 Factors affecting water availability	A Destruction of wetlands B Poor farming practices
1.3.4 Provides greater chances for the fusion of sperm and egg	A External fertilisation B Internal fertilisation
1.3.5 Characteristic of vivipary	A Placenta is formed B Live offspring is born
1.3.6 Examples of greenhouse gases	A Carbon dioxide B Methane

(6 x 2) **(12)**

- 1.4 The diagram below represents a portion of the central nervous system of humans.

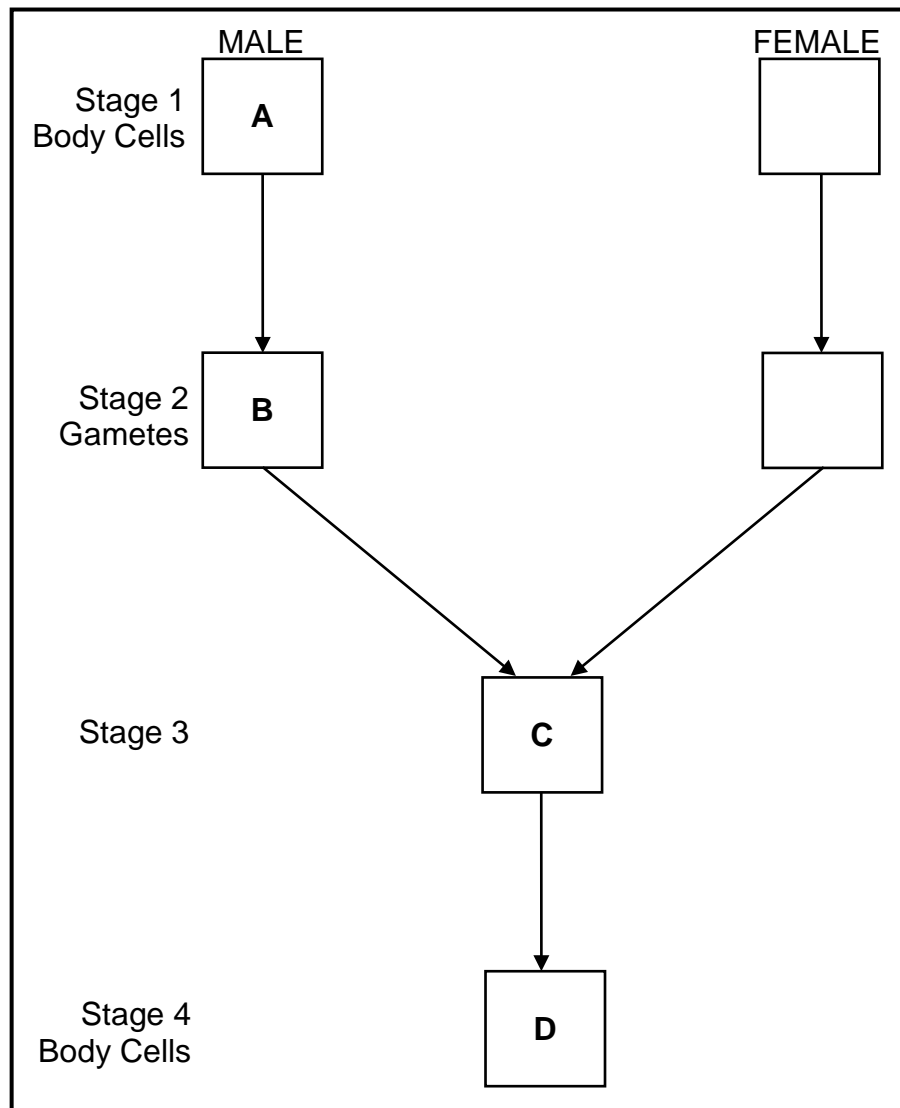


Write down the LETTER ONLY of the part which:

- |       |  |            |
|-------|--|------------|
| 1.4.1 | Regulates heartbeat and breathing rate               | (1)        |
| 1.4.2 | Coordinates movement while walking                   | (1)        |
| 1.4.3 | Interprets what you see                              | (1)        |
| 1.4.4 | Has its hemispheres connected by the corpus callosum | (1)        |
| 1.4.5 | Controls balance and equilibrium                     | (1)        |
|       |  | <b>(5)</b> |



1.5 The diagram below shows the various stages in the life cycle of a human.



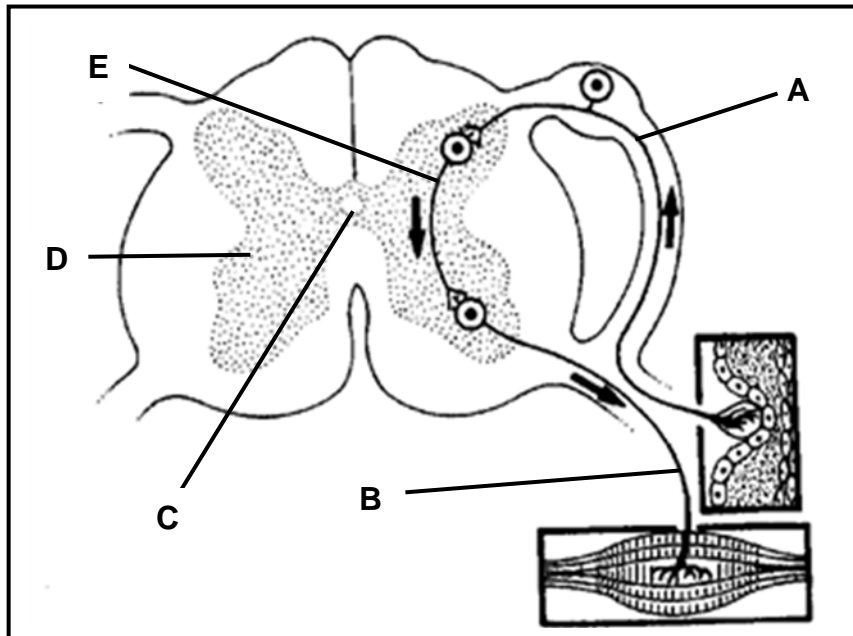
- 1.5.1 State the chromosome number of the cells represented by **A**, **B** and **C**. (3)
- 1.5.2 Name the structure at Stage 3. (1)
- 1.5.3 Between which two consecutive stages does meiosis occur in the life cycle? (1)
- 1.5.4 Between which two consecutive stages does mitosis occur in the life cycle? (1)
- (6)**

**TOTAL SECTION A: 50**

## SECTION B

### QUESTION 2

2.1 Study the diagram below, which shows a reflex arc.



2.1.1 Give labels for each of the following:

- (a) Region **D** (1)
- (b) Neuron **E** (1)

2.1.2 Write down the LETTER of the part which:

- (a) Transmits impulses to the central nervous system (1)
- (b) Contains cerebrospinal fluid (1)

2.1.3 Explain the effect on the reflex action if part **B** was damaged. (2)

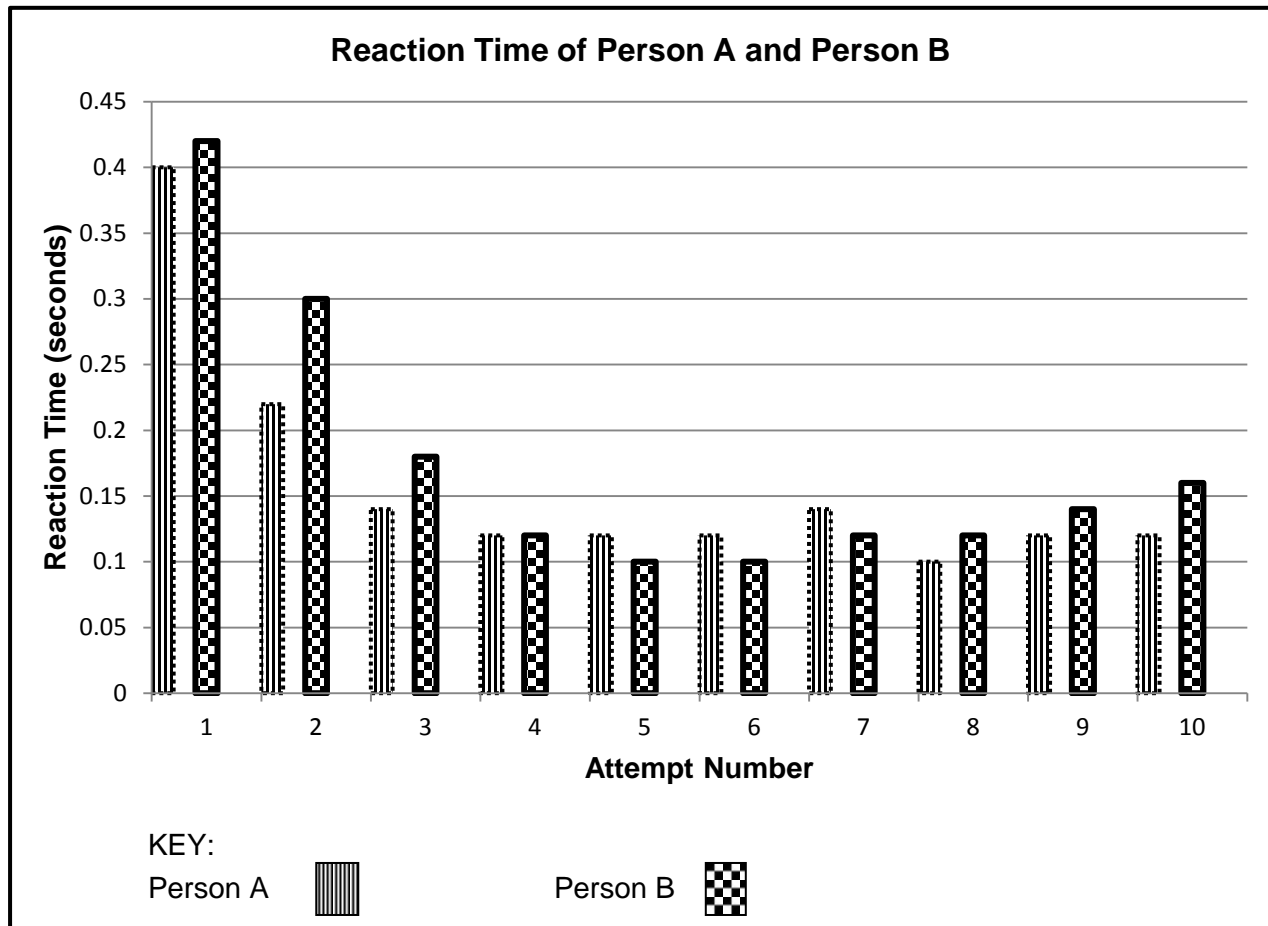
2.1.4 The nerve pathway in the above response is about 1,5 metres in length. A nerve impulse travels at  $75 \text{ m s}^{-1}$ .

Use this information to calculate the time taken for this reflex action to occur. Show all working. (3)

2.1.5 Explain the significance of a reflex action. (2)

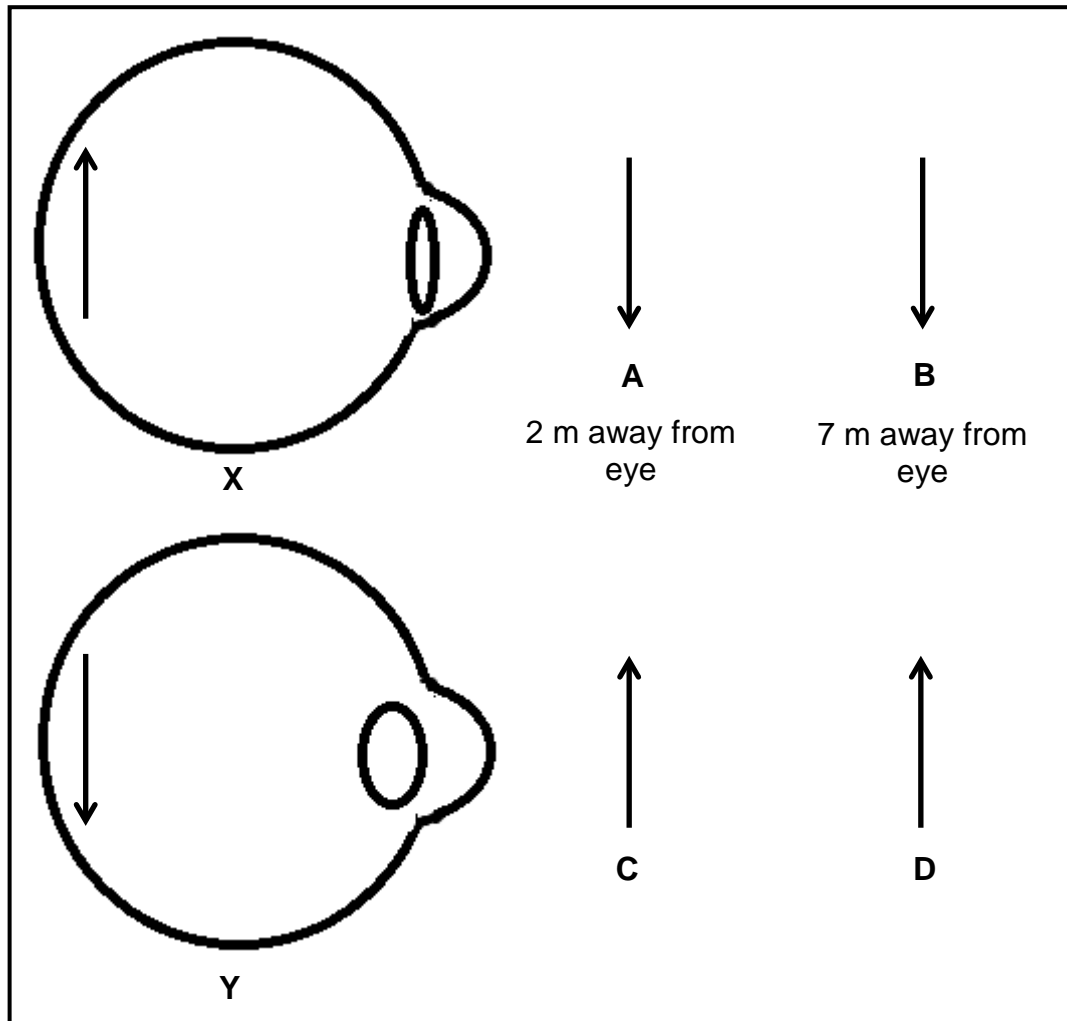
**(11)**

- 2.2 A learner carried out an investigation to measure the reaction time of two people (A and B). Each person had to ring a bell when a light flashed on. The time taken for each person to react was recorded and plotted on the bar graph below. The test was carried out 10 times.



- 2.2.1 What was the slowest reaction time? (1)
- 2.2.2 Describe how the reaction time of Person **B** changed over the 10 attempts. (3)
- 2.2.3 Suggest a possible reason for the trend described in QUESTION 2.2.2. (2)
- 2.2.4 What was the stimulus in this investigation? (1)
- 2.2.5 How would the reaction time of Person **A** have differed if he/she had been under the influence of drugs during the experiment? (1)
- (8)**

- 2.3 The diagram shows two eyes (**X** and **Y**) focused on objects (represented by arrows) at different distances from the eye. Objects **A** and **C** were 2 metres away from the eye. Objects **B** and **D** were 7 metres away from the eye.



2.3.1 Write down the LETTER ONLY of the object that:

- (a) Eye **X** is focused on (2)
- (b) Eye **Y** is focused on (2)

2.3.2 Name and describe the process that allows eye **Y** to form a clear image on the retina. (5)

(9)

- 2.4 A Grade 12 learner performed an investigation to determine the effect of light on the growth of plant shoots. The learner divided the plants that were used into three groups as follows:

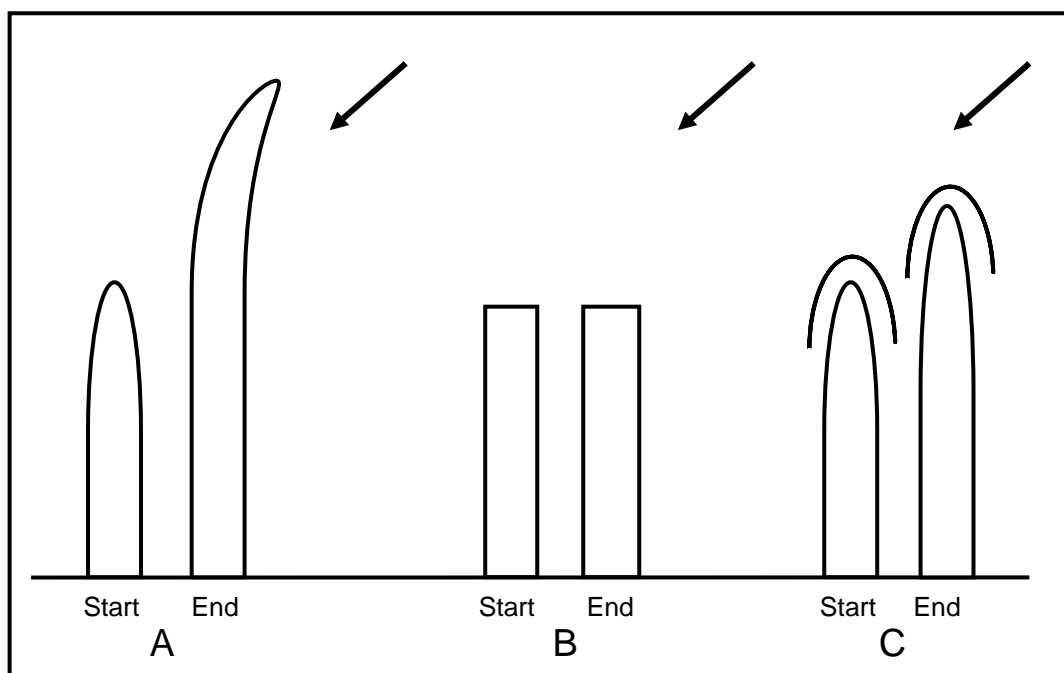
Group A – The tip of the shoot was intact.

Group B – The tip of the shoot was removed.

Group C – The tip of the shoot was covered by a cap that does not allow light to pass through.

The diagram below shows each shoot at the start of the investigation and next to each, the same shoot at the end of the investigation.

The arrows indicate the direction of light in each investigation.

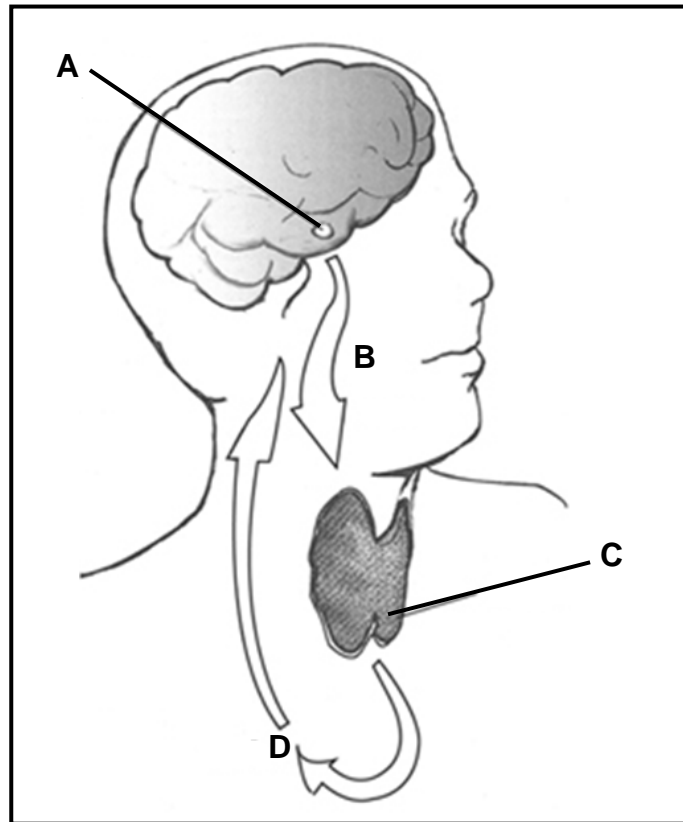


- 2.4.1 Name the dependent variable in this investigation. (1)
- 2.4.2 State TWO factors that must be kept constant in this investigation. (2)
- 2.4.3 The influence of which plant hormone is being investigated? (1)
- 2.4.4 Explain the results observed in investigations **A** and **C**, as illustrated in the diagram above. (6)
- 2.4.5 State TWO ways in which the learner could improve the reliability of this investigation. (2)

**(12)**  
**[40]**

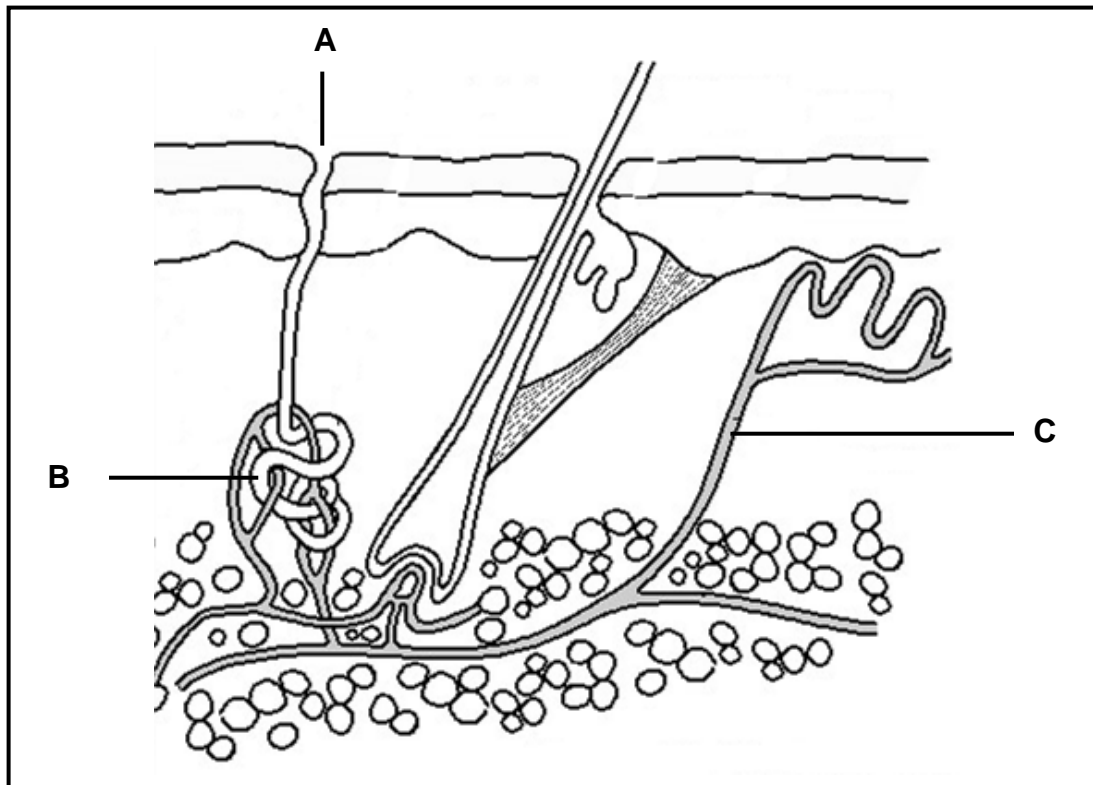
### QUESTION 3

- 3.1 The diagram below represents the interaction between two important endocrine glands. The gland labelled **A** is found at the base of the brain, while the gland labelled **C** is present towards the front of the neck.



- 3.1.1 Give a label for gland **A**. (1)
- 3.1.2 Name hormone **B**. (1)
- 3.1.3 State TWO functions of hormone **D**. (2)
- 3.1.4 Describe the *negative feedback mechanism* that operates when the level of hormone **D** is higher than normal in the blood. (5)
- (9)**

3.2 The diagram below shows a section through the mammalian skin.



3.2.1 Give labels for parts **A**, **B** and **C**. (3)

3.2.2 Describe how parts **B** and **C** play a role in reducing the body temperature back to normal when it increases above the normal level. (6)  
(9)

- 3.3 The Human Sciences Research Council (HSRC) conducted a survey on food security across the provinces. The results showed that the overall percentage of food-secure households in South Africa is 45,6% as opposed to 48% in 2008.

The results, indicating the percentage of food-insecure households in each province according to the latest survey, are shown in the table below.

PROVINCE	FOOD-INSECURE HOUSEHOLDS (%)
Eastern Cape	36
Limpopo	31
Mpumalanga	30
Free State	29
KwaZulu-Natal	28
Northern Cape	21
Gauteng	19
Western Cape	16

- 3.3.1 What is meant by *food security*? (2)
- 3.3.2 Use the data in the table to draw a bar graph for the four provinces that have the highest percentage of food-insecure households. (7)
- 3.3.3 State how the use of fertilisers by farmers can: (1)
- (a) Increase food security for a country (1)
- (b) Decrease food security for a country (1)
- 3.3.4 State how the use of pesticides by farmers can: (1)
- (a) Increase food security for a country (1)
- (b) Decrease food security for a country (1)
- 3.3.5 State TWO factors, other than the use of fertilisers and pesticides, which may have led to a decrease in the percentage of food-secure households in South Africa since 2008. (2)
- (15)**



- 3.4 The carbon dioxide concentration in the atmosphere was recorded at 400 parts per million (ppm) in May 2013 compared to 316 parts per million (ppm) in 1958. This change is due to an increase in the use of fossil fuels as well as an increase in deforestation.
- 3.4.1 Describe how deforestation contributes to the high carbon dioxide concentration in the atmosphere. (2)
- 3.4.2 State ONE other impact of deforestation on the environment. (1)
- 3.4.3 Explain why we should be concerned about the rising carbon dioxide levels. (3)
- 3.4.4 Suggest ONE way in which the government can reduce carbon emissions caused by the generation of electricity. (1)
- (7)**  
**[40]**

**TOTAL SECTION B: 80**

## SECTION C

### QUESTION 4

Name the hormones produced by the testes and ovaries and describe the role of each hormone in human reproduction.

Content: (17)  
Synthesis: (3)  
**(20)**

**NOTE:** NO marks will be awarded for answers in the form of flow charts or diagrams.

**TOTAL SECTION C: 20**  
**GRAND TOTAL: 150**