Basic Education

KwaZulu-Natal Department of Basic Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES P1

PREPARATORY EXAMINATION

SEPTEMBER 2015

NATIONAL SENIOR CERTIFICATE

GRADE 12

MARKS: 150

TIME: 2½ Hours

This question paper consists of 14 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your 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 should be done 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 may use a non-programmable calculator, protractor and a compass where necessary.
11. Write neatly and legibly.

ECTION 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 1.1.10) in your ANSWER BOOK, for example 1.1.11 D

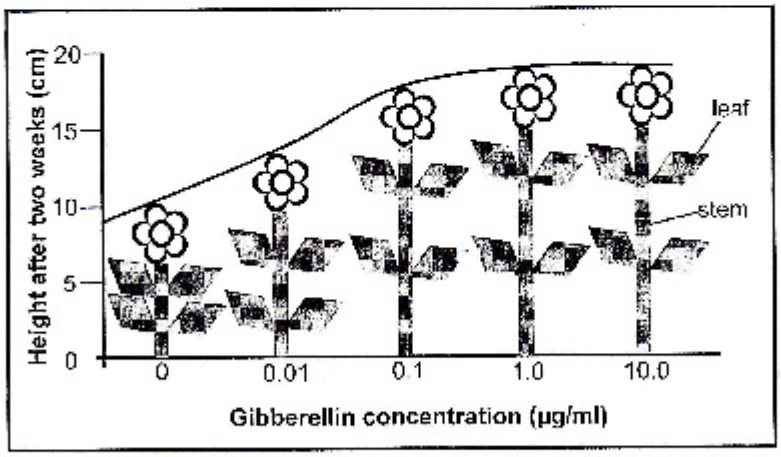
1.1.1 Events that occur during prophase I of meiosis include ...

A pairing of homologous chromosomes and crossing over.
B pairing of homologous chromosomes and DNA replication
C the disappearance of the nuclear membrane and the splitting of the centromeres.
D DNA replication and crossing over.

1.1.2 During which phase of meiosis do homologous chromosomes line up at the equator in pairs?

A Prophase I
B Metaphase I
C Anaphase II
D Metaphase II

1.1.3 An investigation was carried out to determine the effect of gibberellin concentration on plant growth. The results of the investigation are shown in the diagram below.

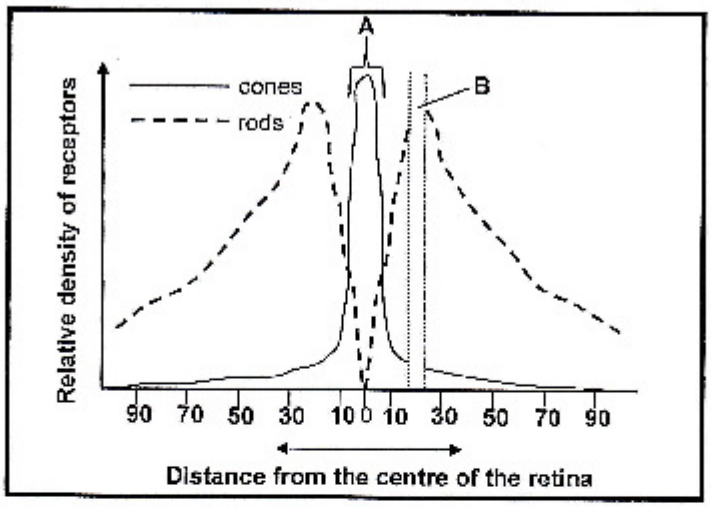


Adapted: http://www.easynotecards.com

A sugar cane farmer harvests the stem of the plant to extract sugar. What is the **minimum** gibberellin concentration that should be used to ensure the highest yield of sugar from the crop.

A 0,01 µg/ml
B 0,1µg/ml
C 1,0 µg/ml
D 10,0 µg/ml

1.1.4 The **graph below** shows the relative density of rods and cones across the retina of the eye. Zero (0) is the centre of the retina at the back of the eye. The numbers represent the distance to the left or right from the centre of the retina.

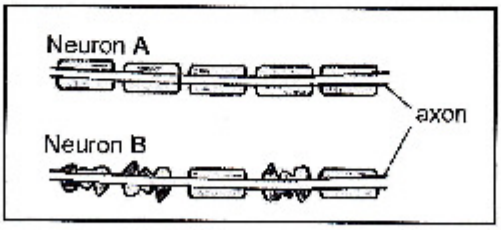


http://plantcellbiology.masters.grkraj.org

The parts labelled **A** and **B** on the graph are the ...

A blind spot and chorcid.
B sclera and yellow spot.
C yellow spot and blind spot.
D retina and cornea.

1.1.5 The diagram shows part of a neuron from a person suffering from multiple sclerosis and from a normal person.



The neuron from the person with multiple sclerosis is ...

A B, because the myelin sheath is damaged.
B B, because the axon is damaged.
C A, because the myelin sheath is not damaged.
D A, because the axon is damaged.

1.1.6 The part of the brain that receives impulses from the utriculus and sacculus is the ...

A hypothalamus.
B cerebellum.
C medulla oblongata.
D cerebrum.

1.1.7 The hormone involved when responding to an emergency is ...

A adrenalin.
B prolactin.
C growth hormone.
D aldosterone.

1.1.8 Reproductive strategies used by ground nesting birds such as the ostrich include ...

A external fertilisation and ovipary.
B ovovipary and no parental care
C vivipary and internal fertilisation
D ovipary and internal fertilisation

1.1.9 Extra-embryonic membranes that are present in the amniotic egg are the ...

A albumin and allantois.
B chorion and amnion.
C endometrium and amnion.
D albumin and chorion.

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

	WATER LEVEL IN BLOOD RELATIVE TO NORMAL	AMOUNT OF ADH PRODUCED RELATIVE TO NORMAL	AMOUNT OF WATER REABSORBED BY KIDNEYS
A	Increase	Increase	Decrease
B	Increase	Decrease	Increase
C	Decrease	Increase	Increase
D	Decrease	Decrease	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 number (1.2.1 to 1.2.9) in your ANSWER BOOK.

1.2.1 A pair of chromosomes, one inherited from each parent, that have the same genes at the same locus

1.2.2 The point at which crossing over of chromosomes occurs during meiosis

1.2.3 The functional connection between the axon of one neuron and the dendrites of another neuron

1.2.4 Connects the two halves of the brain together

1.2.5 Increased content of nutrients in lakes and dams due to the inflow of fertilizers

1.2.6 The condition of a cell when it has a single set of chromosomes

1.2.7 The cutting down of trees and removing of vegetation from land leading to a decrease in the amount of CO_2 taken up by plants during photosynthesis

1.2.8 The hormone that controls salt levels in the body

1.2.9 The two strands of a chromosome joined by a centromere

(9 x 1) **(9)**

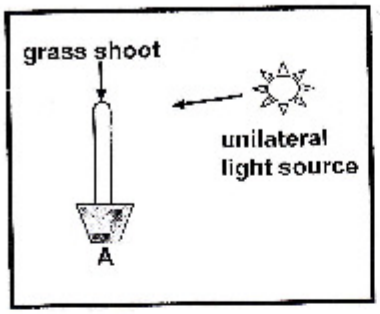
1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (1.3.1 to 1.3.6) in the ANSWER BOOK.

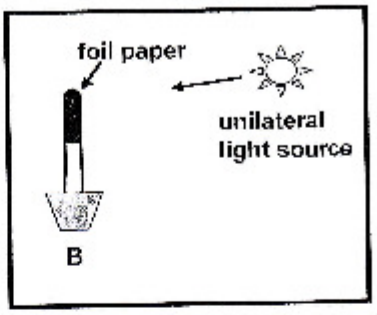
	COLUMN I	COLUMN II
1.3.1	The phase of cell division when the cytoplasm has divided	A: Anaphase B: Prophase
1.3.2	Controlled by negative feedback mechanisms	A: Carbon dioxide B: Salts
1.3.3	Equalizes the pressure between the middle ear and the atmosphere	A: Eustachian tube B: Semi-circular canals
1.3.4	Controlled by the autonomic nervous system	A: Breathing B: Heart rate
1.3.5	Maintenance of a constant internal environment by the body	A: Gametogenesis B: Homeostasis
1.3.6	Offspring are poorly developed and are helpless at birth	A: Precocial B: Altricial

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

1.3 The apparatus was set up as show in Diagram **A** to determine the effect of unilateral light on the growth of grass shoots. An additional grass shoot was set up, covered with foil as shown in Diagram **B**.

The diagrams below show the grass shoots at the start of the investigation.





1.4.1 Name each of the following:

(a) A plant's growth response to light (1)
(b) The plant hormone involved in the response named in QUESTION 1.4.1 (a) (1)

1.4.2 What effect does light have on the hormone named in QUESTION 1.4.1 (b)? (1)

1.4.3 What is the purpose of the:

(a) Foil paper (1)
(b) Setup **B** (1)

1.4.4 State the results of the investigation in:

(a) **A** (1)
(b) **B** (1)

1.4.5 Grass shoot **C** was covered with foil and then placed in a horizontal position as shown below.

(a) After one week it had started to bend upwards. Name the stimulus that the shoot is responding to. (1)

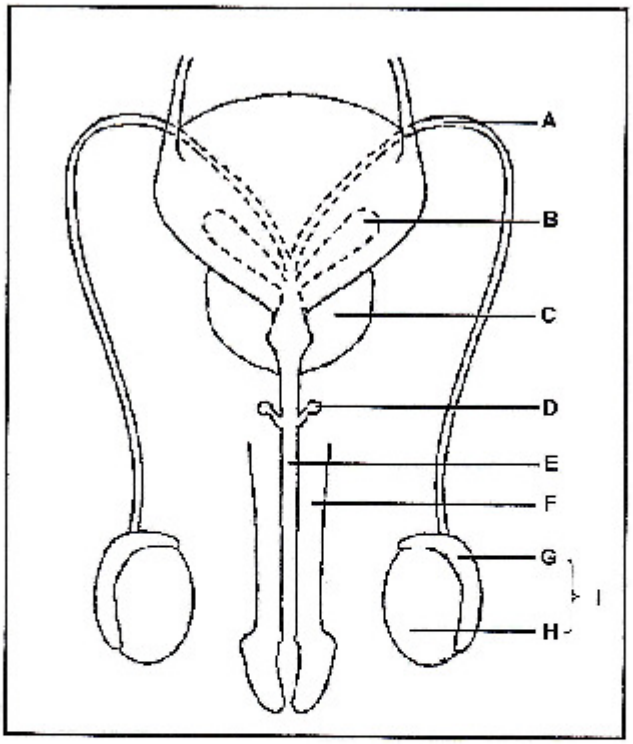
(b) On which side of the shoot, upper or lower, would the Concentration of the hormone named in QUESTION 1.4.1(b) be in a lower concentration? (1)
(9)

TOTAL QUESTION 1: [50]
TOTAL SECTION A: [50]

SECTION B

QUESTION 2

2.1 The diagram below represents the male reproductive system in a human.



2.1.1 Give ONE function of:

(a) **G** (1)

(b) **H** (1)

2.1.2 Explain the result in the male if:

(a) All the glands **B**, **C** and **D** are removed (2)

(b) Part I was inside the body (2)

2.1.3 Explain how the function of part **E** differs in males and females. (2)

2.1.4 During a vasectomy, part **A** is cut as a means of contraception. Explain how this would help in preventing pregnancy. (2)
(10)

2.2 Insulin is the hormone that regulates blood glucose levels. Some patients have a condition where they are unable to produce insulin and must therefore have regular injections of insulin. Two types of insulin are used, NPH insulin and LANTUS insulin.

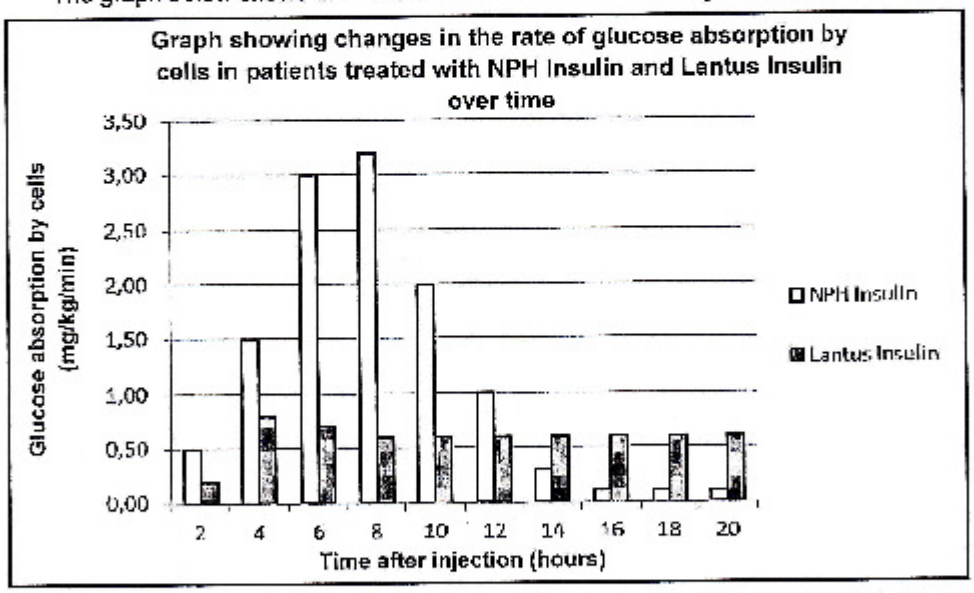
Scientists wanted to establish which of these types of insulin controls blood glucose levels for longer periods in insulin-dependent patients.

They used the following procedure during this investigation:

- They divided 20 patients into two groups of 10 patients each.
- The one group was injected with NPH insulin and the other group was injected with LANTUS insulin.
- All the patients received the same amount and concentration of insulin.
- The glucose absorption by cells was then measured every 2 hours, over a period of 20 hours and the average calculated.

The insulin is regarded as effective when the glucose absorption by the cells is above 0,4 mg/kg/min.

The graph below shows the results obtained from this investigation.



Adapted from: www.lantus.com

2.2.1 Provide a suitable hypothesis for this investigation. (2)

2.2.2 Name the condition that results when the body is unable to produce insulin. (1)

2.2.3 According to the graph, how long after being injected did LANTUS become effective? (1)

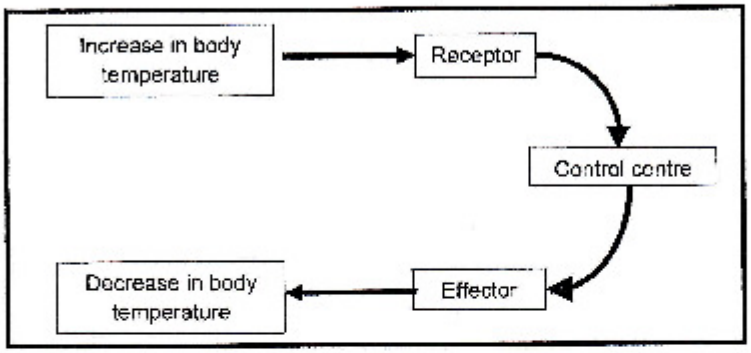
2.2.4 Which type of insulin caused the highest glucose absorption by cells? (1)

2.2.5 Which type of insulin should be recommended for patients? (1)

2.2.6 Give a reason for your answer to QUESTION 2.2.5. (1)

2.2.7 Explain how insulin works to reduce blood glucose levels. (3)
(10)

2.3 The flow diagram below represents the body's response to an increase in the environmental temperature.



2.3.1 Name the organ sensitive to temperature which could be the receptor in the diagram. (1)

2.3.2 Name the part of the brain that is the control centre in the diagram. (1)

2.3.3 Describe how each of the following parts of the skin, which act as effectors, help to decrease the body temperature on a hot day.

(a) Sweat glands (3)

(b) Blood vessels (4)
(9)

2.4 Scientists conducted an investigation into the effects of different types of activities on the reaction times of people.

Three people (**A**, **B** and **C**) of the same age and gender were chosen to participate in the investigation. Each person was asked to perform two tests in which their reactions times were determined by asking them to press a buzzer as soon as they felt a tap on their knee. A tap on the knee results in a knee jerk reaction which is a reflex action.

The two tests were done as follows:

TEST 1

Each person performed the test with no other activity and their time taken to react was recorded.

TEST 2

Each person (**A, B** and **C**) performed the test again with each having a different activity to perform as indicated below. The time taken to react was recorded again.

The percentage increase in the time taken to react in the first and second tests was calculated.

The results of the tests are provided in the table below.

PERSON	TYPE OF ACTIVITY PERFORMED	INCREASE IN TIME TAKEN TO REACT (%)
A	Using a hands-free phone	27
B	Using a hand-held phone	37
C	Sending a text message	46

Adapted from: http://www.dailymail.co.uk

2.4.1 Explain the importance of the reflex actions in humans. (2)

2.4.2 State the independent variable in this investigation. (1)

2.4.3 List TWO ways in which the scientists ensured the validity of this investigation. (2)

2.4.4 State ONE way in which this investigation could be made more reliable. (1)

2.4.5 Which person (**A, B** or **C**) had a reaction time in **Test 2** that was closest to his/her reaction time for **Test 1**? (2)

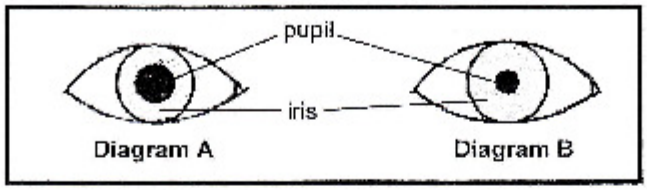
2.4.6 Use the results of the investigation to explain whether the following hypothesis should be accepted or rejected.

'Sending text messages while driving can cause more car accidents than using a hands-free or a hand-held phone while driving'. (3)
(11)

TOTAL QUESTION 2: [40]

QUESTION 3

3.1 The diagram below represents a process that takes place in the human eye. Diagram **A** shows the eye in dim light conditions and diagram **B** shows the same eye with light shining into it.



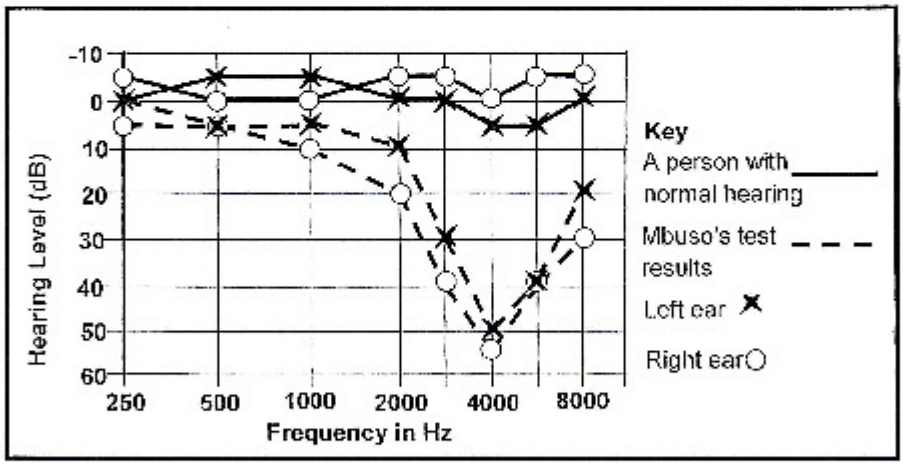
3.1.1 Name the mechanism that is represented in the diagram. (1)

3.1.2 Describe how the response shown in diagram **B** is brought about. (3)

3.1.3 Describe how the eye would adjust to ensure that an object moving closer to it remains in focus. (4)
(8)

3.2 Mbuso had found lately that he has difficulty hearing. He went to a doctor who tested his ability to hear sounds of different frequencies in each ear.

The results of his hearing test are shown in the diagram below.



Adapted: http://auditoryneuroscience.com

3.2.1 In which ear/s (right, left or both) has Mbuso suffered hearing loss? (1)

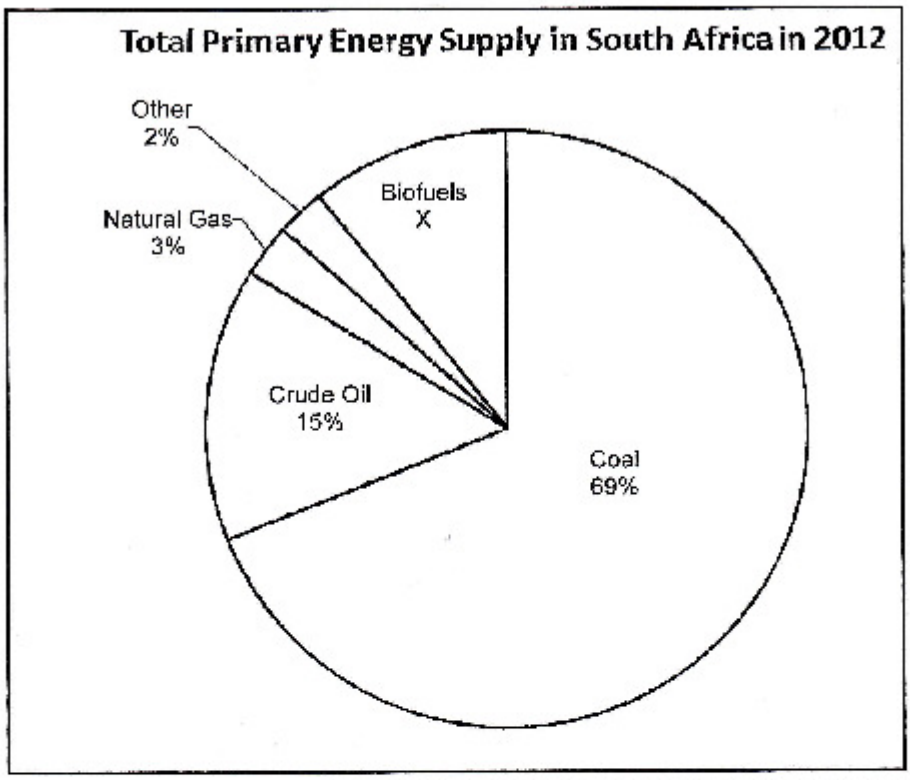
3.2.2 Which frequency of sound does he have the most difficulty hearing. (2)

3.2.3 Explain how excess wax in the ear may cause hearing difficulties. (3)

3.2.4 Describe the role of the round window in hearing. (2)

(8)

3.3 The various sources of energy in South Africa and their contribution to the total primary energy supply is represented in the chart below.



Adapted from: https://en.m.wikipedia.org/wiki/Energy_in_South_Africa

3.3.1 Determine the value of **X**. Show ALL calculations. (2)

3.3.2 Name the natural gas produced in landfill sites that is flammable. (1)

3.3.3 Give ONE way in which the gas named in QUESTION 3.3.2 is useful to humans. (1)

3.3.4 Most of the electricity in South Africa is produced from coal. Describe the impact of using this energy source on climate change. (4)

3.3.5 Name TWO alternative energy sources used in South Africa that makes up the 2% of '**other**' sources. (2)

3.3.6 Describe how the mining of coal impacts on biodiversity in South Africa. (2)
(12)

3.4 The extract below describes some of the problems caused by alien plants in Southern Africa.

> Invasive alien vegetation poses a serious threat to South Africa's water supply, as well as the country's agricultural potential and biodiversity.
>
> If the alien invasive vegetation across the country could be condensed into a single area, it would form a dense, impenetrable thicket about twice the size of the Kruger National Park.
>
> Asked how long it would take to clear the country of alien vegetation, and what this would cost, Marais said that a "conservative" estimate was R34 billion over the next 25 years.
>
> Left untouched, the alien vegetation would spread at an average rate of one percent a year, threatening water and food security.

Adapted from:http://www.iol.co.za

3.4.1 What is meant by 'alien vegetation'? (1)

3.4.2 Give TWO possible reasons for the high cost of removing alien vegetation. (2)

3.4.3 Describe how alien vegetation can affect the biodiversity of living organisms in a dam. (5)

3.4.4 Explain TWO ways in which alien plants impact on food security. (4)

(12)

TOTAL QUESTION 3: [40]
TOTAL SECTION B: [80]

SECTION C

QUESTION 4

Describe the interaction of FSH and progesterone in controlling the production of ova, and the development of a fertilised ovum until it embeds itself onto the uterus wall.

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: [40]

GRAND TOTAL: [150]