



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 2012

MARKS: 150

TIME: 2½ hours

This question paper consists of 15 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 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.

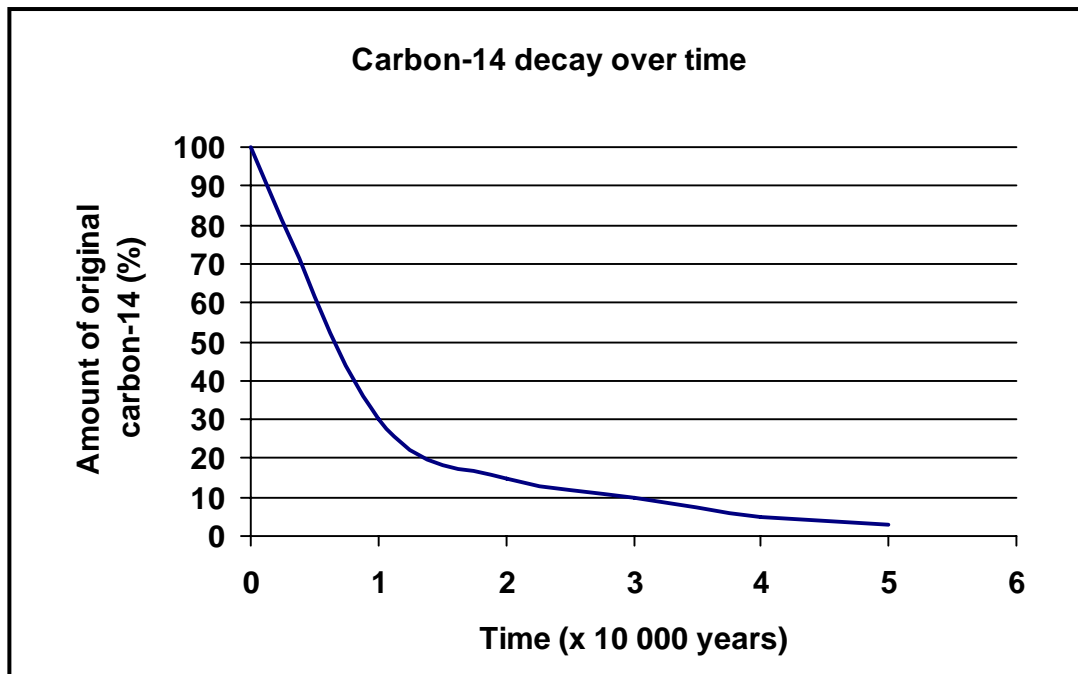
SECTION A

QUESTION 1

- 1.1 Various options are 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 your ANSWER BOOK, for example 1.1.6 D.

- 1.1.1 Macroevolution is a term that describes ...
- A an increase in the size of individuals of a population over a long period of time.
 - B the process leading to the formation of new genera and families of organisms.
 - C a gradual change in the number of species found in the fossil record.
 - D changes that can be seen without the need for a microscope.
- 1.1.2 Two individuals are most likely members of the same species if they ...
- A have a different number of chromosomes.
 - B can mate and produce fertile offspring.
 - C breed at different times.
 - D are phenotypically different.
- 1.1.3 The following list refers to events in nature:
- 1. Random fusion of gametes
 - 2. Random assortment of chromosomes
 - 3. Mutations
 - 4. The process of crossing over
- The events that contribute to genetic variation include ...
- A 1, 2, 3 and 4.
 - B 1, 2 and 4 only.
 - C 4 only.
 - D 1, 2 and 3 only.

- 1.1.4 One way to determine the age of a fossil is to use the rate of decay of carbon-14. The graph below shows how carbon-14 decays over time.



A fossil snail was found to have 30% of its carbon-14 remaining. According to the above graph, the age of the fossil is approximately ...

- A 5 000 years.
 - B 15 000 years.
 - C 10 000 years.
 - D 20 000 years.
- 1.1.5 The following steps occur during eutrophication as a result of excess use of fertilisers:

1. Aquatic algae grow rapidly
2. Bacteria use up oxygen
3. Excess nitrates and phosphates discharged into the river
4. Dead algae decomposed by bacteria
5. Fish die of suffocation

The correct order in which eutrophication occurs is ...

- A 3 → 4 → 1 → 5 → 2
- B 5 → 3 → 2 → 4 → 1
- C 5 → 2 → 3 → 1 → 4
- D 3 → 1 → 4 → 2 → 5

(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 1.2.6) in your ANSWER BOOK.

1.2.1 Waste that cannot be broken down by decomposers

1.2.2 A study of species in similar biomes across the world

1.2.3 Species that are no longer found on Earth

1.2.4 Structures inherited from the ancestor that are small, poorly developed and have no useful function

1.2.5 The variety of different species living in an area

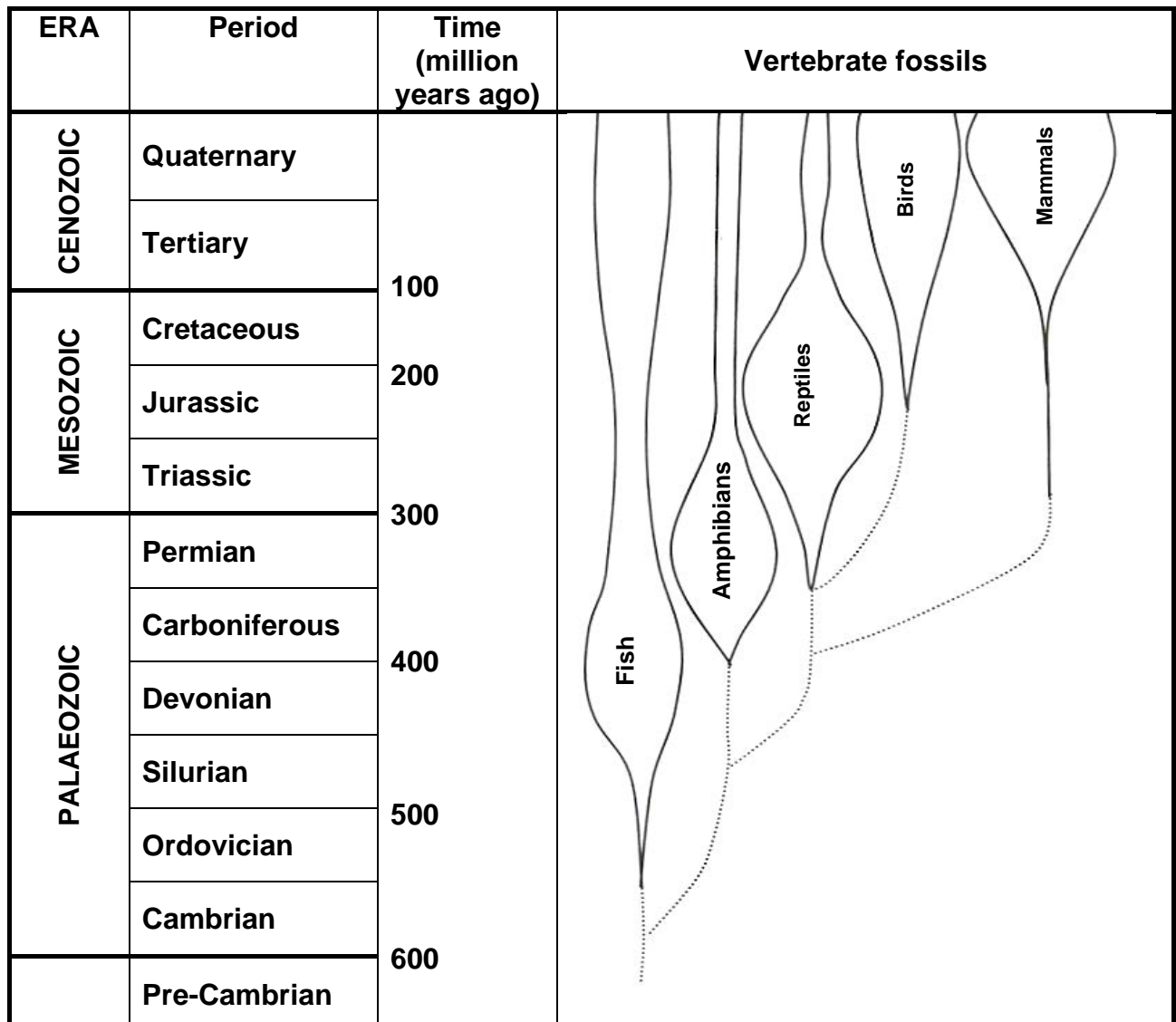
1.2.6 The breaking up of Pangaea to form different land masses (6)

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 your ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Organisms have an inherent/internal drive to change	A: Lamarck B: Darwin
1.3.2 Comparative embryology	A: Notochord B: Tubular heart
1.3.3 Australopithecines that were found in South Africa	A: Little Foot B: Mrs Ples
1.3.4 Dating of fossils by comparing the age of one fossil to another	A: Relative dating B: Radiometric dating
1.3.5 Evidence for evolution using comparative biochemistry	A: Different metabolic pathways B: Identical proteins
1.3.6 Reproduction between organisms that are closely related	A: Outbreeding B: Inbreeding
1.3.7 Influenced by environmental change	A: Speciation B: Extinction of species

(7 x 2) (14)

- 1.4 Study the diagram below which shows the relative number of species in the five vertebrate classes (fish, amphibians, reptiles, birds and mammals). The distance between the two lines in each class gives an indication of the number of species.



- 1.4.1 During which geological period were the most species of reptiles present? (1)
- 1.4.2 Describe the changes in the number of species of reptiles and mammals during the Tertiary Period. (4)
- 1.4.3 Name TWO vertebrate classes that evolved first. (2)
- 1.4.4 Use the information in the diagram to explain which TWO of the three classes (birds, reptiles and mammals) are more closely related. (3)

(10)

- 1.5 A type of bacterium, called *Escherichia coli* (*E. coli*), normally lives in the large intestine of humans. To determine whether *E. coli* is present in water, a chemical indicator is used.

If the chemical indicator changes from a clear red colour to a cloudy yellow colour, this indicates that *E. coli* is present.

In an investigation conducted by a group of Grade 12 learners, samples taken from THREE rivers (**X**, **Y** and **Z**) were investigated for the presence of *E. coli*. Samples were taken from each river and put into a glass bottle which contained the clear red indicator solution. The bottle was then incubated/kept at 37 °C for two days.

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

Time period	Colour of chemical indicator		
	River X	River Y	River Z
Before incubation	Clear red	Clear red	Clear red
After incubation	Clear red	Cloudy yellow	Clear red

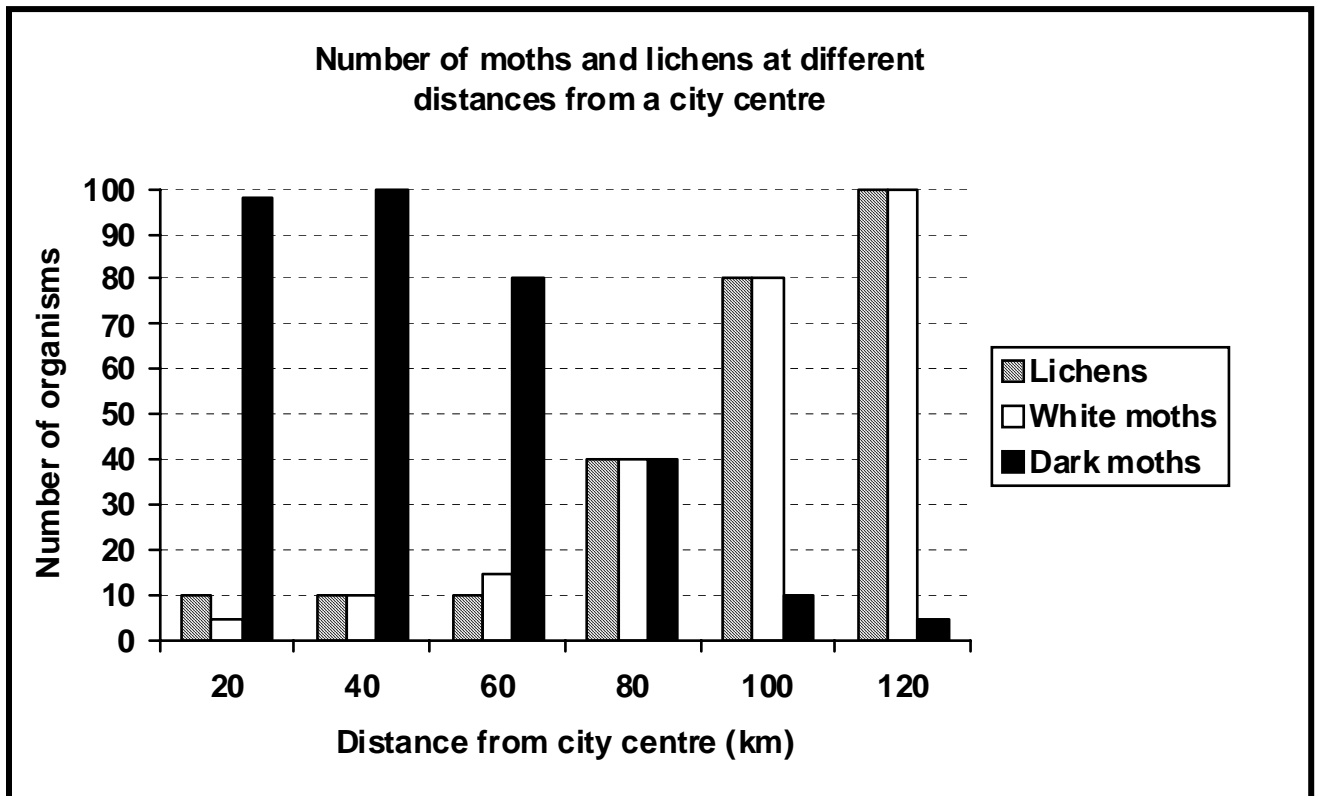
- 1.5.1 Explain TWO safety precautions that the learners should take when conducting this investigation. (4)
- 1.5.2 Give ONE reason for incubating the sample at 37 °C. (2)
- 1.5.3 Which river(s) (**X**, **Y** or **Z**) showed the presence of *E. coli*? (1)
- 1.5.4 Give a reason for your answer to QUESTION 1.5.3 above. (1)
- 1.5.5 Give TWO reasons for the presence of *E. coli* in rivers. (2)
- (10)**

TOTAL SECTION A: 50

SECTION B

QUESTION 2

- 2.1 Lichens are small, light-coloured organisms that can be used as pollution indicators. They 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 white moths and dark moths as well as the number of lichens at various distances from a city centre.



- 2.1.1 At what distance from the city centre is the number of white moths and dark moths and lichens the same? (1)
- 2.1.2 Describe the relationship between the distribution of lichens, dark moths and white moths as the distance from the city centre increases. (4)
- 2.1.3 Explain why lichens do not grow in industrial areas. (2)
- 2.1.4 Predict how the population of white moths and black moths will change if pollution is reduced in the industrial area. (2)
- 2.1.5 Explain your answer to QUESTION 2.1.4. (4)
- (13)**

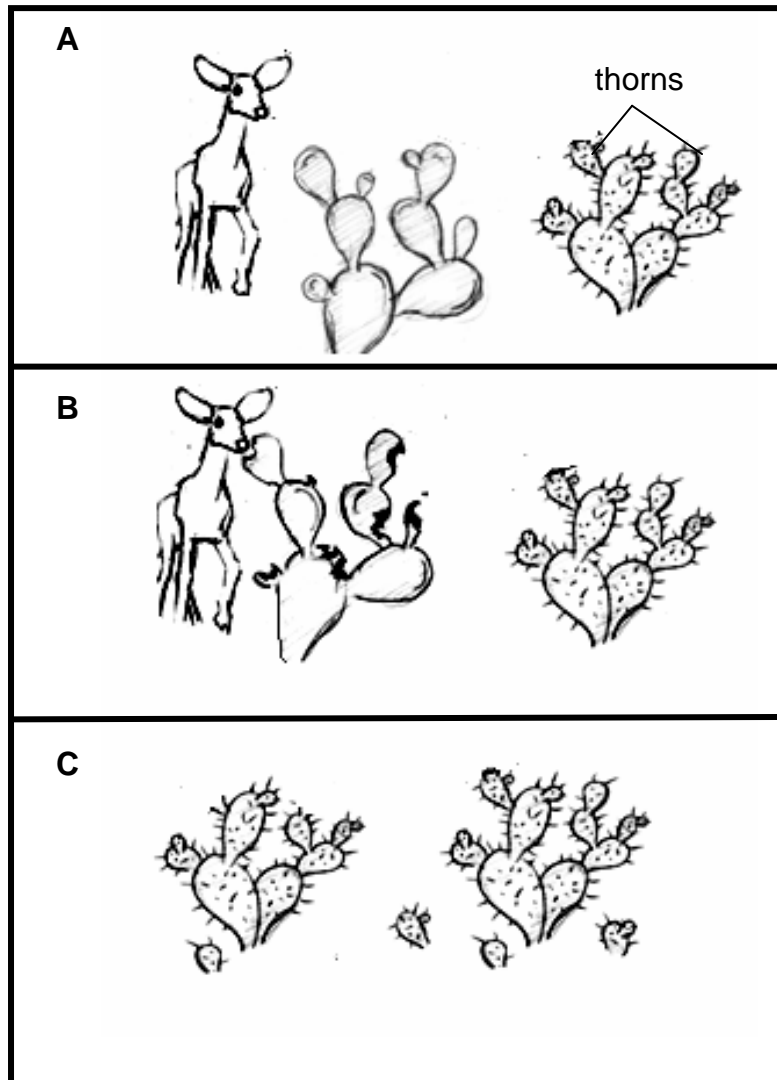
- 2.2 Two students decided to investigate the effect of different concentrations of sodium disulphate on the germination of oats seeds. Five sets of trays, each containing 20 germinating seeds, were used for each of the different concentration of the sodium disulphate solution.

The table below shows the results after one week.

Concentration of sodium disulphate (%)	Number of seeds germinated (five replications)					Germination (average %)
0,00	19	19	17	20	18	93
0,05	16	17	15	15	17	80
0,10	12	13	14	11	12	X
0,50	0	1	0	0	1	2
2,50	0	0	0	0	0	0

- 2.2.1 Formulate a possible hypothesis for this investigation. (2)
- 2.2.2 Name the independent variable in this investigation. (1)
- 2.2.3 Name TWO factors which might affect seed germination and which must be kept constant during this investigation. (2)
- 2.2.4 Why was the investigation repeated five times at each concentration? (2)
- 2.2.5 Calculate **X** in the table above. Show ALL working. (2)
- 2.2.6 What evidence from the results in the table shows that sodium disulphate affects the germination of oats seeds? (2)
- (11)**

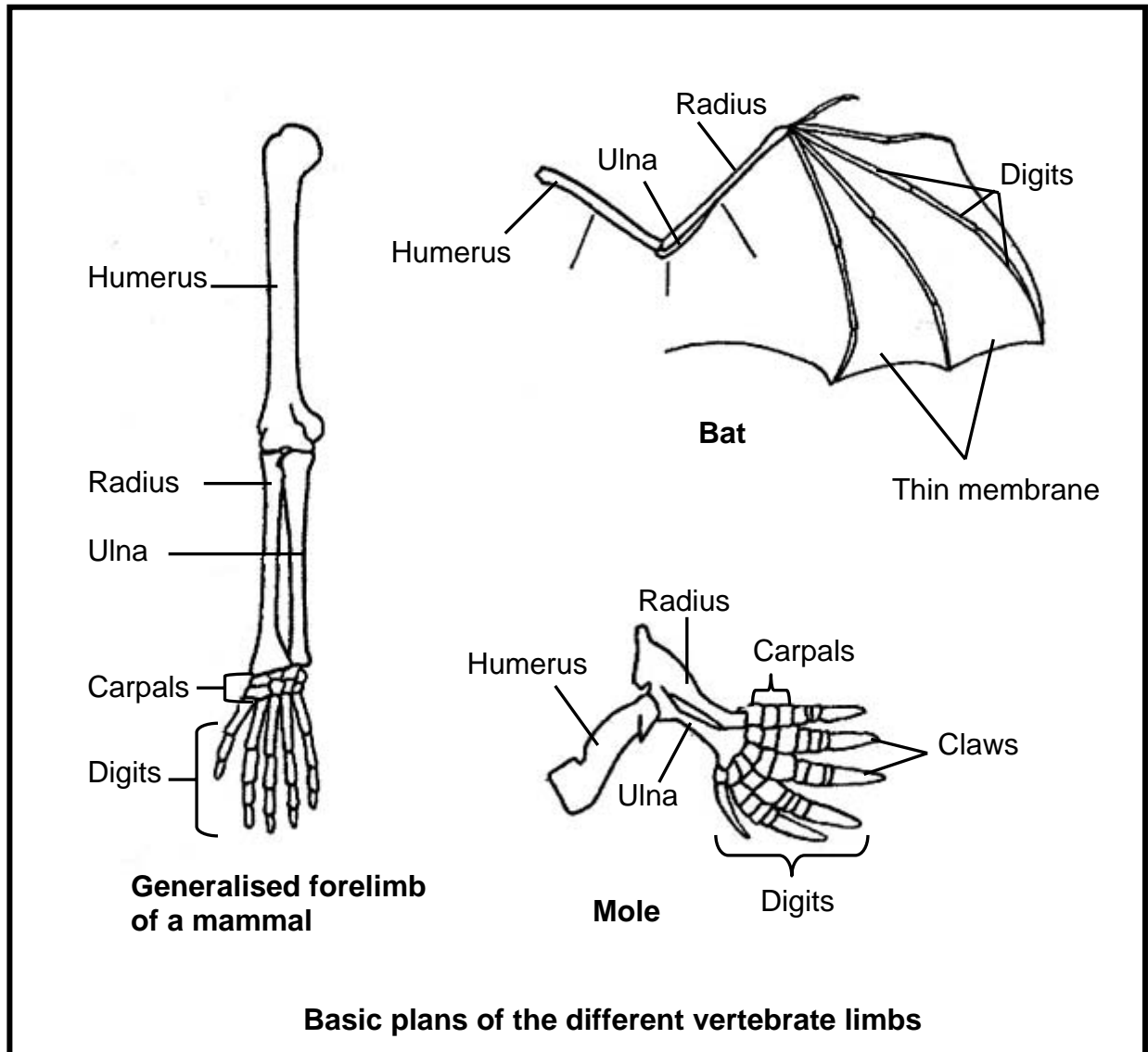
- 2.3 Below is a sequence of diagrams (**A**, **B** and **C**) representing the changes in a population of cactus plants on which bucks feed over a period of time.



- 2.3.1 Which evolutionary process is represented by the above diagrams? (1)
- 2.3.2 Use the diagrams **A**, **B** and **C** above to explain the process mentioned in QUESTION 2.3.1. (5)
- (6)
- [30]

QUESTION 3

3.1 Study the basic plans of three different vertebrate limbs shown below.

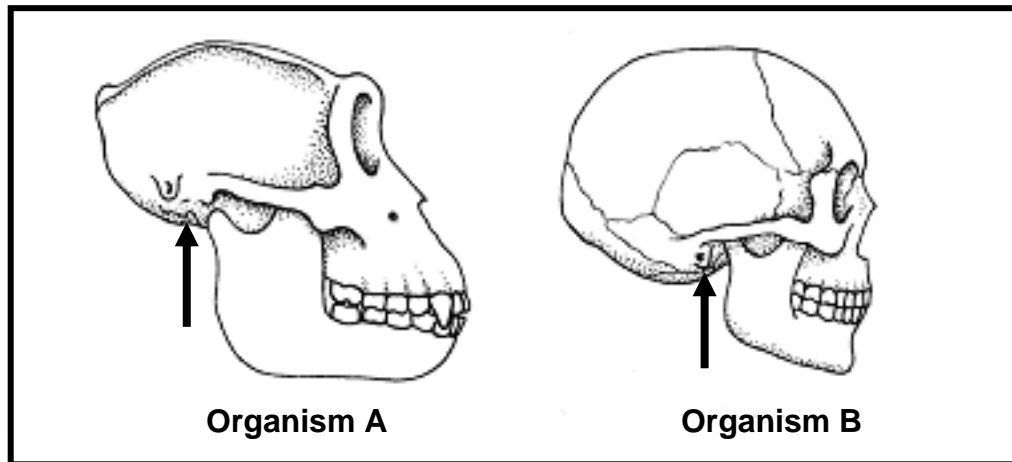


The limbs represented in the diagram are said to be homologous.

3.1.1 What do you understand by the concept *homologous*. (2)

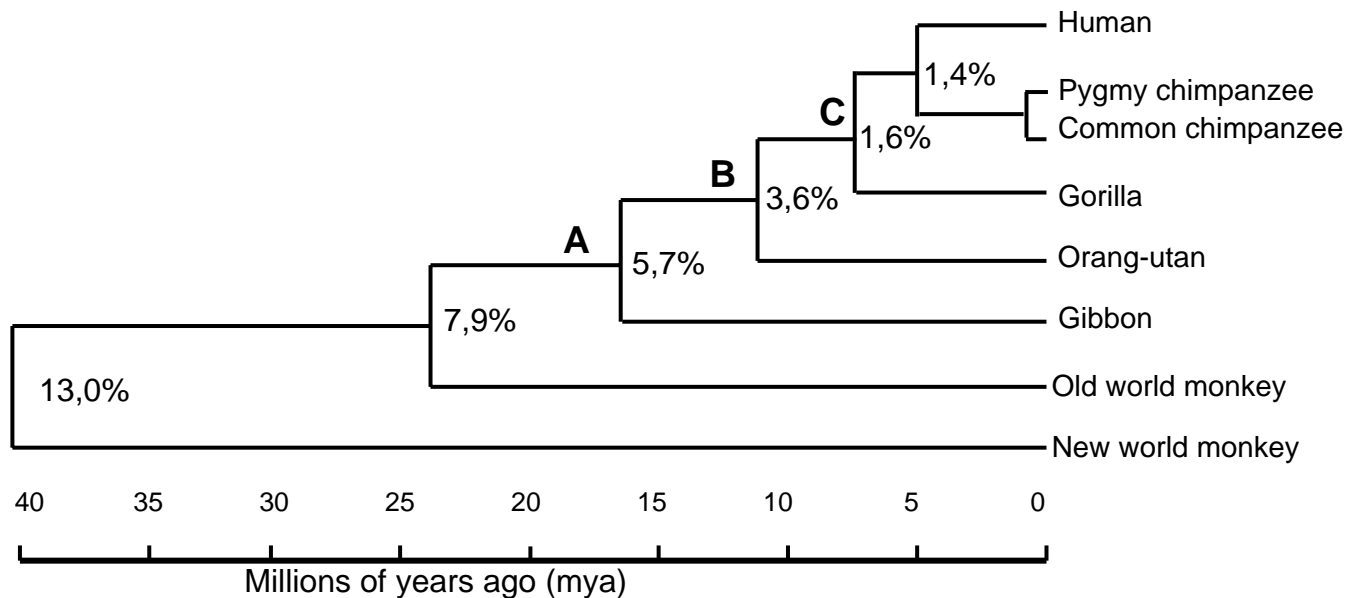
3.1.2 Explain ONE way in which the bat's limb is adapted for locomotion. (2)
(4)

- 3.2 The diagrams below represent the skulls of two organisms, a modern human and a gorilla. Each arrow indicates the position of the foramen magnum. Study the diagrams, which are drawn to scale, and answer the questions that follow.



- 3.2.1 Identify each of the organisms that are represented by **A** and **B**, respectively. (2)
- 3.2.2 Tabulate FOUR observable differences between the skulls of organisms **A** and **B**. (9)
- 3.2.3 Which organism is bipedal for most of its adult life? (1)
- 3.2.4 Explain TWO possible advantages of bipedalism for the organism referred to in QUESTION 3.2.3. (4)
- 3.2.5 Name any ONE similarity between organisms **A** and **B** which is a characteristic of primates. (1)
- (17)**
- 3.3 Based on fossil evidence we know that dinosaurs became extinct nearly 65 million years ago. The age of fossils can be determined using carbon or uranium. The half-life of carbon-14 is 5 730 years and the half-life of uranium is 700 million years. Half-life refers to the time taken for half of the original amount of carbon or uranium to decay.
- Explain which of carbon-14 or uranium should be used to calculate the age of dinosaur fossils. (3)

- 3.4 The diagram below shows a phylogenetic tree based on DNA similarities. The percentage next to each branch shows the number of differences in the genome (DNA nucleotide sequence) of the two groups being compared.



A phylogenetic tree based on DNA similarities

- 3.4.1 From the diagram, determine how long ago humans and chimpanzees shared a common ancestor. (2)
- 3.4.2 Which common ancestor (**A**, **B** or **C**) is shared by gibbons and gorillas? (1)
- 3.4.3 Which organism is most closely related to humans? (1)
- 3.4.4 What is the DNA similarity between the genomes of the chimpanzee and the human? (2)

(6)

TOTAL SECTION B: 60

SECTION C

QUESTION 4

- 4.1 The table shows the average number of two types of fish, herring and cod, caught in a single net per year, over a period of eight years.

	Catch per net (thousands of tons)	
Year	Herring	Cod
1	370	145
2	150	120
3	110	80
4	105	60
5	85	50
6	70	45
7	65	50
8	70	60

- 4.1.1 Plot TWO line graphs, on the same set of axes, using the information in the table above. (12)
- 4.1.2 Describe how the catch per net of the herring population changed over the eight years. (4)
- 4.1.3 State any TWO management strategies which could prevent the over-exploitation of resources such as herring and cod. (2)
- (18)**

4.2 Study the passage below and answer the questions that follow.

The African potato (*Hypoxis hemerocaluidea*) is widely used for traditional medicine in South Africa and regarded as a natural resource. It is commercially used to cure human ailments such as testicular tumours, enlargement of the prostate gland, urinary infections and stomach aches. It is also used as a laxative.

Research has shown that 73 tons or 428 000 bulbs are widely harvested by sangomas and collectors in KwaZulu-Natal every year. Claims that the extract of African potato can be used to treat diseases like HIV/Aids and cancer has put this traditional medicine under the spotlight.

[Source: www.kznwildlife.com]

- 4.2.1 Name TWO medical conditions that can be treated with the African potato. (2)
- 4.2.2 State THREE strategies to prevent exploitation of plants like the African potato. (3)
- 4.2.3 State TWO consequences of exploitation of plants like the African potato. (2)
- 4.3 Explain FOUR strategies you would use to manage solid waste if you were appointed as the head of the waste disposal division of your town/city. (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