basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

NOVEMBER 2010

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 at 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 all drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, a protractor and a compass.
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 – D) next to the question number (1.1.1 – 1.1.5) in your ANSWER BOOK, for example 1.1.6 D.

1.1.1 Which ONE of the following refers to small genetic changes within a species?

A Macro-evolution
B Micro-evolution
C Natural selection
D Artificial selection

1.1.2 Which of the following are sources of phenotypic variation?

(i) Random fertilisation
(ii) Crossing over
(iii) Random assortment of chromosomes in Metaphase 1
(iv) Mutation

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

1.1.3 The name of the one big mass of land, that all the present continents originated from, is …

A Laurasia.
B Gondwanaland.
C Antarctica.
D Pangaea.

1.1.4 Most scientists agree that … mass extinctions occurred in the history of life on earth.

A 5
B 7
C 3
D 8

1.1.5 The study of fossils is called ...

A anthropology.
B ecology.
C palaeontology.
D geology.

(5 x 2) (10)

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 – 1.2.6) in your ANSWER BOOK.

1.2.1 Reproduction between closely-related individuals of the same species

1.2.2 Organisms that are able to interbreed and produce fertile offspring

1.2.3 Dating fossils by measuring atomic decay

1.2.4 A diagrammatic representation of possible ancestral relationships between species

1.2.5 The taxonomic order to which monkeys, apes and humans belong

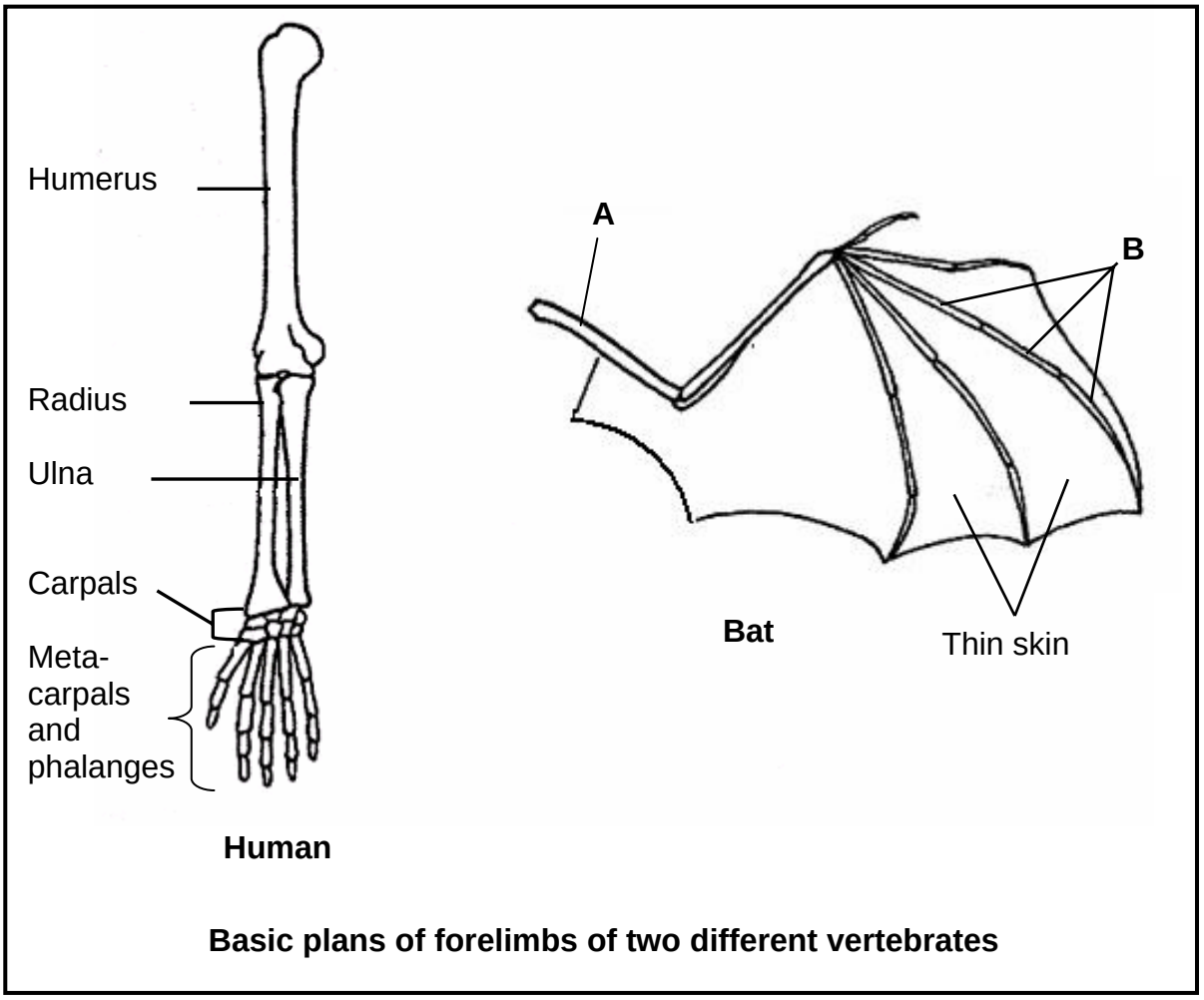
1.2.6 The process which results in all the individuals of a particular species dying out **(6)**

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 – 1.3.6) in your ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Fossil(s) of *Australopithecus* found in South Africa	A: Mrs Ples B: Lucy
1.3.2 Similarities between *Homo sapiens* and apes	A: Opposable thumb B: Two mammary glands
1.3.3 Evidence from comparative embryology supporting the theory of evolution	A: Similar sequence of genes B: Presence of embryonic gill slits
1.3.4 Study of ancient humans and their cultural activities	A: Biogeography B: Archaeology
1.3.5 Possible cause(s) of mass extinctions	A: Volcanic eruptions B: Freezing of parts of the earth
1.3.6 Mutation(s) that influence(s) biodiversity	A: Neutral B: Lethal

(6 x 2) (12)

1.4 Study the basic plans of the forelimbs of two different vertebrates shown below.



Basic plans of forelimbs of two different vertebrates

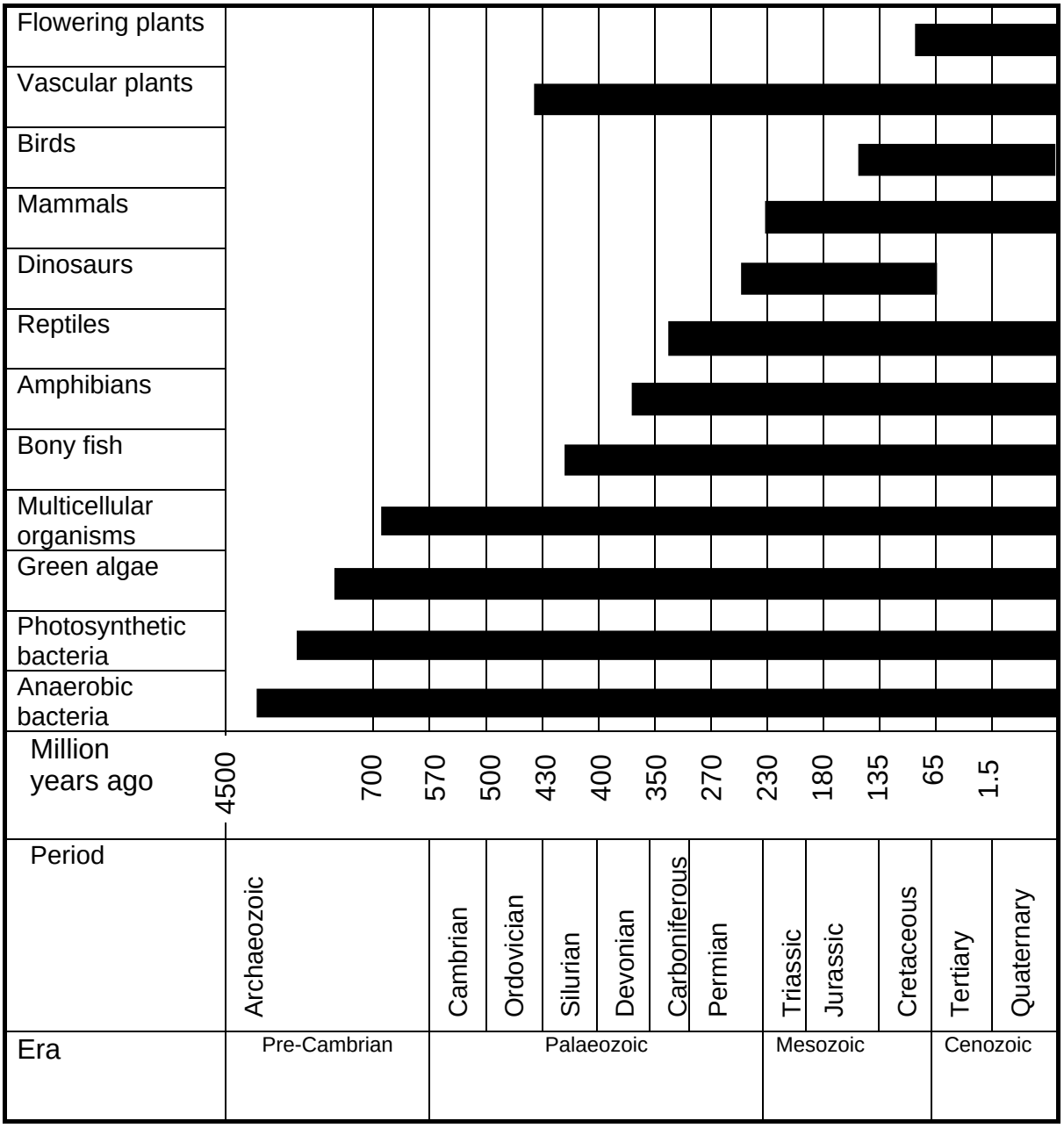
1.4.1 Are the above forelimbs homologous or analogous structures? (1)

1.4.2 Explain your answer to QUESTION 1.4.1. (2)

1.4.3 Using the labels on the forelimb of a human as a guide, give the names of the letters **A** and **B**. (2)

1.4.4 State TWO ways in which the forelimb of the bat is adapted for flying. (2)
(7)

1.5 The diagram below represents a geological timescale with the distribution of different organisms. The time axis is NOT drawn to scale.



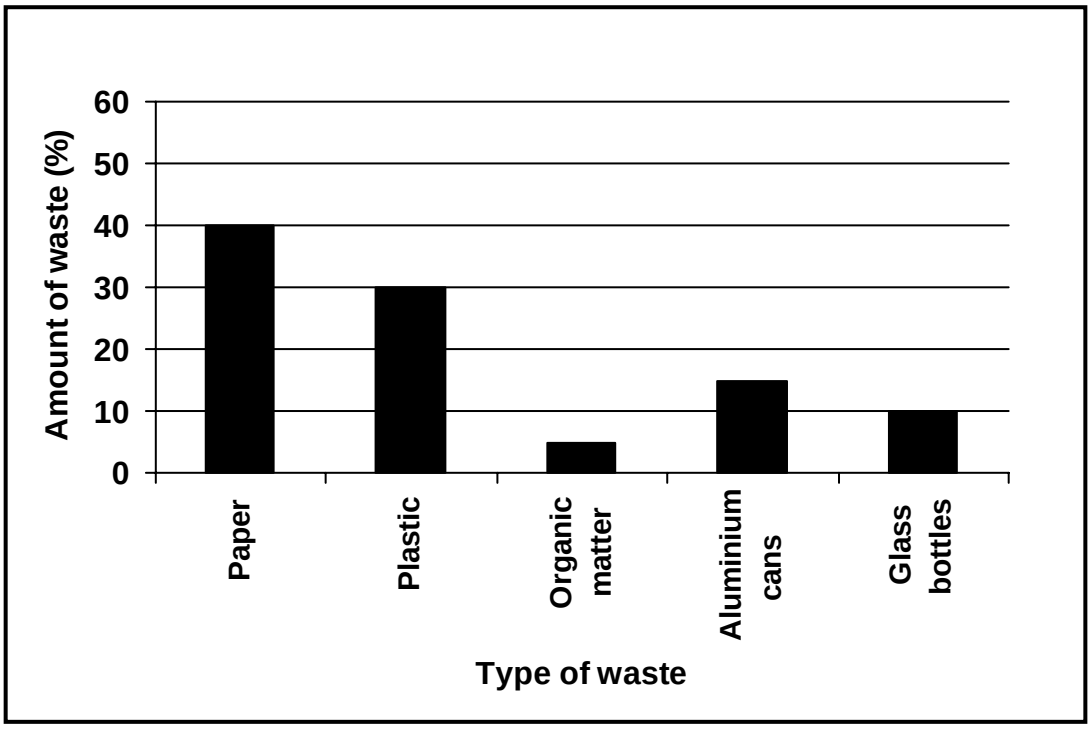
1.5.1 How many million years ago did the mammals first appear? (1)

1.5.2 In which era did the flowering plants first appear? (1)

1.5.3 How many years ago did the dinosaurs become extinct? (2)

1.5.4 Give ONE reason why anaerobic bacteria appeared before photosynthetic bacteria. (2)
(6)

1.6 The graph below shows the percentages of various types of waste found on the grounds of a school.



1.6.1 Draw a table to illustrate the percentages of waste shown in the graph above. (5)

1.6.2 The school wants to manage the large amount of waste generated on a daily basis. They decide to recycle the waste.

(a) Define *recycling*. (2)

(b) Give TWO reasons why the recycling of waste is advantageous. (2)
(9)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The table below shows how the yield of grass varies when different amounts of nitrate fertiliser are added to the crop.

Amount of nitrate fertiliser added to crop (kg/hectare)	Yield of grass (100 kg/hectare)
0	8
225	14
425	18
650	20
700	20
750	19

2.1.1 Give ONE reason why farmers use fertiliser. (1)

2.1.2 What was the yield (100 kg/hectare) of grass when 225 kg of nitrate fertiliser was added? (1)

2.1.3 Use the table to determine the minimum amount of fertiliser that has to be added to the grass crop in order to achieve maximum yield. (2)

2.1.4 Describe the relationship between the amount of fertiliser added and the yield of grass. (3)

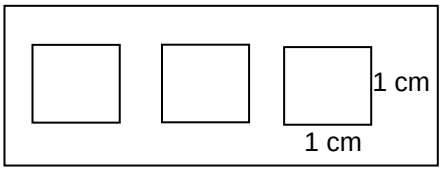
2.1.5 Explain why fertilisers should not be added to the soil immediately before and during the rainy season. (2)

2.1.6 Describe the effect of the excessive use of nitrate fertilisers on rivers, dams and lakes. (3)
(12)

2.2 A group of learners performed the following investigation to measure the presence of particles which cause pollution in the air in their town.

The following procedure was followed:

1. Three squares of 1 cm^2 were drawn on each of three glass microscope slides, using a permanent marking pen, as shown in the diagram below.



Microscope slide

2. The other side of each microscope slide was covered with a thin layer of petroleum jelly/Vaseline.
3. The microscope slides were placed, with the side covered with petroleum jelly/Vaseline facing up, in three different outdoor locations A, B and C, and left for one week.

   Location A: Central area in the town
   Location B: 20 km away from the centre of town
   Location C: A fishing spot 40 km away from the centre of town

4. After a week the slides were collected and examined using a hand lens (magnification x20).
5. The visible particles in each square were counted and recorded in a table.
6. The average number of visible particles per square (1 cm^2) for each of the three locations were then calculated.

. 2.2.1 Formulate a hypothesis for this investigation. (3)

2.2.2 State the dependent variable. (1)

2.2.3 Explain the purpose of the squares drawn on the microscope slides. (2)

2.2.4 Why were the squares drawn on the back of the microscope slides? (1)

2.2.5 Suggest why THREE squares were drawn on each microscope slide and not one. (1)

2.2.6 Name THREE ways in which the validity of the investigation can be improved. . (3)
(11)

2.3 Read the following passage on Rooibos (*Aspalanthus linearis*) and answer the questions that follow.

> The Rooibos plant is used to make herbal tea. South Africa is the only commercial grower of Rooibos plants in the world. Rooibos tea is a caffeine-free beverage with health and medicinal benefits. Some of the benefits of drinking Rooibos tea are: it has a calming effect, it helps with digestion problems and it helps with infant colic.

2.3.1 Name any TWO health benefits of Rooibos tea. (2)

2.3.2 Describe TWO ways in which over-exploitation of plants, such as Rooibos, impacts on life forms and the environment. (2)

2.3.3 Describe THREE strategies to prevent the over-exploitation of plants, such as Rooibos. (3)
(7)
[30]

QUESTION 3

3.1 Read the following passage and answer the questions that follow.

> Thousands of wildebeest were migrating across the great plains of the Serengeti in Africa. Some of them were large, some small, some strong and some weak. Lions followed the wildebeest, catching and eating the slowest ones. Water was scarce and only the strongest were brave enough to stop to drink from the waterholes.

3.1.1 Identify ONE phrase in this passage which describes variation among the wildebeest. (1)

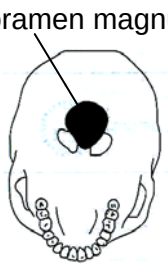
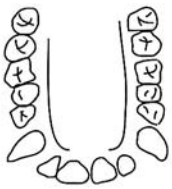
3.1.2 Explain how Darwin's idea of evolution by natural selection can be applied to this passage. (5)
(6)

3.2 Lamarck based his theory of evolution on two principles, ideas or 'laws'.

3.2.1 Name and describe TWO principles that Lamarck used to explain how evolution took place. (6)

3.2.2 Give ONE reason why Lamarck's theory is NOT accepted. (2)
(8)

3.3 Study the diagrams below of the upper jaw, skull and the foot of two organisms **A** and **B**. The diagrams are NOT drawn to scale.

Organism	Upper jaw	Skull (bottom view)	Foot
A			
B			

3.3.1 With regard to the drawings above:

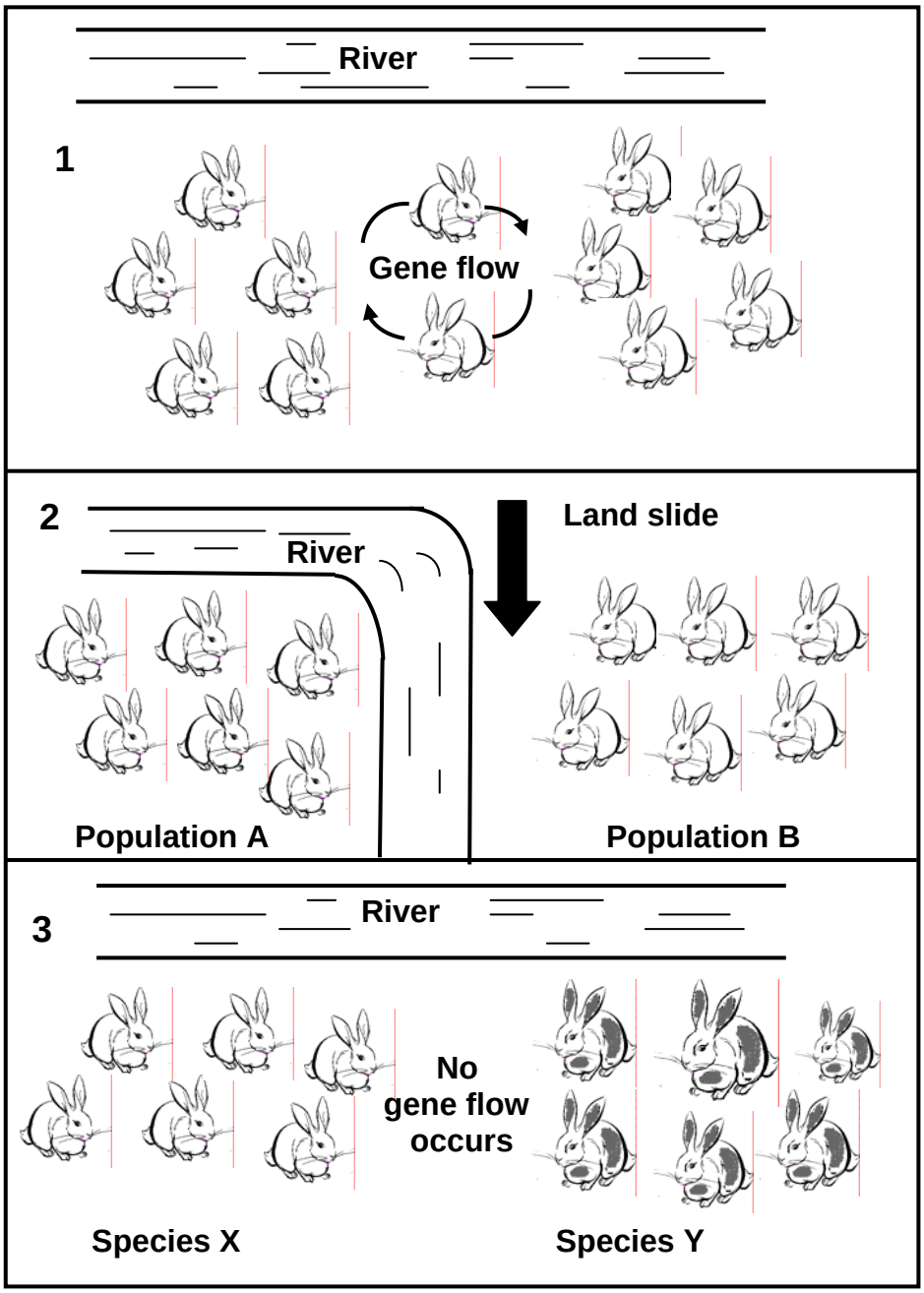
(a) Tabulate TWO visible differences between the upper jaws of organisms **A** and **B**. (5)

(b) Name ONE visible difference between the feet of organisms **A** and **B**. (2)

3.3.2 Which organism (**A** or **B**) is more likely to be bipedal? (1)

3.3.3 Give a reason for your answer to QUESTION 3.3.2. (2)
(10)

3.4 Study the diagrams below showing a process of evolution. DIAGRAMS 1, 2 and 3 show the sequence of events that occurred in rabbit populations over many thousands of years.



3.4.1 Name the evolutionary process represented by the sequence of events shown in DIAGRAMS 1, 2 and 3 above. (1)

3.4.2 Describe the process stated in QUESTION 3.4.1 using the diagrams above. (5)
(6)
[30]

TOTAL SECTION B: 60

SECTION C

QUESTION 4

4.1 Study the table below that represents the amount of carbon dioxide emissions from different countries in 2002.

Countries	Total annual CO_2 emission in 2002 (million tons CO_2/yr)	Proportion of world total (%)
USA	5 673	22
China	3 733	15
Russian Federation	1 477	6
India	1 106	5
South Africa	364	2
Other countries	**X**	50
Total	**24 706**	**100**

[Adapted from: *World Resources Institute*, 2006]

4.1.1 Calculate the total annual CO_2 emission in other countries (**X**) from the table above. Show ALL workings. (3)

4.1.2 The Kyoto Protocol was drafted by the United Nations (UN) in 1997 to provide a global action plan to reduce carbon dioxide emissions by the year 2012. The United States of America (USA) is not implementing the Kyoto Protocol.

(a) Explain the impact that this decision by the USA has on the rest of the world. (2)

(b) If you were working for the UN, explain TWO arguments that you would use to persuade the USA to implement the Kyoto Protocol. (4)

4.1.3 South Africa has the highest annual emission of CO_2 in Africa. Give THREE reasons for this. (3)

4.1.4 Draw a pie chart to show the proportion of CO_2 emissions from the different countries, as shown in the table above. Show ALL calculations. (13)
(25)

4.2 Explain SIX strategies to reduce the amount of air pollution entering the atmosphere from human activity. (12)
Synthesis: (3)
(15)

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

TOTAL SECTION C: 40
GRAND TOTAL: 150