

## LIFE SCIENCES: PAPER I

**EXAMINATION NUMBER** 



# **ANSWER BOOKLET**

# There are (viii) pages in this Answer Booklet.

# **QUESTION 1**

1.1 Select the term in Column B that best matches the description in column A. Write the letter of the term in the corresponding space provided between the brackets. Each letter may only be used once.

## Column A

- Study of cultural human artefact remains of ſ ] past human groups.
- ] A newly found hominid fossil that has features ſ of both the Australopithecus and Homo species.
- A living people with the oldest genetic history in ſ 1 Africa.
- The increased incidence of a recessive allele in ſ 1 an isolated human population (e.g. atherosclerosis in the Afrikaner population).
- 'Handy man' making early stone tools. ſ 1
- An early bipedal human ancestor such as the fossil ſ 1 of the Taung child found at Sterkfontein.
- Collective term for fossilised human ancestors. ſ 1
- ſ 1 A group of organisms that closely resemble each other and can interbreed to produce viable offspring.
- Study of human fossil remains. Γ 1
- A viewpoint that suggests that modern humans ſ 1 evolved in Africa.

### Column B

- Hominids Α
- B Australopithecus africanus
- С Palaeontology
- Multiregional model D
- E Species
- F Archaeology
- G Australopithecus sediba
- Η Founder effect
- Ι The San
- 'Out-of-Africa' model J
- Κ Homo neanderthalensis
- Homo habilis L

(1)

(1)

1.2 Six multiple choice questions are given below. Choose the most correct alternative in each question and write only the letter of the correct answer in the space provided in the table.

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
Answer						

- 1.2.1 The term applied to the treatment of a genetic disease by replacing a faulty gene is known as:
  - A cloning
  - B gene therapy
  - C karyotyping
  - D artificial selection
- 1.2.2 Part of the coding section of a DNA chain is represented by the diagram below. Which of the following changes would take place in the amino acid chain being formed if the mutation shown below had occurred?

#### DNA chain before mutation

#### DNA chain after mutation



- A the amino acid chain would be shorter than expected
- B the amino acid sequence would remain unchanged
- C one amino acid in the polypeptide chain would change
- D the amino acid chain would not be made

Answer Questions 1.2.3 and 1.2.4 with reference to Diagrams 1 to 4 below. The diagrams show a single pair of homologous chromosomes in various stages of meiosis I and II.



1.2.3 Which of the following combinations is the correct sequence for meiosis?

А	3, 4, 1, 2
В	4, 3, 1, 2
С	2, 3, 4, 1
D	4, 3, 2, 1

(1)

- 1.2.4 Which of the numbered stages in the previous diagram represents the chromosomes undergoing 'reduction division'?
  - A 1 B 2
  - C 3
  - D 4
- 1.2.5 A study investigating the factors contributing to evolutionary changes in animal size was conducted by palaeontologists. The average size of all extinct mammals in the Karoo region of South Africa was calculated (using data from the fossil record) for a period of 10 million years. The temperatures in the region were also calculated and graphs representing the findings are shown below.



[Adapted from: <www.NSW.ed.com>]

Which of the following statements best describes the relationship shown by the two graphs?

- A When the temperatures were high, the mammals increased in size.
- B Larger animals are not easily caught by predators and so they are more likely to survive during cold periods.
- C A cooling climate results in all the mammals only passing on large genes to their offspring.
- D A decrease in temperature shows a corresponding increase in the average size of mammals.

(2)

1.2.6 The pedigree diagram below shows the inheritance of a genetically inherited disorder in humans. What is the most likely way in which this disorder is inherited?



- A Parent A and Parent B are homozygous dominant
- B Parent A and Parent B are heterozygous
- C Parent A and B are homozygous recessive
- D Only males pass on the gene for the disorder
- 1.3 The following diagram shows a pair of homologous chromosomes in Prophase I of meiosis. The letters show the position of genes A to K (and a to k) on the chromosomes. The numbered arrow indicates the exact point at which crossing over could occur.



<sup>[</sup>Adapted from Allan and Greenwood, 1999]

1.3.1 Complete the gene sequences for the four chromatids on the diagram below after crossing over has taken place at point 1. Indicate **only** the changes in gene positions that have taken place after crossing over at point 1 between the inner chromatids numbered II and III.



1.4 Radioactive Carbon-14 is present in the tissues of all living things. The amount of Carbon-14 in organic material in a fossil can be used to determine the age of a fossil which is less than 50 000 years old.

The graph below shows how Carbon-14 decays over time.



- 1.4.1 (a) Use an **X** to indicate the point on the graph where a fossil fish contains 30% of the original Carbon-14.
  - (b) According to the graph above, how old is the fossil fish referred to in Question 1.4.1 (a)?

(1)

(1)

1.4.2 Suggest why a 40 000 year old fish fossil could not be accurately dated from the graph.

(2)

1.4.3



The flipper of the whale and the fin of a fish are used by the animals to enable them to swim.

Give TWO reasons for these limbs being an example of convergent evolution.

(2)

1.5 Use the diagram of the phylogenetic tree below which illustrates the evolution of the modern rhinoceros/rhino family to assist you in answering the following questions.



1.5.1 Name ONE rhino that is still living today?

[40]

	Accord rhinos	ding to the diagram, how long ago did the direct ancestor of all the evolve?
	Name	the most recent common ancestor of the African rhinos living today.
	Explai the mo	n how the following scientists would have described the evolution of odern rhino's horn:
	(a)	Charles Darwin
	(b)	Jean-Baptiste de Lamarck
i	(a)	Draw a circle around the living rhino which is most closely related to the extinct woolly rhino?
	(b)	Give a reason for choosing this rhino.