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# basic education

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

## NATIONAL SENIOR CERTIFICATE

**GRADE 12**

**LIFE SCIENCES P2**

**NOVEMBER 2013**

**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 answer 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 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 A relationship in which organisms of two species interact and both benefit is known as ...

- A commensalism.
- B parasitism.
- C predation.
- D mutualism.

1.1.2 The social organisation that enhances the survival of a species is ...

- A external fertilisation.
- B division of labour among members of a colony.
- C symbiosis between members of a species.
- D living together in different habitats.

1.1.3 Which of the following will lead to the greatest increase in the amount of CO<sub>2</sub> in an area after cutting down forest trees?

- A Planting crops in the same area
- B Using the cut trees as building material
- C Introducing animals into the area
- D Leaving the soil bare

1.1.4 Populations grow exponentially (at a high rate) when ...

- A immigration and emigration rates are equal.
- B the death rate remains above the birth rate.
- C the birth rate remains far above the death rate.
- D the emigration rate exceeds the immigration rate.

1.1.5 A researcher was testing the hypothesis that 'the range of sound frequencies that a person can hear decreases with age'.

Males and females of differing ages were selected and a sound generator that produces sounds of varying frequencies was used.

What was the dependent variable in the investigation?

- A Age
- B Gender (male or female)
- C The sound generator
- D The range of frequencies that a person can hear

- 1.1.6 The table below shows the average height of human males and females, from birth to 24 years.

| Age (years) | Average height of human males (cm) | Average height of human females (cm) |
|-------------|------------------------------------|--------------------------------------|
| 0           | 50                                 | 50                                   |
| 4           | 100                                | 90                                   |
| 8           | 120                                | 120                                  |
| 12          | 130                                | 135                                  |
| 16          | 150                                | 150                                  |
| 20          | 170                                | 160                                  |
| 24          | 175                                | 160                                  |

From this data, one could reasonably conclude that ...

- A males and females reach their maximum height at the same age.
- B females reach their maximum height later compared to males.
- C males are taller than females at all ages.
- D male adults are on average taller than female adults.

**QUESTIONS 1.1.7 AND 1.1.8 ARE BASED ON THE INFORMATION BELOW.**

Population size can be estimated using the formula below:

P = population estimate

M = number of organisms captured and marked

C = number of organisms recaptured (second capture)

R = number of marked organisms in second capture

$$P = \frac{M \times C}{R}$$

In an investigation to estimate the fish population in a certain dam, the following data was obtained:

Fish captured, marked and released = 40

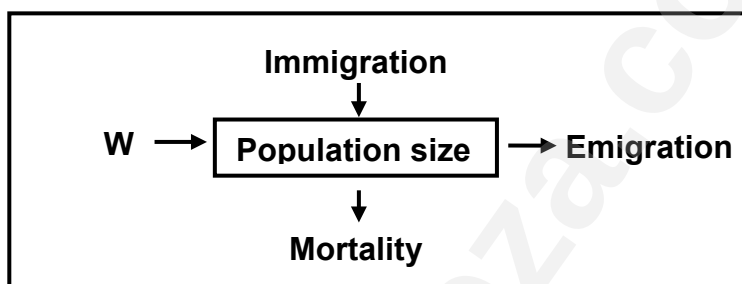
Marked fish in the second capture = 12

Unmarked fish in the second capture = 48

- 1.1.7 The estimated size of the fish population is ...

- A 1 920.
- B 160.
- C 200.
- D 100.

- 1.1.8 The validity of the investigation could be decreased if the ...
- A investigation was repeated and the average estimate calculated.
  - B mark used was harmless to the fish.
  - C second capture was done long after the first capture.
  - D owner of the dam did not grant permission for the investigation to be done.
- 1.1.9 Study the diagram below showing various parameters that influence the size of a population.



Which ONE of the following parameters is indicated by **W**?

- A Migration
  - B Natality
  - C Predation
  - D Competition
- 1.1.10 The table below shows the birth and death rates of four different countries in a particular year.

| Country | Birth rate<br>(per 1 000 of population) | Death rate<br>(per 1 000 of population) |
|---------|-----------------------------------------|-----------------------------------------|
| 1       | 15                                      | 16                                      |
| 2       | 60                                      | 24                                      |
| 3       | 40                                      | 15                                      |
| 4       | 42                                      | 10                                      |

Which country showed the highest population growth in that year?

- A Country 1
- B Country 2
- C Country 3
- D Country 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 1.2.6) in the ANSWER BOOK.

1.2.1 The physical count of every individual in a population

1.2.2 The maximum number of individuals that can be supported by an environment under prevailing conditions

1.2.3 A group of populations living together in the same habitat

1.2.4 The structural changes that some insects undergo before they can resemble the adult form

1.2.5 The structure in angiosperms that develops into a seed

1.2.6 The structure in a flower that supports the stigma

(6)

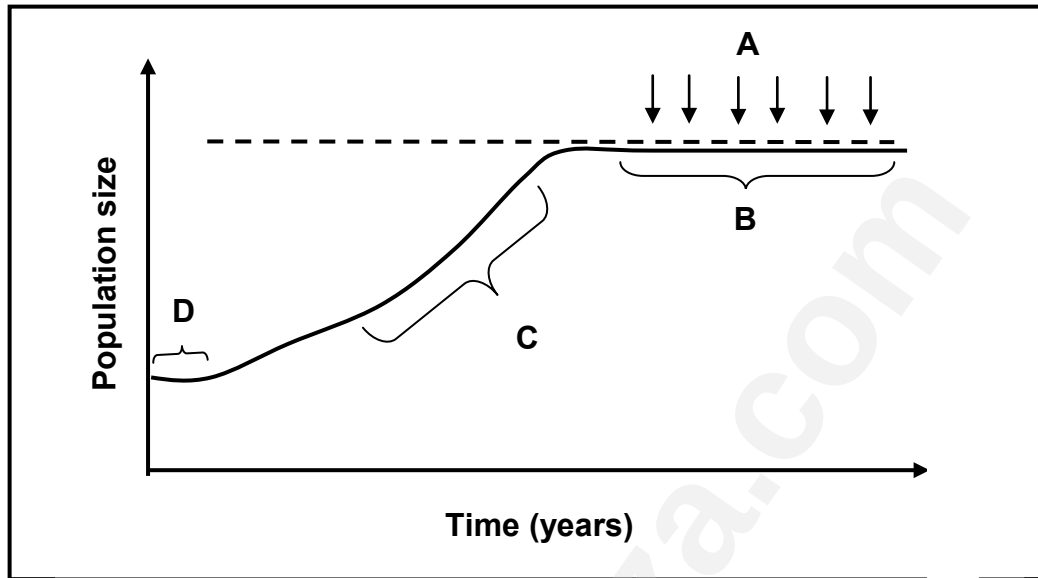
1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.7) in the ANSWER BOOK.

| COLUMN I                                                                           | COLUMN II                                   |
|------------------------------------------------------------------------------------|---------------------------------------------|
| 1.3.1 Importance of seeds                                                          | A: Source of food<br>B: Protect the embryo  |
| 1.3.2 Organisms that are able to produce their own food by means of photosynthesis | A: Decomposers<br>B: Primary consumers      |
| 1.3.3 A type of asexual reproduction in plants                                     | A: Pollination<br>B: Vegetative             |
| 1.3.4 Used in the treatment of middle ear infections                               | A: Cochlear implants<br>B: Grommets         |
| 1.3.5 The transfer of pollen from an anther to a stigma of the same flower         | A: Cross-pollination<br>B: Self-pollination |
| 1.3.6 Pollination involving flowers with petals that are reduced or absent         | A: Insect<br>B: Wind                        |
| 1.3.7 Restricts heat loss from the blood                                           | A: Vasoconstriction<br>B: Vasodilation      |

(7 x 2)

(14)

1.4 Study the graph below.



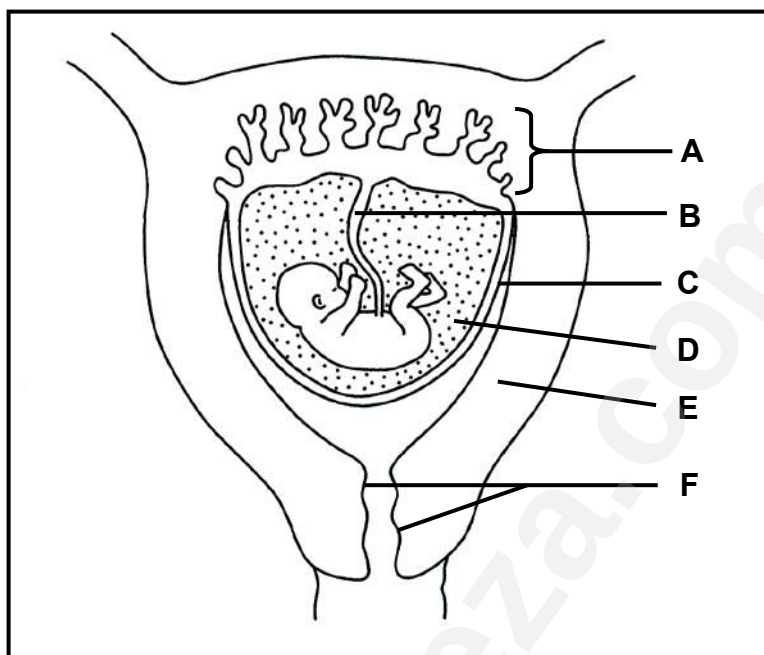
1.4.1 Name the following phases:

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

1.4.2 What do the arrows at **A** represent in the graph? (1)

1.4.3 What type of growth curve is represented by the graph? (1)  
(5)

1.5 Study the diagram below.



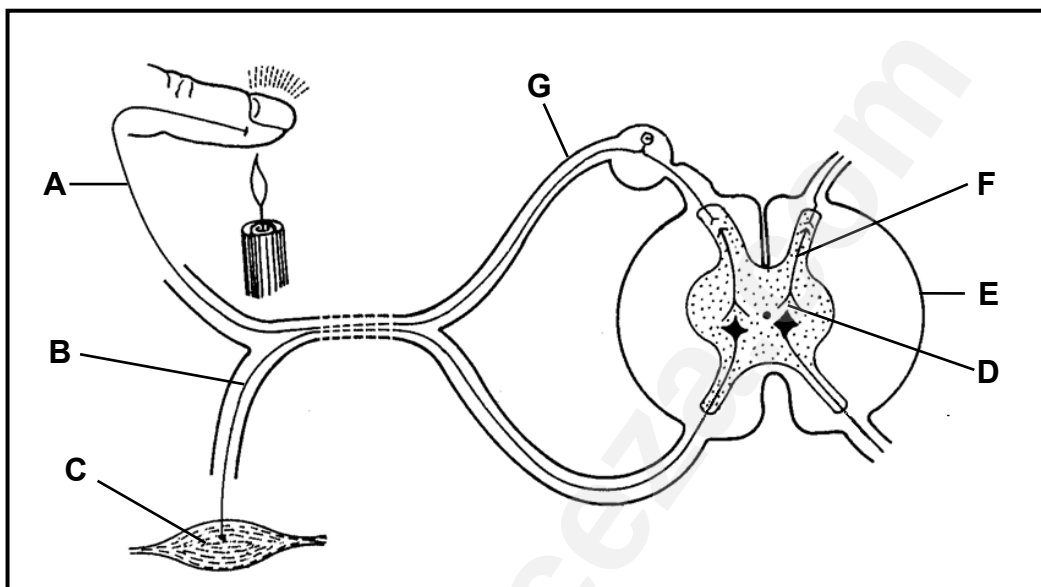
Match the structures (**A** to **F**) with the descriptions (1.5.1 to 1.5.5) below, for example 1.5.6 G. A letter may be used more than once, or not at all.

- |       |                                                                     |            |
|-------|---------------------------------------------------------------------|------------|
| 1.5.1 | Where gaseous exchange occurs between the mother and the foetus     | (1)        |
| 1.5.2 | Removes excretory products from the foetus                          | (1)        |
| 1.5.3 | Contains strong muscles which will push the foetus out during birth | (1)        |
| 1.5.4 | Clamped and cut after the baby is born                              | (1)        |
| 1.5.5 | Acts as a shock absorber for the developing foetus                  | (1)        |
|       |                                                                     | <b>(5)</b> |

**TOTAL SECTION A: 50**

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

2.1 The diagram below shows a part of the central nervous system.



2.1.1 Give labels for each of the following:

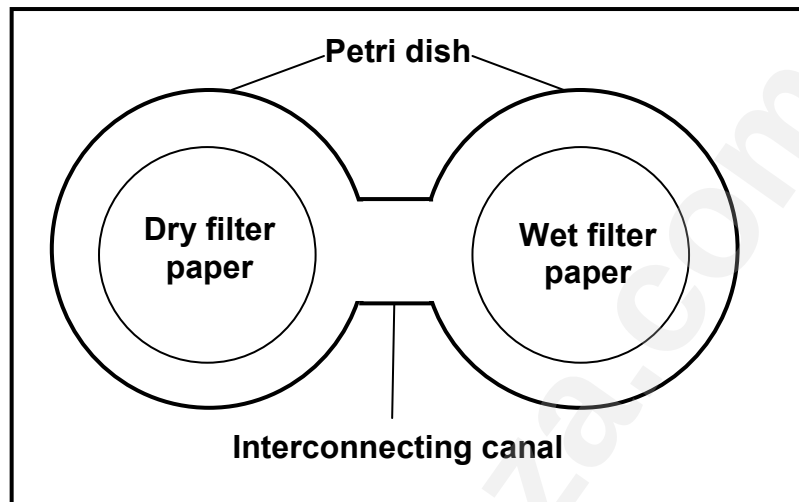
- (a) **C**
- (b) Microscopic gap **D**
- (c) **E**
- (d) **F**
- (e) **G** (5)

2.1.2 Explain ONE consequence for the body if **A** is damaged. (2)

2.1.3 Give TWO examples of reflex actions. (2)

2.1.4 Draw a labelled diagram of neuron **B** to show its structure. (5)  
(14)

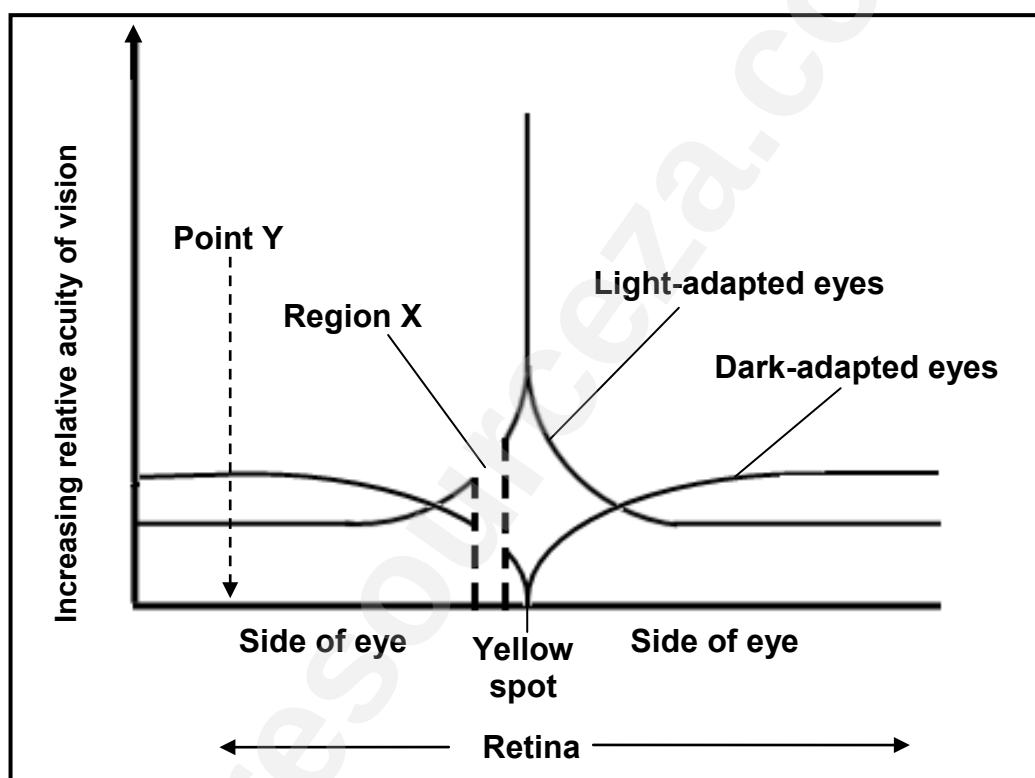
- 2.2 A learner wanted to investigate whether wood lice preferred to live in dry or moist conditions. He used two petri dishes that were interconnected so that the wood lice could move between the two petri dishes. Twenty wood lice were used in his investigation.



- 2.2.1 State FOUR planning steps that the learner must consider before the above investigation on wood lice is undertaken. (4)
- 2.2.2 For the investigation above, state the following:
- (a) Dependent variable (1)
  - (b) Independent variable (1)
- 2.2.3 State TWO factors that should be kept constant during the investigation above. (2)
- (8)**

- 2.3 When a person moves from bright light into almost total darkness, he is temporarily blinded. After a few minutes, the rod cells in each retina respond and he can see fairly well. His eyes are now dark-adapted. When he returns to bright light he cannot see clearly for a short period until the cone cells in each retina respond. Then he can see properly again and his eyes are now light-adapted.

The degree of sharpness of detail seen by an eye is called its visual acuity. The graph below shows the visual acuity of a dark-adapted and a light-adapted eye.

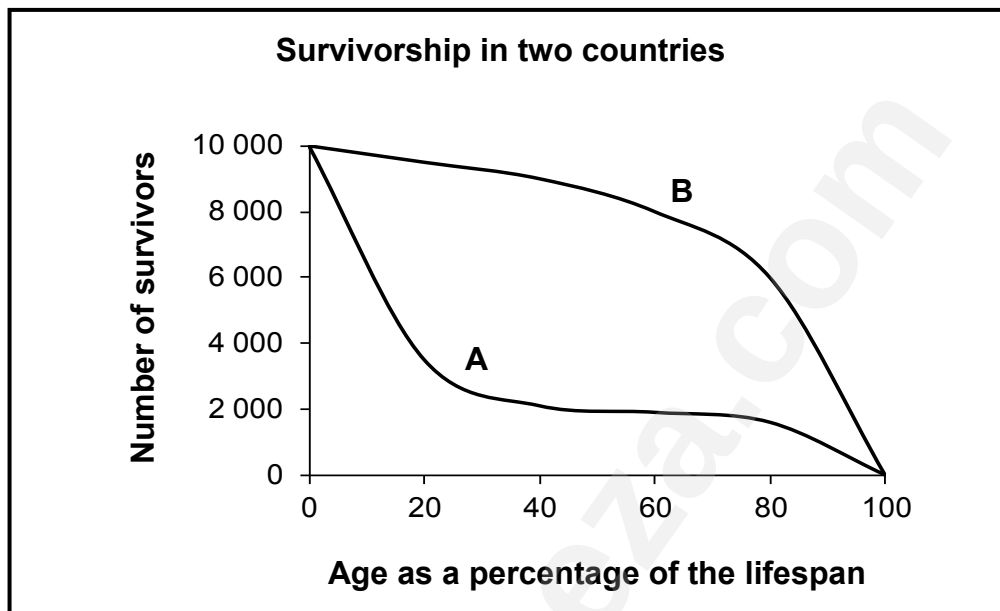


- 2.3.1 Explain the difference between a *light-adapted* and a *dark-adapted* eye. (2)
- 2.3.2 In which type of eye is the relative acuity (sharpness) of vision the greatest at the:
- (a) Yellow spot (2)
  - (b) Side of the eye at point Y (2)
- 2.3.3 Identify region X on the graph. (1)
- 2.3.4 Give the reason why the acuity of vision for both types of eye is zero at region X on the retina. (1)

(8)  
[30]

**QUESTION 3**

3.1 The graph below shows the survivorship in two countries (**A** and **B**).



- 3.1.1 Which curve (**A** or **B**) represents survivorship in a developing country? (1)
- 3.1.2 Give TWO explanations for your answer to QUESTION 3.1.1. (4)
- (5)

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

Statistics on rhino poaching in South Africa show that rhino poaching is on the increase. In 2005, 13 rhinos were poached. This figure has steadily risen every year, and 448 rhinos were poached in 2011.

The rhino horns are smuggled to some countries in the East, where they are sold illegally and at very high prices.

These rhino horns are used to make aphrodisiacs (sexual stimulants), as well as ornaments. They are also used to make medicines which are thought to cure cancer and other ailments.

[Adapted from *the iol news*, April 2012]

- 3.2.1 What is *poaching*? (1)
- 3.2.2 Give ONE reason stated in the text above for the increase in rhino poaching in South Africa. (1)
- 3.2.3 State TWO ways in which Eastern countries use these rhino horns. (2)
- 3.2.4 Explain why we should be concerned about the increasing rhino poaching problem in South Africa. (2)
- 3.2.5 Explain TWO ways in which the South African government can prevent rhino poaching. (4)
- (10)**

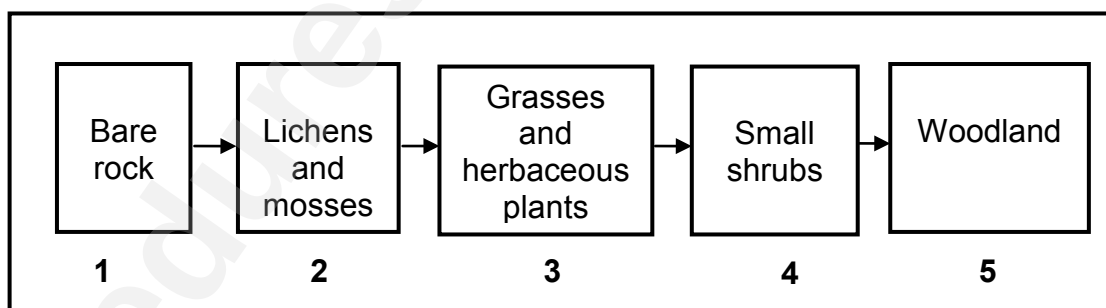
- 3.3 Two sea-birds, *Phalacrocorax aristotelis* (commonly known as the shag) and *Phalacrocorax canbo* (commonly known as the cormorant), feed in the same area and build their nests on the same mountain cliffs.

The table below shows the percentages of different prey eaten by each of these types of birds.

| Prey                                   |           | % of prey taken by each |           |
|----------------------------------------|-----------|-------------------------|-----------|
|                                        |           | Shag                    | Cormorant |
| Swimming near the surface of the water | Sand eel  | 49                      | 2         |
|                                        | Herring   | 48                      | 4         |
| Swimming near the bottom of the water  | Flat fish | 1                       | 42        |
|                                        | Shrimp    | 2                       | 52        |

- 3.3.1 Explain why the shags and the cormorants are not in direct competition with each other, although they feed in the same area. (2)
- 3.3.2 Name the phenomenon explained in QUESTION 3.3.1. (1)
- 3.3.3 State ONE resource mentioned above for which the two species compete with each other. (1)
- 3.3.4 Name the type of competition that occurs between the two species for the resource mentioned in QUESTION 3.3.3. (1)  
(5)

- 3.4 The flow diagram below shows a certain type of plant succession that starts on bare rock that has never been inhabited/colonised previously.



- 3.4.1 Name the type of succession involving the organisms in the diagram. (1)
- 3.4.2 Give a reason for your answer to QUESTION 3.4.1. (1)
- 3.4.3 Write down the collective term given to the plants in box 2 based on their role in succession. (1)
- 3.4.4 State ONE role of the organisms mentioned in QUESTION 3.4.3 in succession. (1)  
(4)

- 3.5 A type of seaweed (*Caulerpa taxifolia*) was accidentally introduced into a new environment. In this new environment these seaweeds grew at twice the rate of the local seaweeds. Herbivores could not eat *C. taxifolia* as it produced a chemical which made it inedible. Scientists initially used chlorine to kill *C. taxifolia*, but are now considering introducing sea slugs (marine snails), which feed on the seaweed.
- 3.5.1 Explain what might happen to the population size of the carnivorous fish that feed on the herbivores if the local seaweeds are replaced by *C. taxifolia*. (3)
- 3.5.2 Suggest a reason why it may not be advisable to use chlorine to kill *C. taxifolia*. (1)
- 3.5.3 Explain a possible disadvantage of introducing sea slugs to control the *C. taxifolia* population. (2)  
(6)  
[30]
- TOTAL SECTION B: 60**

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

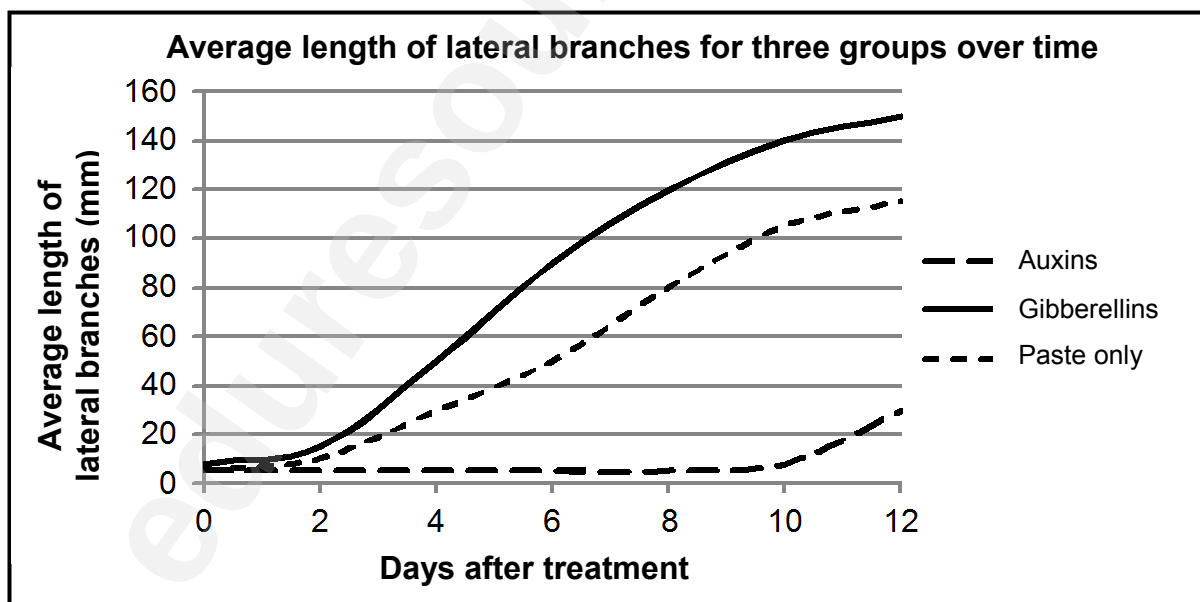
- 4.1 A learner investigated the effects of two plant growth substances, gibberellins and auxins, on apical dominance. The apical buds of nine pea plants of the same species, age and height were removed. These plants were then divided equally into three groups. In each group the cut surface of the remaining shoot (growing stem) of the pea plants was treated in one of the following ways:

- Group 1: Coated with a paste containing gibberellins of the same concentration  
 Group 2: Coated with a paste containing auxins of the same concentration  
 Group 3: Coated with a paste only (containing no plant growth hormones)

The hormones diffuse into the plant until no more hormones remain in the paste.

The treated plants were all grown under the same conditions in the laboratory. The length of the lateral branches of each plant was measured after every two days for a period of 12 days. Measurements were taken at the same time for all treated plants and the average for each group was calculated.

The results of the investigation are shown in the graph below.



- 4.1.1 State ONE function of the gibberellins that led to the results obtained in the investigation. (1)

- 4.1.2 Calculate the difference in the average length of the lateral branches between the plants treated with gibberellins and the plants treated with the paste only on the 8<sup>th</sup> day after the treatment. Show ALL working. (3)

4.1.3 State TWO ways in which the reliability of the investigation could be increased. (2)

4.1.4 Use the results to explain the effect of auxins on the growth of the lateral branches. (4)  
(10)

4.2 Diabetes mellitus is usually linked to the body mass index (BMI), which is calculated as follows:

$$\text{BMI} = \frac{\text{mass (kg)}}{\text{height}^2 (\text{m}^2)}$$

An investigation was done to determine the relative risk of developing diabetes mellitus in females for each BMI.

The results are shown in the table below.

| Body mass index (BMI)<br>(kg/m <sup>2</sup> ) | Relative risk of developing<br>diabetes mellitus in females (%) |
|-----------------------------------------------|-----------------------------------------------------------------|
| <20                                           | 7,5                                                             |
| 20–25                                         | 18,0                                                            |
| 26–30                                         | 37,5                                                            |
| 31–35                                         | 57,0                                                            |
| >35                                           | 74,5                                                            |

[Adapted from American Diabetics Association, March 2007]

4.2.1 Draw a histogram using the data in the table above. (6)

4.2.2 Name the hormone that results in diabetes mellitus when it is deficient. (1)

4.2.3 Name the organ that secretes the hormone mentioned in QUESTION 4.2.2. (1)

4.2.4 State TWO other hormones (except the one mentioned in QUESTION 4.2.2) that influence the glucose level of the blood. (2)  
(10)

4.3 Describe the menstrual cycle and how it is influenced by different hormones.

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

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

**TOTAL SECTION C: 40**  
**GRAND TOTAL: 150**