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# basic education

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

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P1  
FEBRUARY/MARCH 2015**

**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. ALL drawings must be done in pencil and labelled 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 given 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 A light stimulus is converted into a nerve impulse in the ...
- A iris.
  - B retina.
  - C optic nerve.
  - D choroid.
- 1.1.2 Which plant hormone promotes seed dormancy?
- A Gibberellin
  - B Auxin
  - C Abscisic acid
  - D Growth hormone
- 1.1.3 The type of reproduction in which young develop from the eggs that are kept in the mother's body but do not receive nutrition from the mother:
- A Vivipary
  - B Ovipary
  - C Ovovivipary
  - D Altricial
- 1.1.4 Which part of the human brain controls balance and equilibrium?
- A Cerebrum
  - B Cerebellum
  - C Medulla oblongata
  - D Corpus callosum
- 1.1.5 DNA replication occurs during ...
- A anaphase I.
  - B interphase.
  - C prophase I.
  - D prophase II.

- 1.1.6 Which of the following CORRECTLY represents the events involved in the secretion and action of ADH (antidiuretic hormone)?

	<b>WATER LEVEL IN BLOOD RELATIVE TO NORMAL</b>	<b>AMOUNT OF ADH PRODUCED RELATIVE TO NORMAL</b>	<b>AMOUNT OF WATER REABSORBED BY KIDNEYS</b>
A	Increase	Increase	Decrease
B	Increase	Decrease	Increase
C	Decrease	Increase	Increase
D	Decrease	Decrease	Decrease

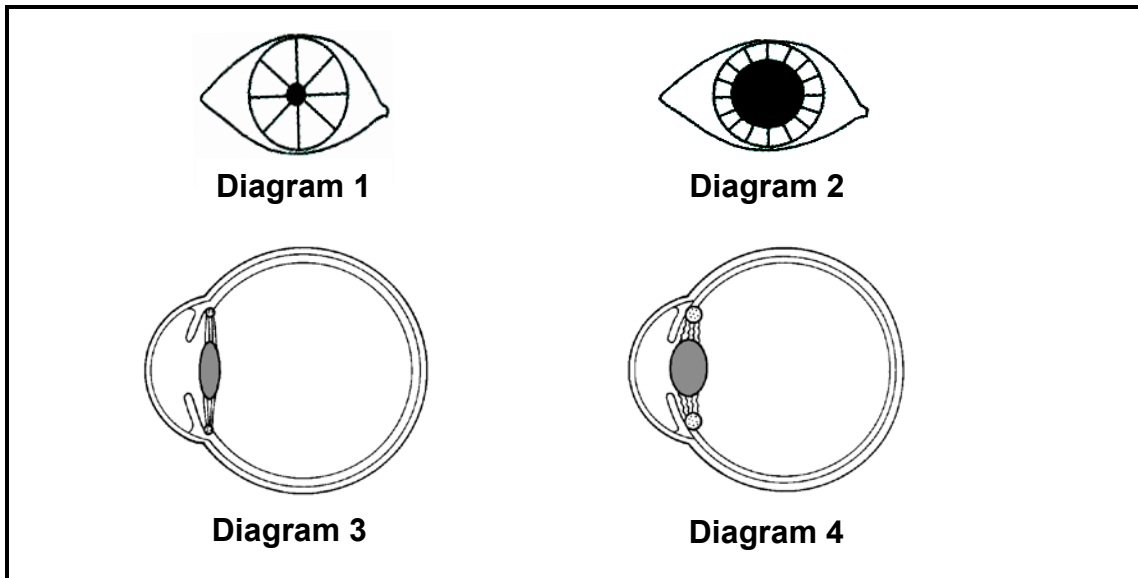
- 1.1.7 A worker spent about ten minutes in a walk-in freezer. Below are some of the changes that occurred in his body in response to the drop in external temperature.

- (i) Blood vessels in the skin constrict
- (ii) Brain reacts
- (iii) Skin temperature changes
- (iv) Temperature receptors in the skin detect changes

Which ONE is the correct sequence in which the changes occurred?

- A (ii) → (i) → (iii) → (iv)
- B (iii) → (i) → (iv) → (ii)
- C (iv) → (ii) → (i) → (iii)
- D (iv) → (i) → (ii) → (iii)

- 1.1.8 The diagrams below show the human eye under different conditions.



Which TWO diagrams above show the result when the ciliary muscles contract and the circular muscles of the iris relax?

- A 1 and 3  
 B 3 and 2  
 C 1 and 4  
 D 4 and 2
- 1.1.9 A learner conducted an investigation to determine the percentage of people that are long-sighted.

The factor that is LEAST likely to affect such an investigation is the ...

- A light intensity of the room in which the test was conducted.  
 B height of the people.  
 C age of the people in the sample.  
 D distance between the tool used to test the sight and the person being tested.

- 1.1.10 The data below represents the results of an investigation used to determine how the thickness of the lens changed as a pencil was moved away from the eye.

DISTANCE FROM EYE (cm)	THICKNESS OF LENS (mm)
10	4,0
20	3,6
30	3,2
50	2,9
100	2,6
150	2,6
200	2,6

[Adapted from *Complete Biology*, 2000]

The general conclusion that can be made from the data is that ...

- A as the distance from the eye increased up to 100 cm, the thickness of the lens increased, after which it remained constant.
- B as the distance from the eye decreased, the thickness of the lens remained constant.
- C as the distance from the eye increased up to 100 cm, the thickness of the lens decreased, after which it remained constant.
- D the thickness of the lens increased with an increase in distance from the eye.

(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 The structure in the ear that equalises the pressure on either side of the eardrum
- 1.2.2 Measurement of the total amount of carbon dioxide emissions of an individual, a defined population or a company per year
- 1.2.3 The type of pollution caused when water is released into a river after being heated in power stations or industries
- 1.2.4 The watery fluid that supports the cornea and the front chamber of the eye
- 1.2.5 The hormone produced by the Graafian follicle
- 1.2.6 The hormone responsible for the formation of the corpus luteum
- 1.2.7 The receptors in the ear that detect changes in the direction and speed of any movement of the body

- 1.2.8 A hormone which stimulates the secretion of thyroxin
- 1.2.9 The type of fertilisation associated with viviparous reproduction
- 1.2.10 The series of changes that take place in the shape of the lens and the eyeball in response to the distance of an object from the eye

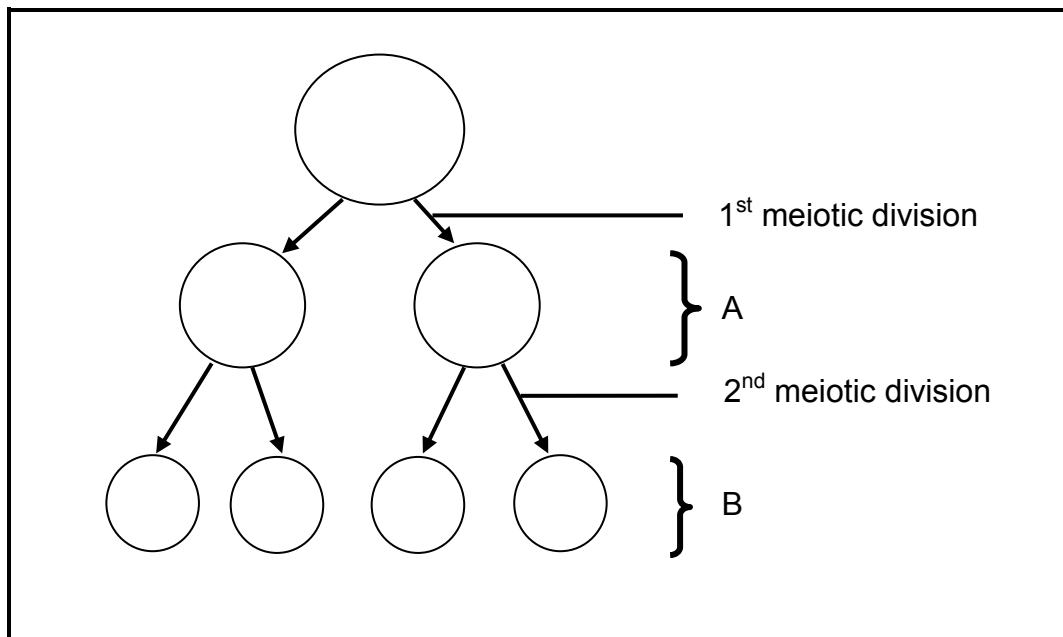
(10 x 1) (10)

- 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	May cause a decrease in the pH of the blood	A:	excess glucose
		B:	excess carbon dioxide
1.3.2	The part of the brain that connects the two hemispheres	A:	cerebellum
		B:	corpus callosum
1.3.3	A brain disorder that results in memory loss	A:	Alzheimer's disease
		B:	multiple sclerosis
1.3.4	A structure in the nervous system that detects a stimulus	A:	effector
		B:	receptor
1.3.5	A hormone secreted by the pituitary gland/hypophysis	A:	testosterone
		B:	thyroxin
1.3.6	A type of development in birds in which the young are capable of moving around soon after hatching	A:	precocial development
		B:	Altricial development

(6 x 2) (12)

1.4 Study the diagram below, which shows a process occurring in a human male.



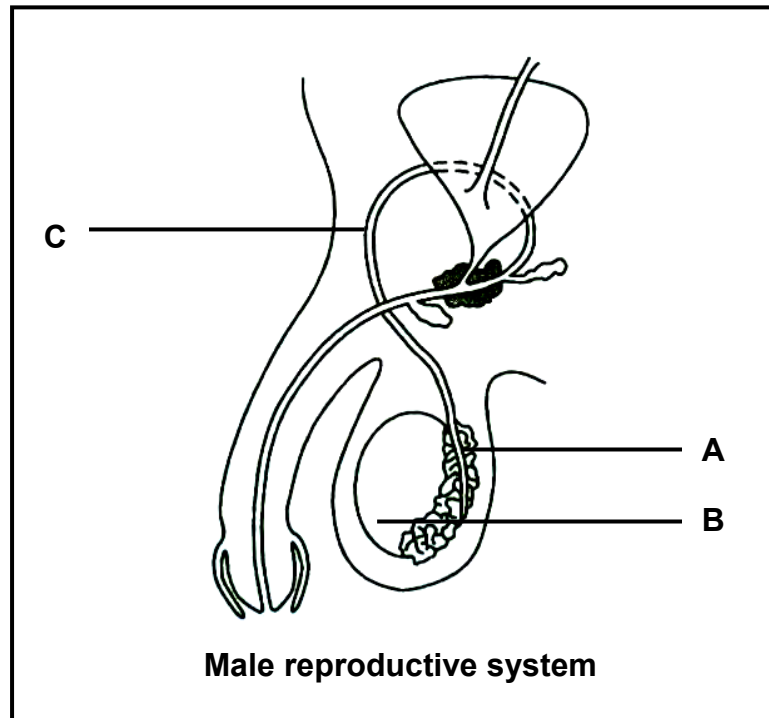
- 1.4.1 Name the process by which male gametes in humans are formed through meiosis. (1)
- 1.4.2 Name the organ in males where the process mentioned in QUESTION 1.4.1 takes place. (1)
- 1.4.3 How many chromosomes will be found in each cell at:
- (a) A (1)
- (b) B (1)
- 1.4.4 Name TWO processes occurring during the 1<sup>st</sup> meiotic division that contribute to the genetic variation of cells **A**. (2)
- 1.4.5 How many cells at **B** will carry the Y-chromosome? (1)
- 1.4.6 What are the mature cells at **B** called? (1)

(8)

**TOTAL SECTION A: 50**

**SECTION B****QUESTION 2**

2.1 Study the diagram below.



2.1.1 Give labels for each of the following:

- (a) A (1)
- (b) B (1)
- (c) C (1)

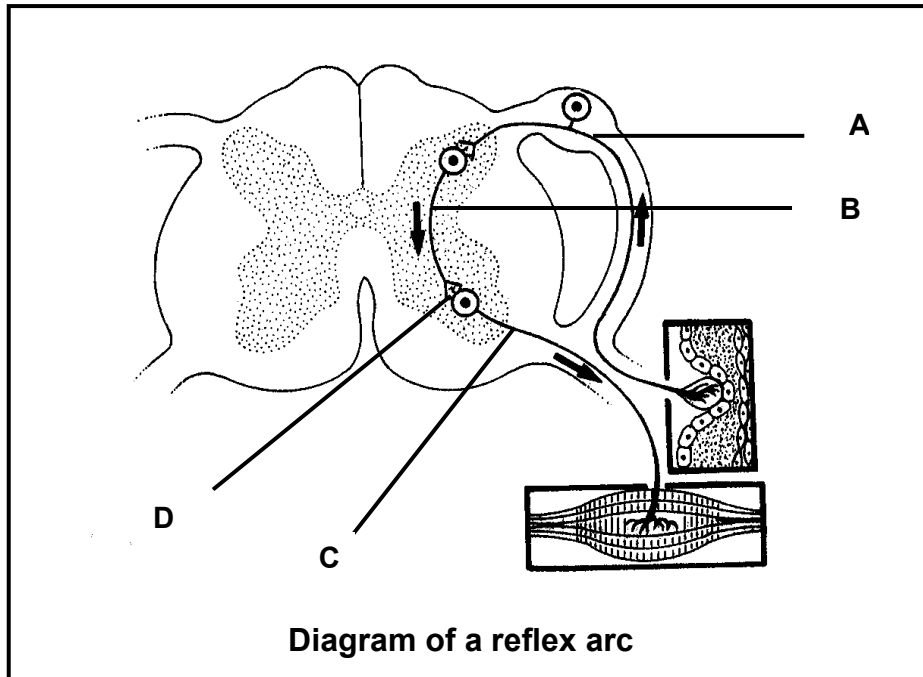
2.1.2 State ONE function of part **A**. (1)

2.1.3 Explain the consequences for reproduction if part **C** is surgically cut. (3)

2.1.4 Explain why it would still be possible for an HIV positive man to infect another person during sexual intercourse after part **C** is surgically cut. (2)

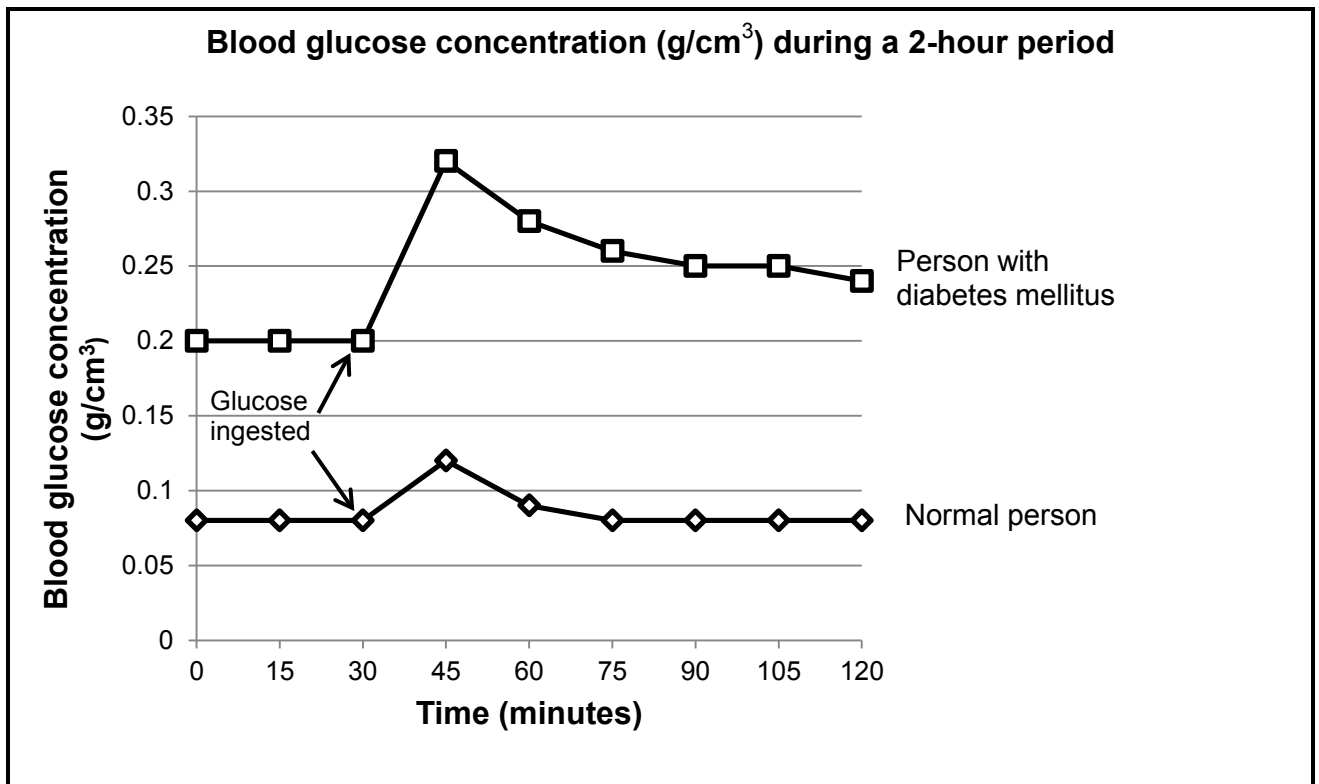
2.2 Describe how the different parts of the ear and brain allow for hearing to occur. (7)

2.3 Study the diagram of a reflex arc below.



- 2.3.1 What is a *reflex action*? (2)
- 2.3.2 Label the following:
- (a) The functional connection at **D** (1)
- (b) Neuron **B** (1)
- 2.3.3 State the significance of the functional connection at **D**. (1)
- 2.3.4 Write down, in the correct order, the LETTERS ONLY of the neurons involved from the time a stimulus is received until a response takes place. (2)
- 2.3.5 Explain the consequences for a reflex action if neuron **C** is damaged. (2)
- 2.3.6 Draw a labelled diagram to represent the structure of neuron **A**. (5)
- (14)**

- 2.4 The graph below shows the blood glucose concentration in a normal person and in a person with diabetes mellitus. Both persons ingested 100 ml of glucose solution at 30 minutes.

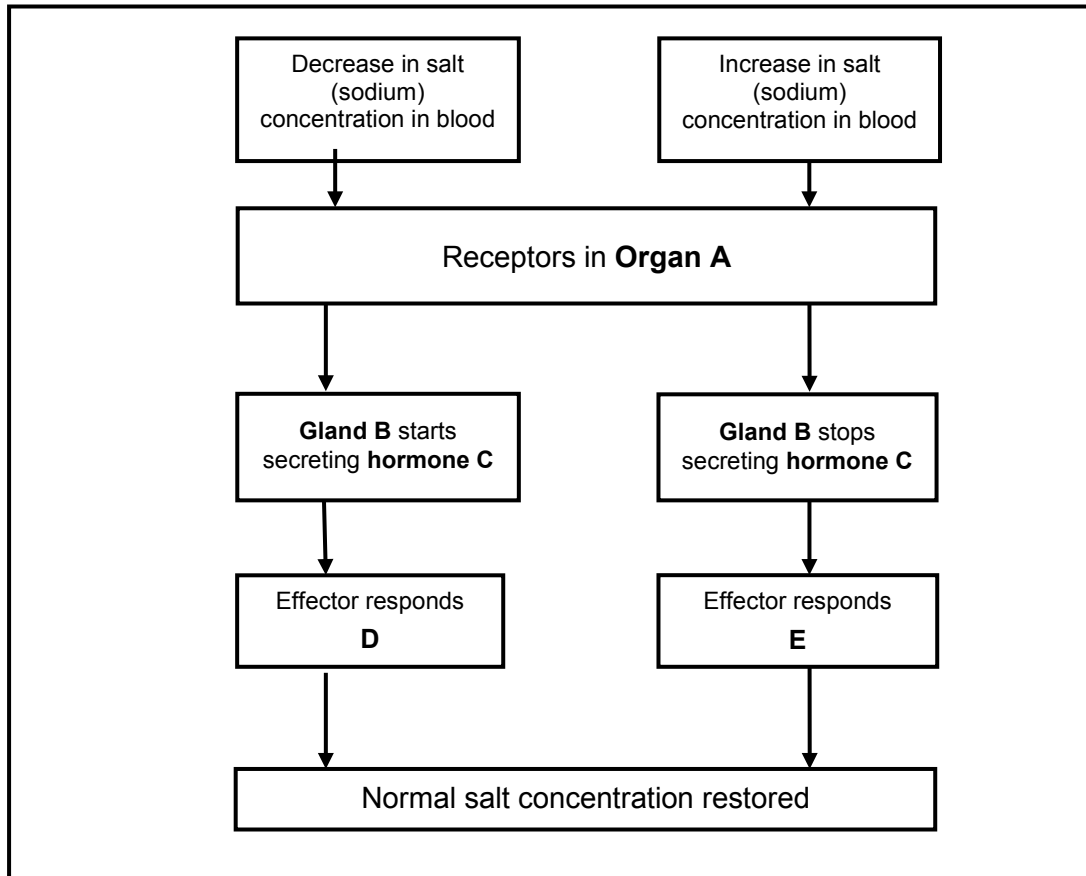


[Adapted from *Cambridge Biology 2*, 2001]

- 2.4.1 What is the blood glucose concentration ( $\text{g}/\text{cm}^3$ ) of the person with diabetes mellitus at 90 minutes? (1)
- 2.4.2 How many minutes after the ingestion of glucose did the glucose concentration reach its highest level in the normal person? (1)
- 2.4.3 Describe TWO differences in the pattern of the blood glucose concentration for the person with diabetes mellitus and a normal person. (4)
- 2.4.4 Explain the reason for the differences mentioned in QUESTION 2.4.3. (2)
- 2.4.5 Name TWO hormones that have the opposite effect to that of insulin. (2)
- (10)**  
**[40]**

**QUESTION 3**

3.1 Study the flow diagram below of a homeostatic mechanism used to regulate the concentration of salts in the human body.



3.1.1 Define *homeostasis*. (2)

3.1.2 Give the name of the following:

(a) Organ **A** (1)

(b) Gland **B** (1)

(c) Hormone **C** (1)

3.1.3 Describe the response by the effector at **D**. (2)

(7)

3.2 Read the passage below and answer the questions.

**POPULAR DAM IS A BIOLOGICAL 'DESERT'**

The Hartebeespoort Dam is situated in a residential area in North West. Unfortunately, it is rapidly becoming a biological 'desert' due to pollution by 2,7 million people living in the surrounding area, as well as the 720 megalitres of treated sewage water flowing into the dam. The inflow of treated sewage water increased the amount of phosphates present in the dam. This reduced the biodiversity of the dam resulting in only two plant species (water hyacinth and algae) and only three fish species (common carp, barbel and canary kurper) remaining in the dam, leading to an overpopulation of these species.

The Department of Water Affairs started a biological control programme to reduce the population of the remaining species so that other species could recolonise the dam. After a year the biodiversity of the dam increased.

[Adapted from *The Times*, 10 October 2013]

- 3.2.1 Based on the text above, explain what is meant by the term *biological 'desert'*. (1)
- 3.2.2 Explain why the increased phosphate levels caused a decrease in biodiversity. (3)
- 3.2.3 Explain how the reduction in biodiversity can affect the ecological balance in the dam. (4)
- 3.2.4 What is meant by *biological control*? (2)
- (10)**

- 3.3 The table below shows the global carbon dioxide emissions from fossil fuel combustion and some industrial processes in 2008.

COUNTRY	CARBON DIOXIDE EMISSIONS (%)
China	23
European Union	13
USA	19
India and Russian Federation	12
Other	33

[Adapted from [www.environmentalprotectionagency.gov/climatechange](http://www.environmentalprotectionagency.gov/climatechange)]

- 3.3.1 Draw a pie chart to represent the data in the table. (6)
- 3.3.2 Explain the impact of the increased carbon dioxide emissions on the environment. (3)
- 3.3.3 Each country has been given a mandate to reduce its carbon dioxide emissions to reach a certain target. This is reviewed annually by the Conference of the Parties (COP), a United Nations organisation comprising 195 countries that meets to assess progress in dealing with climate change.
- Explain TWO reasons why some countries are against reducing the carbon dioxide emissions by their industries. (4)
- (13)**

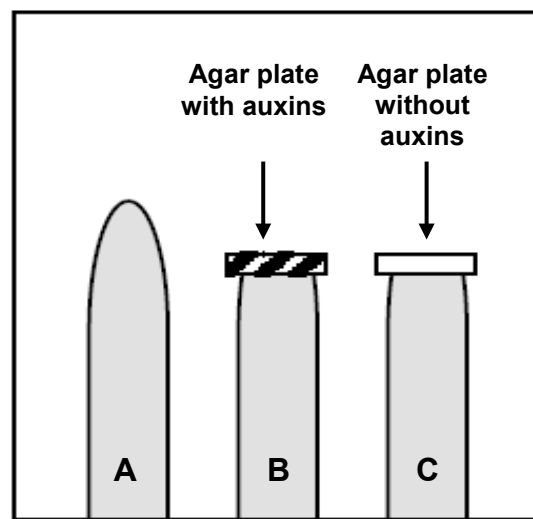
3.4 Thobeka investigated the effect of auxins on the growth of three plant shoots (**A**, **B** and **C**). The plant shoots were treated as follows:

- Shoot **A** – Not treated in any way
- Shoot **B** – Tip removed and agar plate with auxins placed on top
- Shoot **C** – Tip removed and agar plate without auxins placed on top

All shoots were exposed to the same light conditions.

**NOTE:** Agar is a jelly-like substance that allows auxins to diffuse through it.

The diagram below illustrates the set-up at the beginning of the investigation.



- 3.4.1 Identify the independent variable in this investigation. (1)
- 3.4.2 State TWO factors that must be kept constant in this investigation. (2)
- 3.4.3 Explain the results observed in:
- (a) Shoot **B** after a few days (3)
- (b) Shoot **C** after a few days (2)
- 3.4.4 Suggest TWO ways in which Thobeka could have improved the reliability of her investigation. (2)

**(10)**  
**[40]**

**TOTAL SECTION B: 80**

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

The unicellular zygote undergoes many developmental changes until it becomes a multicellular foetus, nourished and protected by the mother.

Describe the changes that allow the zygote to eventually develop into a foetus and how this foetus is nourished and protected during the period of pregnancy.

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

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

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