



# basic education

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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P2**

**VERSION 2 (OLD CONTENT) FOR PART-TIME CANDIDATES**

**FEBRUARY/MARCH 2013**

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 13 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 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 necessarily drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, protractor and compass.
11. Write neatly and legibly.

## SECTION A

### QUESTION 1

1.1 Various options are given 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 1.1.5) in the ANSWER BOOK, for example 1.1.6 D.

1.1.1 Two individuals are members of the same species if they ...

- A have different numbers of chromosomes.
- B breed at different times.
- C are phenotypically different.
- D can mate and produce fertile offspring.

1.1.2 Which of the following are characteristics of fossilisation?

- (i) Organisms tend to decay before coming fossils.
- (ii) All organisms were preserved as fossils.
- (iii) Animals with hard parts are preserved more easily.
- (iv) Geological processes may destroy fossils.

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

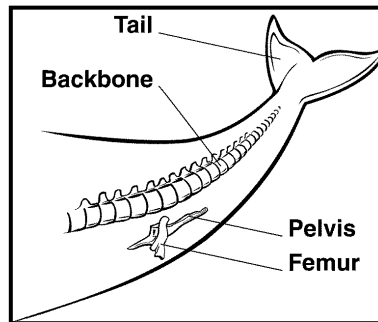
1.1.3 Darwin's theory of evolution is based on ...

- A use and disuse.
- B natural selection.
- C a tendency towards perfection in organisms.
- D the passing on of acquired characteristics to offspring.

1.1.4 Gene flow is best defined as ...

- A the transmission of genetic information from the cytoplasm to the nucleus.
- B the transmission of alleles from parents to their offspring.
- C the spread of alleles through a population over a period of successive generations.
- D the movement of genes from one chromosome to another.

- 1.1.5 How do scientists explain the vestigial structures (pelvis and femur) in a whale shown in the diagram below?



- A Whales need the femur to swim.  
B Whales will be able to walk on land in the future.  
C The ancestors of whales had hind limbs.  
D Humans evolved from whales.

(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 to 1.2.5) in the ANSWER BOOK.

- 1.2.1 A diagram that shows possible evolutionary relationships between groups of organisms  
1.2.2 Fossil species that have some traits of two different groups of organisms that are thought to be related  
1.2.3 All the non-living components in an ecosystem  
1.2.4 Numerous interacting food chains that show the feeding relationships in an ecosystem  
1.2.5 Well-substantiated explanations of related hypotheses that have been accepted

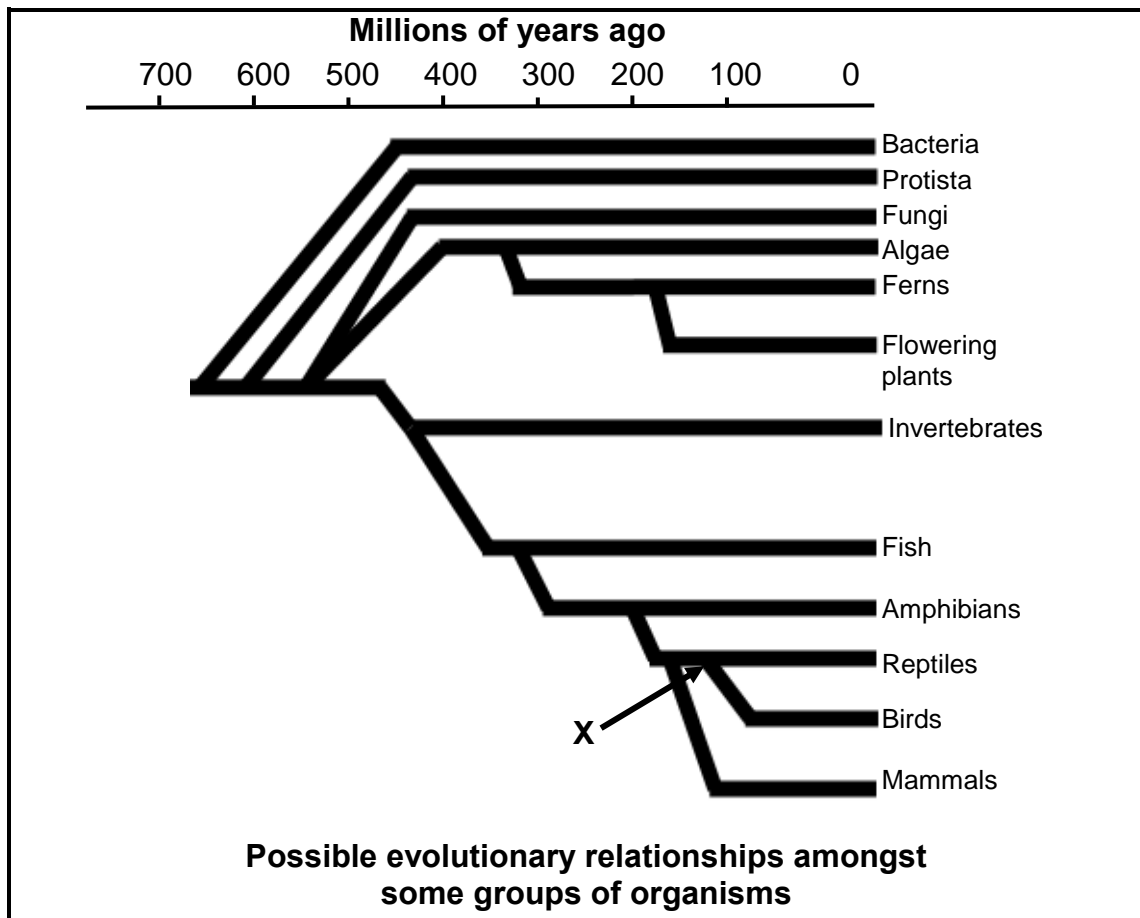
(5)

- 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 1.3.4) in the ANSWER BOOK.

COLUMN I		COLUMN II
1.3.1	The variable that is observed or measured by an investigator during an investigation	A: Independent B: Dependant
1.3.2	Structures that have a similar basic construction, which indicates a common ancestor	A: Homologous B: Analogous
1.3.3	Effect of water pollution on the health of humans	A: Gastroenteritis B: Typhoid
1.3.4	Dating of fossils by comparing the age of one fossil to another	A: Relative dating B: Radiometric dating

(4 x 2) (8)

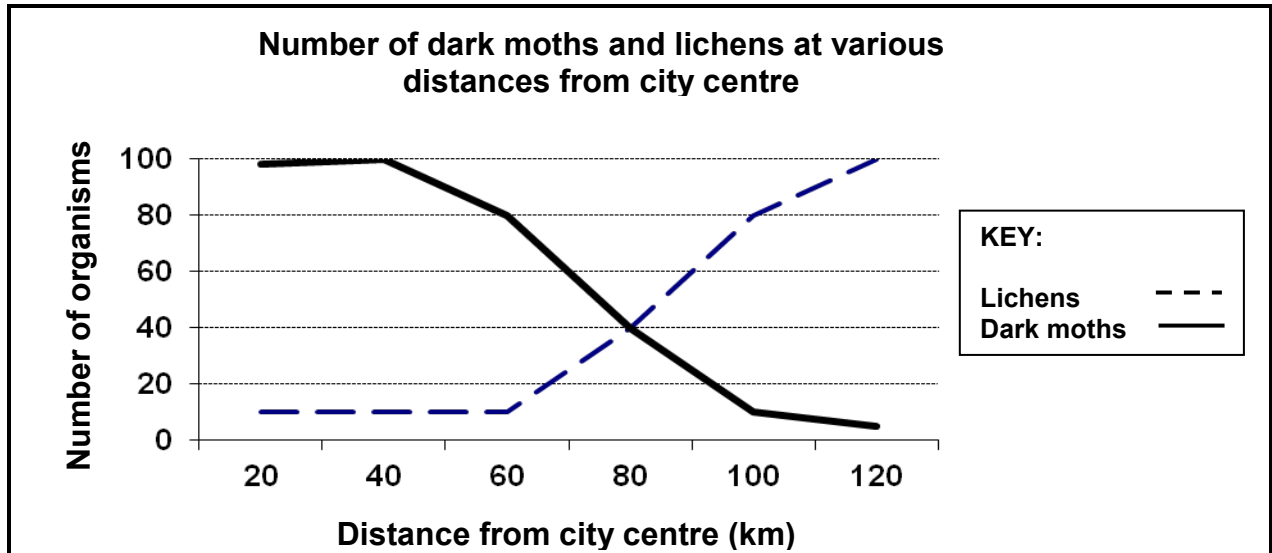
- 1.4 Study the diagram below showing possible evolutionary relationships amongst some groups of organisms.



According to the diagram:

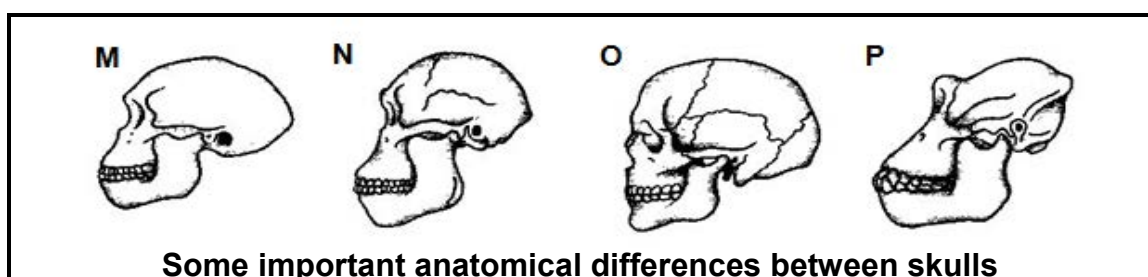
- |       |                                                                             |            |
|-------|-----------------------------------------------------------------------------|------------|
| 1.4.1 | How many million years ago did fungi evolve?                                | (1)        |
| 1.4.2 | Which were the first organisms to live on Earth?                            | (1)        |
| 1.4.3 | Which group of plants gave rise to flowering plants?                        | (1)        |
| 1.4.4 | Which is the most recent group of animals to evolve?                        | (1)        |
| 1.4.5 | Which groups of organisms were derived directly from the common ancestor X? | (2)        |
|       |                                                                             | <b>(6)</b> |

- 1.5 Lichens are small organisms that can be used as indicators of pollution. Lichens generally flourish in rural areas but do not appear in industrial areas, which are normally near the city centre. The graph below shows the number of dark moths as well as the number of lichens at various distances from the city centre.



- 1.5.1 Describe the relationship between the distribution of lichens and dark moths, and the distance from the city centre. (3)
- 1.5.2 Explain why lichens do not grow in industrial areas. (3)
- 1.5.3 Predict how the population of dark moths will change when pollution is reduced in the industrial areas. (1)
- 1.5.4 Explain your answer to QUESTION 1.5.3. (3)
- (10)**

- 1.6 A comparison of the anatomical features of the skulls of different species has helped scientists to propose evolutionary relationships.



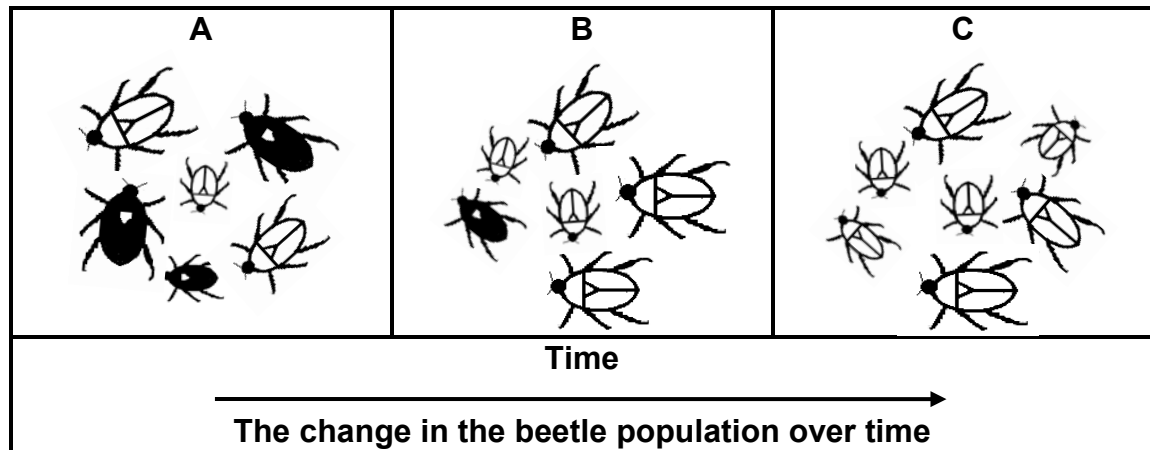
- 1.6.1 Tabulate THREE observable differences between the side view of the skulls **O** and **P**. (7)
- 1.6.2 Using the letters **M**, **N** and **O** from the diagram above, give the correct sequence in which these organisms appeared on Earth. (3)
- 1.6.3 Name ONE fossil of *Australopithecus* found in South Africa. (1)
- (11)**

**TOTAL SECTION A: 50**

## SECTION B

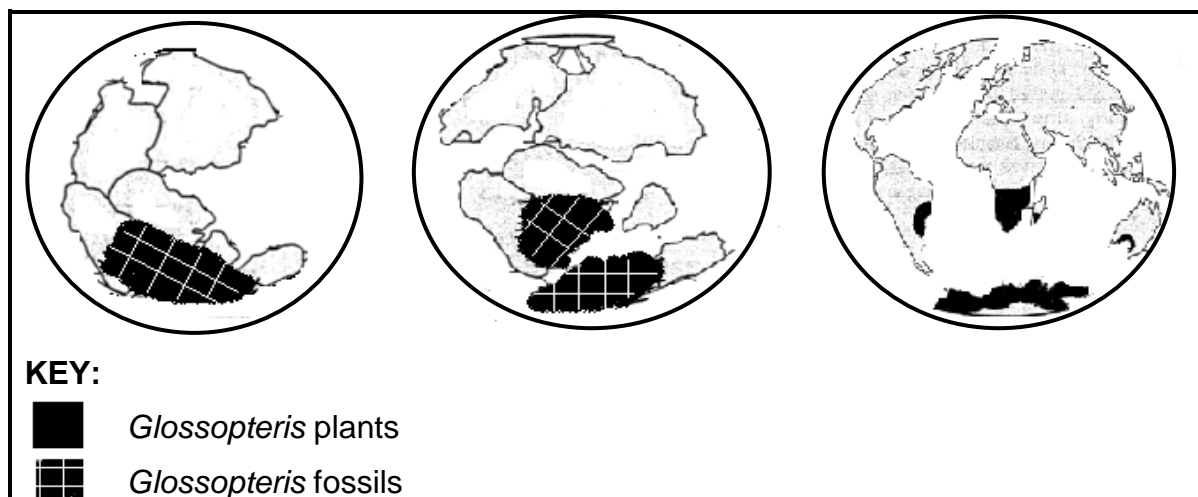
### QUESTION 2

- 2.1 Study the three diagrams (**A**, **B** and **C**) below that show how a population of beetles changed over a long period of time.



- 2.1.1 By comparing diagrams **A** and **B**, state the characteristic of the beetles that have enabled their offspring to survive. (1)
- 2.1.2 Name the mechanism that is illustrated in these diagrams. (1)
- 2.1.3 Use the **THREE** diagrams above to explain the mechanism named in QUESTION 2.1.2. (6)
- (8)**

- 2.2 Refer to the diagrams below that show the distribution of the fossils of *Glossopteris* and the present-day *Glossopteris* plants and answer the questions that follow.



- 2.2.1 Between 500 and 300 million years ago the Earth was one supercontinent as shown in the first diagram. What is the name of this supercontinent? (1)
- 2.2.2 How do scientists explain the present-day distribution of *Glossopteris* plants? (3)
- (4)**

- 2.3 A team of environmental monitors from the Department of Water Affairs took samples downstream from a paint factory. The team tested the water for concentrations of metal pollutants. Three months later the monitors repeated the test. The results of the investigation are shown in the table below, together with the human tolerance levels for these metal pollutants.

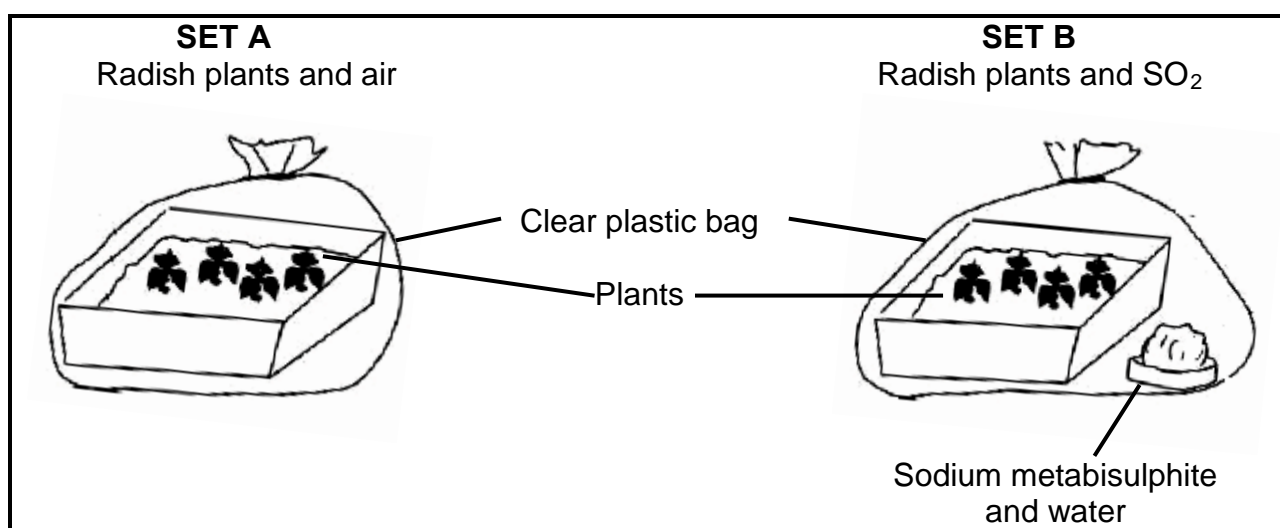
METAL POLLUTANTS	CONCENTRATION (x 10 mg/ℓ)		
	RESULTS OF FIRST TEST	RESULTS OF SECOND TEST (THREE MONTHS LATER)	CONCENTRATION THAT HUMANS CAN TOLERATE
Arsenic	0,03	0,02	5
Cadmium	0,02	0,60	1
Lead	2,10	3,80	5
Mercury	0,04	0,23	5

- 2.3.1 Which metal pollutant has decreased in concentration between the two tests? (1)
- 2.3.2 Give TWO possible reasons why there could be a decrease in the metal named in QUESTION 2.3.1. (2)
- 2.3.3 Which metal concentration has increased the most in the last three months? (1)
- 2.3.4 Explain whether the present concentrations of the metals are a risk for human health. (2)
- (6)**



2.4 A pupil thinks that sulphur dioxide ( $\text{SO}_2$ ) will have a toxic effect on germinating seeds. She does an investigation over a two-week period, as shown in the diagram below, to test her idea. Sodium metabisulphite, when mixed with water, releases sulphur dioxide.

- Cotton wool is placed in two trays.
- Five radish seeds are placed on the cotton wool in each tray.
- The seeds are covered with clear plastic bags.
- A solution of sodium metabisulphite and water is placed in one plastic bag with the seeds.
- The seeds are left for a week.
- The plants which resulted from germination are counted.



The following results were obtained:

DAY	NUMBER OF PLANTS IN SET A	NUMBER OF PLANTS IN SET B
2	2	2
4	4	4
6	4	2
8	4	0

- 2.4.1 Name the dependent variable in this investigation. (1)
- 2.4.2 Formulate a hypothesis for the above investigation. (3)
- 2.4.3 Explain THREE ways in which the reliability of the results can be ensured. (6)
- 2.4.4 State TWO effects of air pollution on human health. (2)
- (12)**  
**[30]**

### QUESTION 3

- 3.1 The table below shows different types of waste and their decomposition times.

TYPES OF WASTE	DECOMPOSITION TIME (MONTHS)
Nylon socks	40
Tin cans	30
Paper	15
Glass	10
Orange peel	5

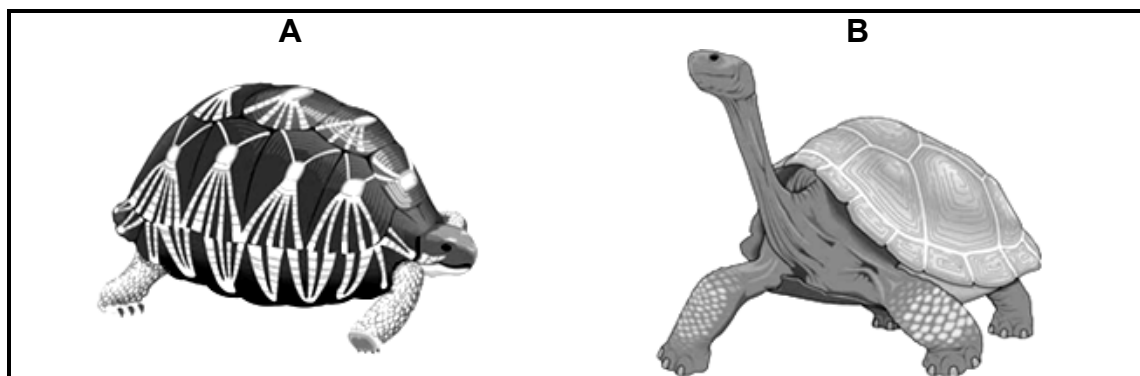
- 3.1.1 Draw a pie graph to represent the data in the table above. Show ALL working. (9)
- 3.1.2 Name ONE type of waste in the table above that can be recycled. (1)
- 3.1.3 Explain TWO advantages of recycling. (4)
- (14)**

- 3.2 During his journey Darwin discovered that there were different species of tortoises on each of the two different islands.

One had a domed shell and short neck and the other one had a longer neck.

The two islands had different vegetation. One of the islands (Island **X**) was rather dry. It had no grass, but rather short, tree-like cactus plants.

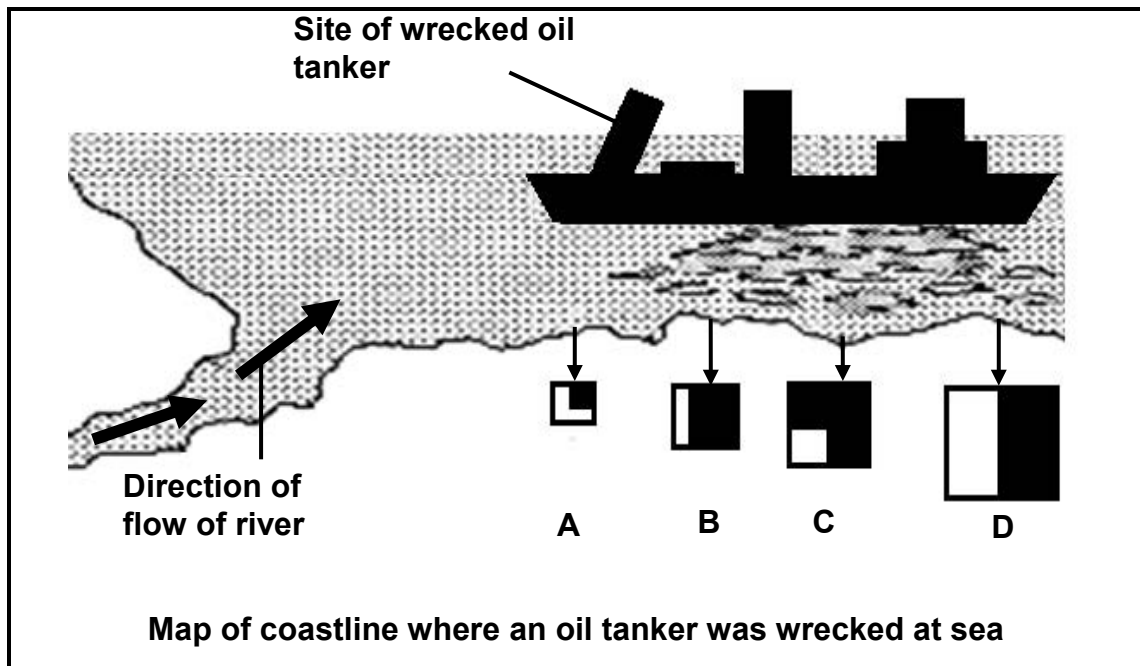
On the other island (Island **Y**), there were no cactus plants but it had a good supply of water and grass grew across the island.



- 3.2.1 Which tortoise (**A** or **B**) would have been found on Island **Y**? (1)
- 3.2.2 Darwin suggested that these two species on the different islands might have evolved from a common ancestor from the mainland. Explain how this could have occurred. (9)
- (10)**

- 3.3 The map below shows a region of coastline close to where a giant oil tanker was wrecked at sea. The shallow waters of the coastline sustain a rich source of crabs that are eaten by humans and other organisms. Oil does not kill the crabs but their flesh cannot be eaten (contaminated) and they cannot be sold. Samples of the crabs were collected at sites A to D.

The number of crabs is indicated by the size of the squares. The size of the shaded part at each site represents the proportion of the crabs with contaminated flesh after the disaster.



- 3.3.1 Which sample site (**A, B, C** or **D**) had the highest number of crabs? (1)
- 3.3.2 Name the substance of pollution that affected the crabs. (1)
- 3.3.3 At which sample site (**A, B, C** or **D**) were the least number of crabs affected compared to their population size? (1)
- 3.3.4 Explain your answer to QUESTION 3.3.3. (2)
- 3.3.5 State **ONE** consequence of an increase in the number of contaminated crabs to humans. (1)

(6)  
[30]

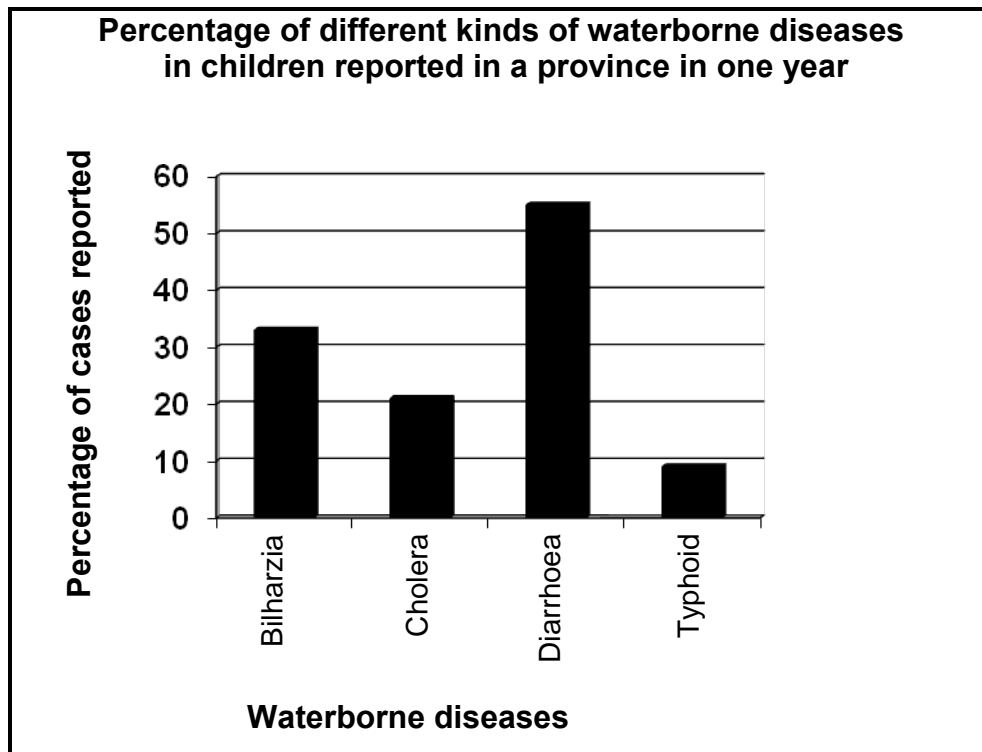
**TOTAL SECTION B: 60**

## SECTION C

### QUESTION 4

- 4.1 *Homo sapiens* share some characteristics with other primates, one of which is an opposable thumb.
- 4.1.1 State ONE possible advantage of having an opposable thumb. (1)
- 4.1.2 List FOUR characteristics that humans share with primates, other than an opposable thumb. (4)  
**(5)**
- 4.2 Scientists have used information from various fields of science to provide evidence for evolution.
- 4.2.1 List FOUR aspects of comparative biochemistry that provide evidence for evolution. (4)
- 4.2.2 State TWO pieces of evidence from comparative embryology that have led scientists to believe that all vertebrates may have had a common ancestor. (2)  
**(6)**
- 4.3 There are different sources of genetic variation within populations.
- 4.3.1 Explain how each of the following contributes to genetic variation:  
(a) Prophase 1 (2)  
(b) Random fusion of gametes (1)
- 4.3.2 Define *gene mutation*. (1)
- 4.3.3 Explain how gametes with extra chromosomes arise. (3)
- 4.3.4 Name the process that occurs when gametes fuse. (1)
- 4.3.5 State what is meant by each of the following:  
(a) Lethal mutations (1)  
(b) Fixed mutations (1)  
**(10)**

- 4.4 The graph below shows reported cases of waterborne diseases affecting children in the rural areas of a province over a period of one year. Study the graph and answer the questions that follow.



- 4.4.1 According to the graph, which disease had the highest percentage of reported cases in this province? (1)
- 4.4.2 Describe THREE possible ways in which data was collected for this investigation. (3)  
(4)
- 4.5 Describe FOUR ways in which the overexploitation of indigenous plants impacts on the environment and also explain FOUR appropriate management strategies that can reduce such overexploitation. (12)  
Content: (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**