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# basic education

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

## **SENIOR CERTIFICATE EXAMINATIONS**

**LIFE SCIENCES P1**

**2016**

**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. 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 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 The part of the brain that is stimulated when a learner is exposed to a change in environmental temperature:

- A Cerebellum
- B Cerebrum
- C Hypothalamus
- D Corpus callosum

1.1.2 Which ONE of the following is a function of gibberellins?

- A Apical growth
- B Stimulation of seed germination
- C Inhibition of side branches
- D Dropping of leaves in winter

1.1.3 Below is a list of changes that occur in the human eye when viewing an object closer than 6 metres.

- (i) The lens becomes more convex.
- (ii) The ciliary muscles contract.
- (iii) There is less tension on the lens.
- (iv) The suspensory ligaments slacken.

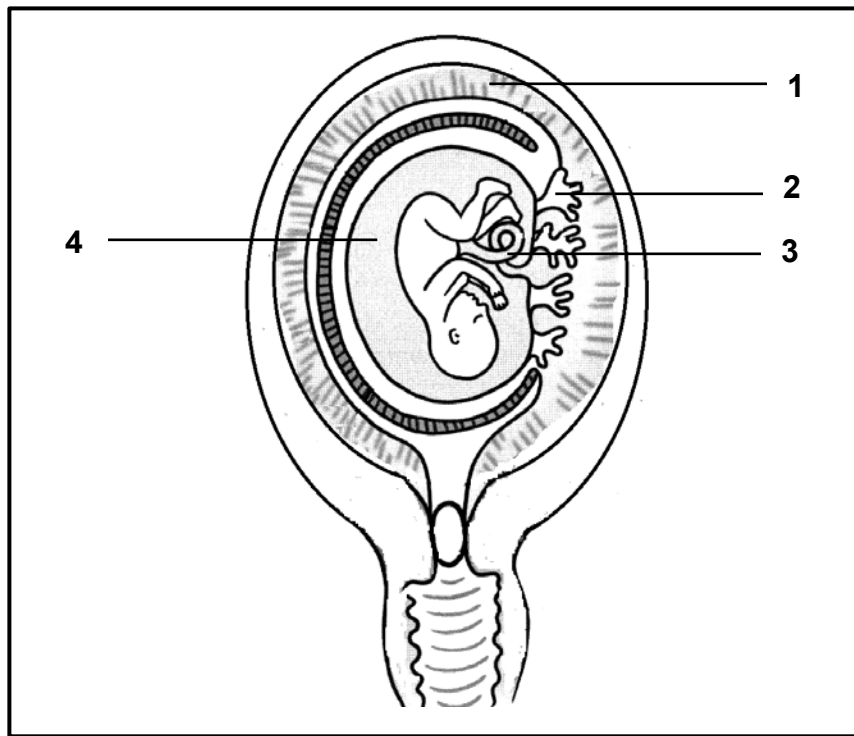
Which ONE of the following represent the correct sequence in which the changes take place?

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

1.1.4 The structure in the amniotic egg that supplies nutrients:

- A Shell
- B Allantois
- C Chorion
- D Yolk sac

**QUESTIONS 1.1.5 AND 1.1.6 REFER TO THE DIAGRAM BELOW, WHICH REPRESENTS A DEVELOPING FOETUS IN THE UTERUS.**



- 1.1.5 Which ONE of the following is responsible for protecting the foetus against temperature changes?
- A 1
  - B 2
  - C 3
  - D 4
- 1.1.6 What would be a possible consequence for the foetus if part 2 produces insufficient progesterone?
- A The foetus will not grow because there will be no cell division.
  - B The foetus may be underdeveloped due to a shortage of growth hormone.
  - C A miscarriage will take place because the endometrium will disintegrate.
  - D The foetus could be injured because there will be no shock absorption.

- 1.1.7 When a person spends most of his/her time looking at a cellphone or a computer screen the ciliary muscles of the eye are in a constant state of contraction. The muscles cannot return to their relaxed position.

As a result the muscles are unable to change the ...

- A shape of the lens to focus on distant objects.
- B shape of the lens to focus on nearby objects.
- C size of the pupil to let more light into the eye.
- D size of the pupil to reduce the amount of light entering the eye.

- 1.1.8 An investigation was carried out to determine the effect of growth hormone on children with a particular disorder that causes their height to be below the average height expected for their age and sex.

The following procedure was followed:

- 740 children with the disorder were included in the investigation.
- Their initial heights were measured.
- They were divided into two groups (**A** and **B**).
- Group **A** was given a growth hormone injection every day for 3 years.
- Group **B** did not receive the treatment.
- The height of each child in each group was then measured.

The following is a list of variables in the investigation:

- (i) Children of the same age and sex with the same disorder
- (ii) The nutrition given to the children
- (iii) The type of growth hormone used
- (iv) The height of the children at the end of the investigation

Which ONE of the following combinations are factors that should have been kept constant during this investigation?

- A (i), (ii), (iii) and (iv)
- B Only (i), (ii) and (iii)
- C Only (i), (iii) and (iv)
- D Only (ii), (iii) and (iv)

- 1.1.9 A human male underwent a vasectomy where the sperm duct/vas deferens was cut.

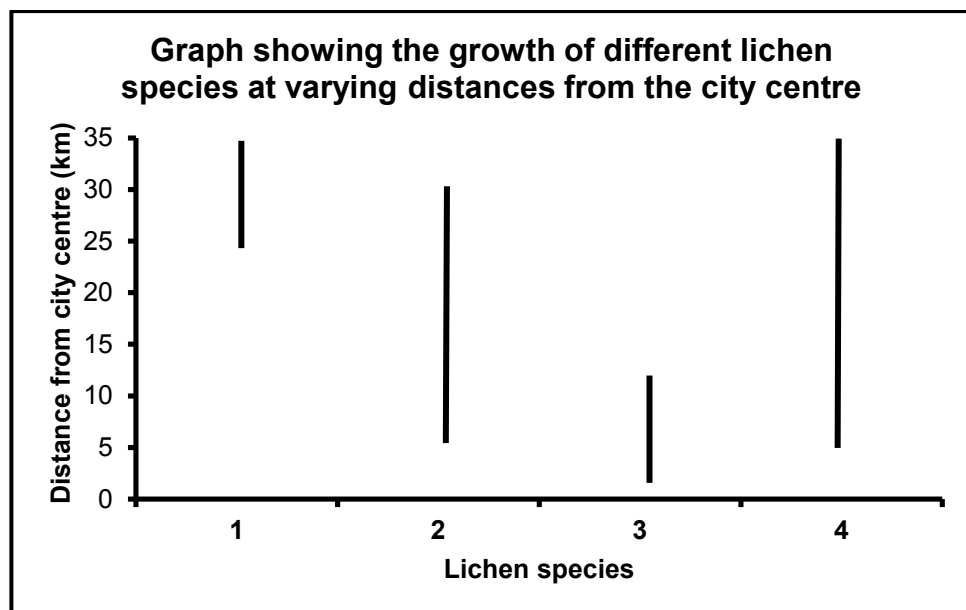
Which ONE of the following structures would no longer contribute to the production of semen?

- A Seminal vesicles
- B Prostate gland
- C Seminiferous tubules
- D Cowper's gland

- 1.1.10 Air pollution is generally higher in city centres than away from it.

The amount of pollution in the atmosphere can be estimated by using lichen. Lichen is a plant that consists of a fungus and an alga living together in a mutualistic relationship.

The graph below shows the growth of different lichen species at varying distances from the city centre.



[Adapted from [www.air-quality.org.uk](http://www.air-quality.org.uk)]

Which lichen has the HIGHEST tolerance for varying levels of pollution?

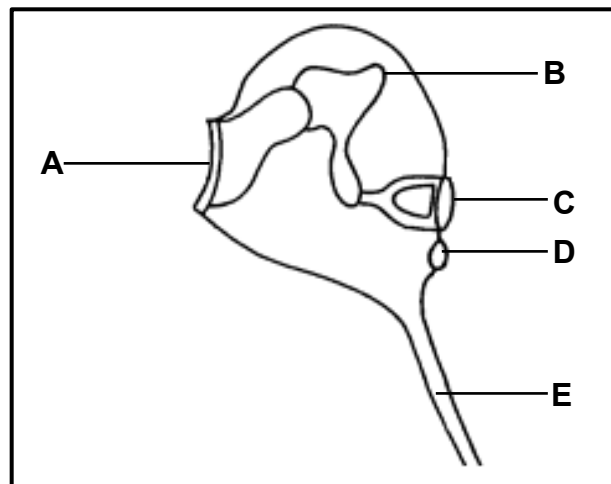
- A Species 1
- B Species 2
- C Species 3
- D Species 4

(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 1.2.7) 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 growth of part of a plant in response to gravity
- 1.2.3 The condition of the blood vessels in the skin in humans when the environmental temperature is low
- 1.2.4 The reproductive strategy when hatchlings are able to move and feed themselves
- 1.2.5 The sensory receptors found in the semicircular canals
- 1.2.6 The type of pollution that occurs when hot fluids are released into rivers and oceans
- 1.2.7 A layer inside the eye that absorbs light, thus reducing reflection (7)

1.3 The diagram below represents the middle ear of humans.



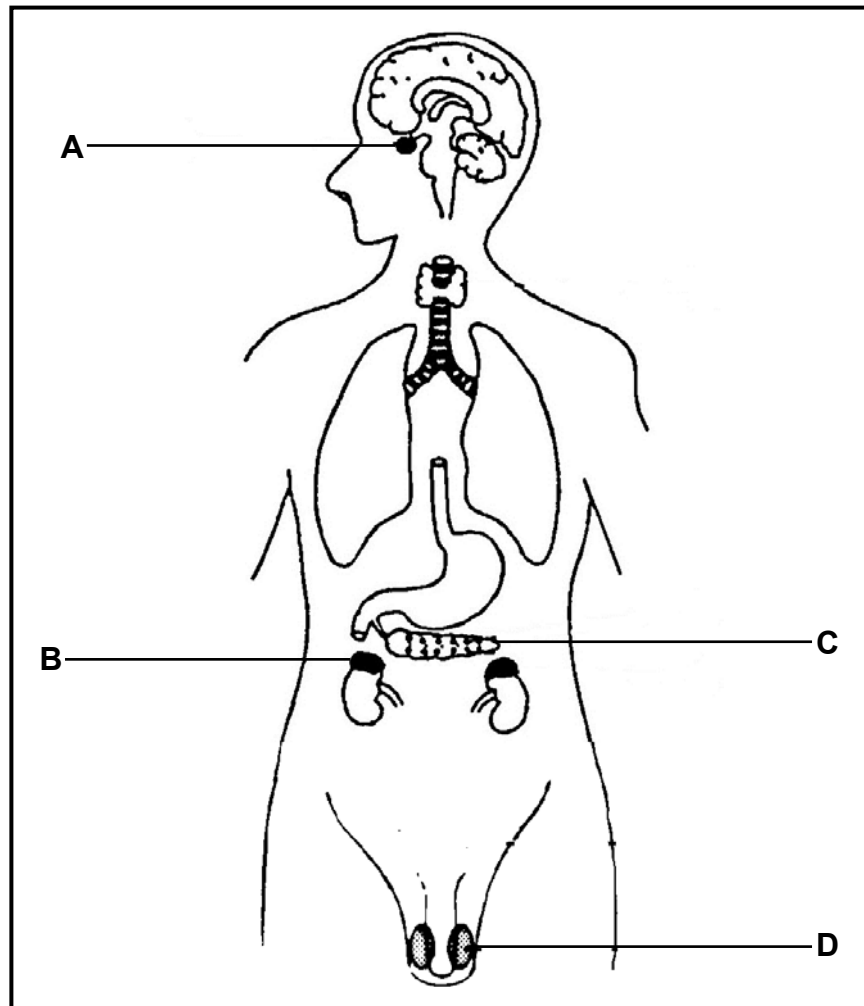
1.3.1 Identify part:

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

1.3.2 Give the LETTER of the part that absorbs sound waves to prevent an echo. (1)

1.3.3 Give the LETTER and the NAME of the part that may become blocked when infected, which may result in temporary hearing loss. (2)  
(6)

1.4 The diagram below represents parts of the endocrine system in humans.



1.4.1 Identify gland:

(a) **A** (1)

(b) **B** (1)

1.4.2 Give the LETTER and the NAME of the gland that secretes a hormone responsible for:

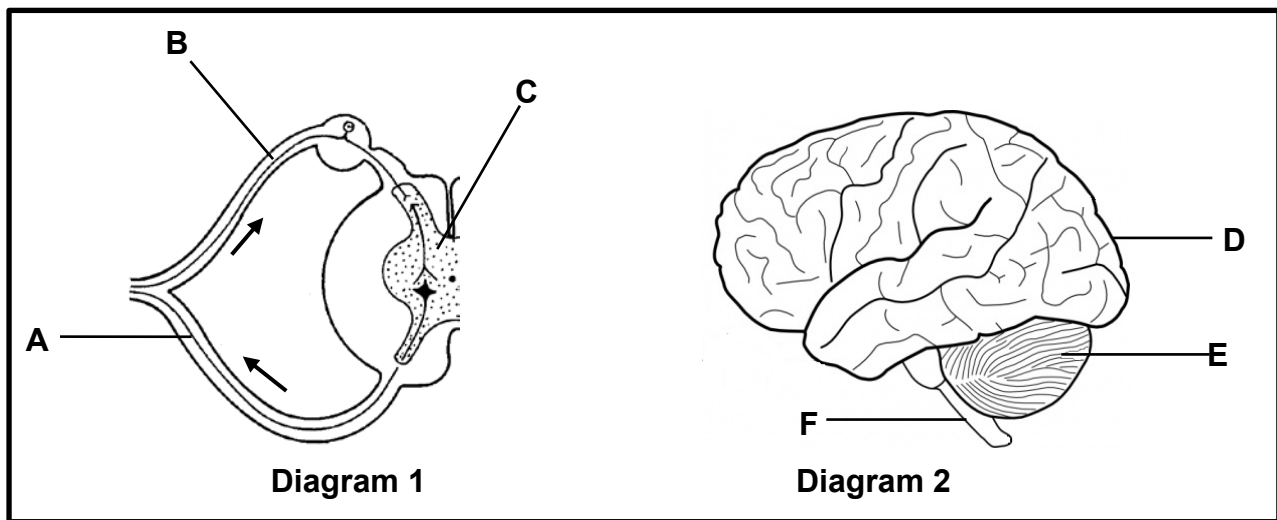
(a) Starting puberty in males (2)

(b) Stimulating absorption of glucose by cells (2)

(c) Making the kidney tubules permeable to water (2)

**(8)**

1.5 The diagrams below represent parts of the central nervous system of humans.



1.5.1 Identify part:

(a) **C** (1)

(b) **D** (1)

1.5.2 Give the LETTER and the NAME of the part in diagram 2 that receives impulses from the:

(a) Rods and cones (2)

(b) Receptors in the heart muscles (2)

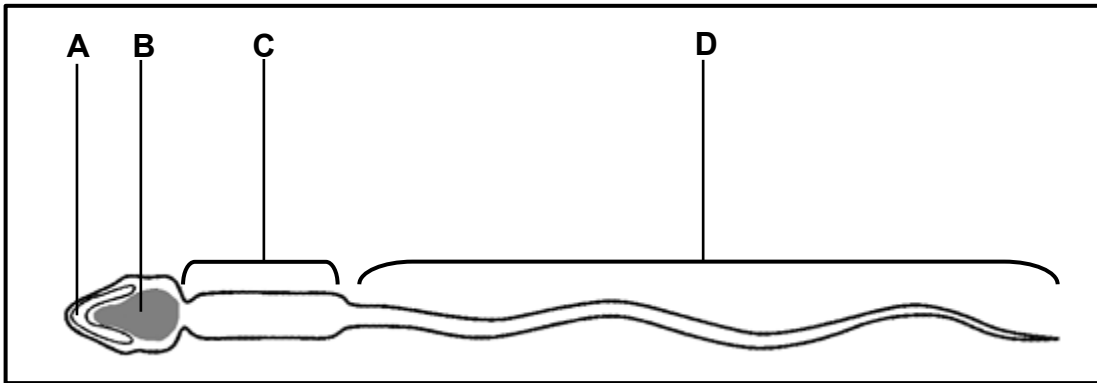
1.5.3 Name the process taking place in diagram 1 which minimises injury to the body. (1)

1.5.4 Give the LETTER and the NAME of the neuron that transports impulses from the central nervous system (CNS) to the effectors. (2)  
(9)

**TOTAL SECTION A: 50**

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

2.1 The diagram below represents a sperm cell.



2.1.1 Identify part:

(a) **B** (1)

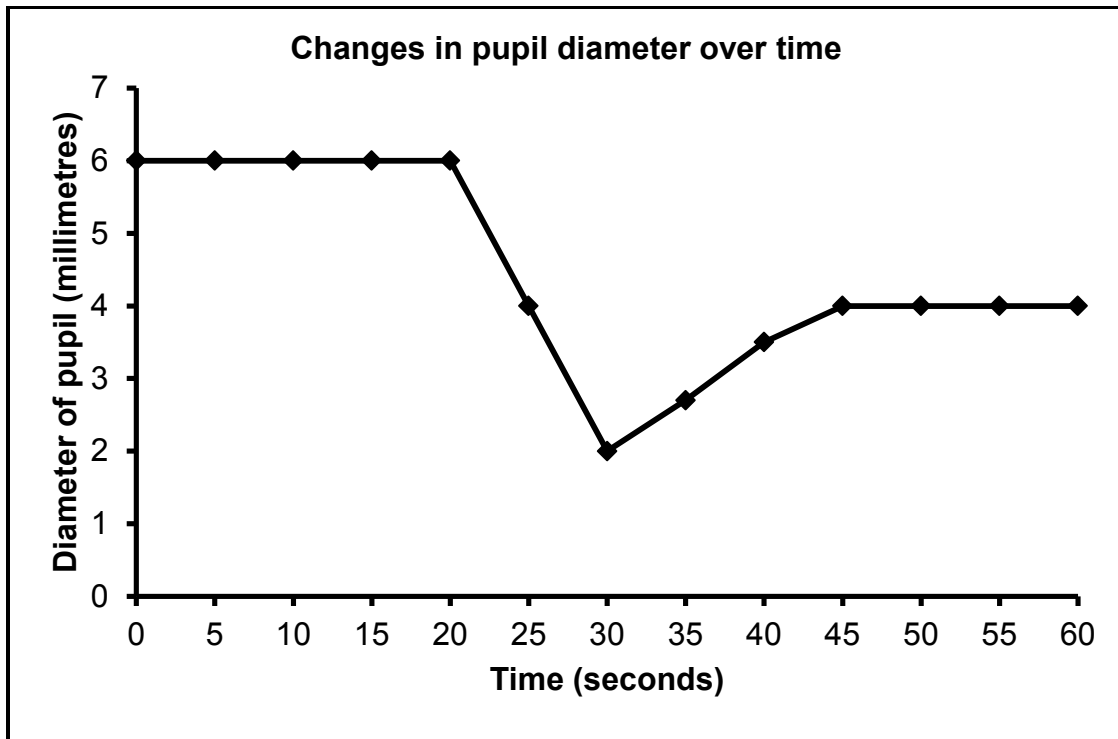
(b) **D** (1)

2.1.2 Explain ONE way in which the sperm cell is adapted to ensure effective movement towards the Fallopian tubes. (2)

2.1.3 Explain the consequences for reproduction if a sperm cell did not have part **A**. (3)  
(7)

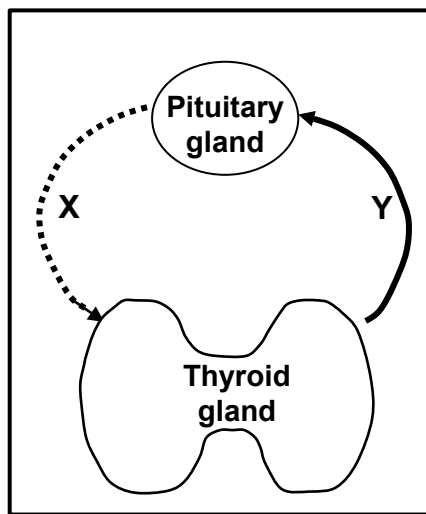
2.2 Describe the path followed by a sound wave from its source to the cochlea in the human ear. (6)

- 2.3 The graph below indicates the changes in diameter of the pupil of the human eye.



- 2.3.1 Which structure in the human eye is responsible for the changes indicated in the graph? (1)
- 2.3.2 During which period of time was the person moving from **dim light** to **bright light**? (1)
- 2.3.3 Describe the changes that took place in the eye that led to the diameter change indicated from 30 to 35 seconds. (3)
- 2.3.4 Draw a labelled diagram of the front view of the eye to show the exact size of the pupil at 20 seconds, as indicated in the graph. (4)
- (9)**

- 2.4 The diagram below represents a negative feedback mechanism. **X** and **Y** represent hormones secreted by the respective glands.



- 2.4.1 What is the role of any negative feedback mechanism in the human body? (1)
- 2.4.2 Identify hormone **X**. (1)
- 2.4.3 Explain the consequences for a person if hormone **Y** remained abnormally high for extended periods of time. (3)  
(5)

- 2.5 Research shows that the average age of first menstruation is influenced by socio-economic status as well as race.

Scientists carried out an investigation to determine the average age of the first menstruation of the girls in a community.

Their hypothesis was:

**The average age of first menstruation has decreased over time.**

- 2.5.1 For the investigation, state the:

(a) Independent variable (1)

(b) Dependent variable (1)

- 2.5.2 Name THREE planning steps that had to be considered before carrying out the investigation. (3)

- 2.5.3 If the results show that the average age of first menstruation has remained at 12,9 years of age for the last 25 years, explain the implications for the hypothesis stated by the scientists. (2)

- 2.5.4 Name TWO physical characteristics in girls which would indicate the start of puberty. (2)  
**(9)**

- 2.6 One contraceptive method for females is to take a daily oral pill that contains progesterone.

Explain how this pill functions to prevent pregnancy. (4)  
**[40]**

**QUESTION 3**

- 3.1 The table below shows the change in the concentration of carbon dioxide (CO<sub>2</sub>) in a person's veins, as exercise levels increase.

The person in the investigation was asked to ride a bicycle which generated electricity, measured in watts. The faster the person cycled, the more watts he generated.

<b>EXERCISE (watt)</b>	<b>CO<sub>2</sub> CONCENTRATION IN VENOUS BLOOD (mol/mℓ)</b>
0	0,50
50	0,51
100	0,53
150	0,55
200	0,55
250	0,54

[Adapted from [www.umc.edu](http://www.umc.edu)]

- 3.1.1 What is a normal carbon dioxide concentration in the venous blood for this person? (1)
- 3.1.2 Explain the significance of measuring the carbon dioxide concentration in the blood when the person is not doing any exercise. (2)
- 3.1.3 Explain why the carbon dioxide concentration in the veins increased during strenuous exercise. (2)
- 3.1.4 Describe the homeostatic response that takes place in the body to reduce the carbon dioxide concentration when exercising between 200 and 250 watts. (6)
- (11)**

3.2 Read the extract below and answer the questions that follow.

### AUXINS AS HERBICIDES

There are many different herbicides (chemicals used as weed killers). Most herbicides that do not contain hormones damage the plant parts above the ground only, that is the leaves and stems. These herbicides are also poisonous to other organisms.

Hormone-based herbicides are usually a solution to this problem. They kill the plant as a whole and they are selective about which plants they target.

Usually auxins are used as herbicides because of their selective nature in the type of plant they affect. They are most effective against 'broad-leafed' dicotyledonous plants.

[Adapted from [www.herbicidesymptoms.ipm.ucanr.edu](http://www.herbicidesymptoms.ipm.ucanr.edu)]

- 3.2.1 Name ONE place in a plant where the auxins are naturally produced. (1)
- 3.2.2 State ONE function of auxins which results in the growth of a plant. (1)
- 3.2.3 Describe TWO disadvantages of using the herbicides that are NOT made of plant hormones. (4)
- 3.2.4 Explain why it would be a disadvantage for a farmer to use auxin herbicides in a field planted with beans that are dicotyledonous. (2)
- (8)**

3.3 The table below shows the rate of extinction of animal species due to humans since 1600.

CAUSE OF EXTINCTION	RATE OF EXTINCTION OF ANIMAL SPECIES (%)
Hunting	23
Introduction of alien species	39
Habitat destruction	36
Other	2

[Adapted from [www.bio.miami.edu/dana](http://www.bio.miami.edu/dana)]

- 3.3.1 Draw a pie chart to represent the data shown in the table above. (6)
- 3.3.2 Explain how alien vegetation would cause the extinction of an animal species. (3)
- 3.3.3 Suggest ONE illegal human activity that could be causing the 2% rate of extinction. (1)
- (10)**

3.4 Read the extract below and answer the questions that follow.

**FOOD SECURITY IS UNDER THREAT**

Research has shown that the rapid growth in the human population has caused consumption of the four staple foods (wheat, rice, maize and soybeans) to be greater than its production over the past decade. The imbalance between supply and demand has resulted in two huge increases in staple food prices since 2007, with some staple foods more than doubling in cost. The price increases have led to famine (non-availability of food) for tens of millions of poor people in developing countries.

Unsustainable farming practices are responsible for decreased crop yield which also lead to an increase in the prices of basic foods.

The latest scientific research shows that climate change is a contributing factor. Many of the failed harvests of the past decade were a result of weather disasters, like floods, drought and heat waves.

[Adapted from [www.iol.co.za](http://www.iol.co.za)]

- 3.4.1 Name ONE food type, according to the extract, that can be linked to food security. (1)
- 3.4.2 Explain why the use of monoculture to produce more food for the growing human population often results in the increased use of pesticides. (3)
- 3.4.3 Explain ONE way in which floods impact on food security. (2)
- 3.4.4 Explain why some grains have more than doubled in cost over time. (2)
- (8)**
- 3.5 Describe how deforestation would impact on global warming. (3)
- [40]**

**TOTAL SECTION B: 80**

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

Describe how genetic variation is brought about in gametes through cell division and name and describe the specific process that takes place in the formation of an ovum.

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**