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TOTAL
MARKS

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INTERNATIONAL SECONDARY CERTIFICATE EXAMINATION
MAY 2024

BIOLOGY: PAPER II

EXAMINATION NUMBER

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Time: 2 hours

100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. The question paper consists of 16 pages and a Source Material Booklet of 21 pages (pages i–xxi). Please check that your question paper and Source Material Booklet are complete. Remove the Source Material Booklet from the middle of the question paper.
2. The question paper consists of three questions. Questions 1 and 2 are case studies and Question 3 is an essay. Read the sources provided in the Source Material Booklet and use this information and your own knowledge to answer all questions.
3. **Answer ALL the questions on the question paper and hand this in at the end of the examination. Remember to write your examination number in the blocks above.**
4. Read the questions carefully.
5. Refer to the mark allocation for each of the questions in Questions 1 and 2 as an indication of the detail required.
6. It is in your own interest to write legibly and to present your work neatly.
7. ONE blank page (page 16) is included at the end of the question paper. If you run out of space for an answer, use this page. Clearly indicate the number of your answer should you use this extra space.

FOR MARKERS' USE ONLY

Question	1	2	3	Total
Marks	30	30	40	100
Marked				
Moderated				

SECTION A**QUESTION 1**

Refer to pages ii–vi in the **Source Material Booklet**. Use this information as well as your own knowledge to answer the questions that follow.

- 1.1 Study the following table that contains statements in the first column and two biological terms (numbered 1 and 2) in the second column. These statements are taken from the text. Use your own knowledge and information from the sources and **decide which term(s) relate to each statement**.

Write down your choice in the space provided in the ANSWER column, making use of the following codes:

- 1** Only term 1 relates to the statement.
2 Only term 2 relates to the statement.
1 and 2 Both terms 1 and 2 relate to the statement.
None Neither term 1 nor term 2 relates to the statement.

Question	Statement	Biological term		Answer
1.1.1	Anteaters still have nerves and blood vessels in place for teeth, even though they no longer have teeth.	1.	Phenotypic change	
		2.	Vestigial structure	
1.1.2	Toothless jaws in pangolins and anteaters.	1.	Homologous structures	
		2.	Analogous structures	
1.1.3	The evolution of the pentadactyl forelimb.	1.	Convergent evolution	
		2.	Divergent evolution	

(3)

- 1.2 In the space below, draw a table to compare TWO adaptations of anteaters and pangolins to eating insects.

(5)

- 1.3 Refer to Figure 1.3 on page iii of the Source Material Booklet.
Are elephants more closely related to anteaters or pangolins? Provide evidence from Figure 1.3 to support your answer.

(2)

- 1.4 Describe how a body covering of scales in the pangolin evolved by the process of natural selection.

(5)

- 1.5 Refer to Figure 1.4 on page v of the Source Material Booklet.

- 1.5.1 Describe a difference in appearance between the basic pentadactyl forelimb and the adapted pangolin forelimb.

(1)

- 1.5.2 Suggest a reason for this change seen in the pangolin forelimb.

(1)

1.6 Pangolins have various mutations in their genes that have allowed them to evolve and adapt to their environment.

1.6.1 Explain what is meant by a gene mutation.

(1)

1.6.2 Mutations can be harmful, neutral, or beneficial. Refer to Table 1 on page iv to answer the following questions.

(a) Name TWO beneficial gene mutations and explain how each of these mutations benefits the pangolin in its habitat.

(4)

(b) Name ONE neutral gene mutation.

(1)

(c) Describe ONE potential impact of a harmful gene mutation on genotypic variation in the pangolin population.

(2)

1.7 The text states that pangolins are endangered. Conservation goals are to increase heterozygosity within the species and avoid inbreeding.

1.7.1 Explain how inbreeding is a threat to the survival of the pangolin.

(2)

1.7.2 Why is it a good idea to involve the traditional healers in the conservation of the pangolin? Give well-explained reasons for your answer.

(3)
[30]

QUESTION 2

Refer to pages vii–xi in the Source Material Booklet. Use this information as well as your own knowledge to answer the questions that follow.

- 2.1 Many hominid fossils have been discovered on the African continent. The table below lists some hominids and a brief description of each in a random order.

Select the description in Column B that best matches the name of the hominid in Column A. Write the letter of the description in the Answer column next to the hominid name. Each letter may only be used once.

	Answer	Column A – name of hominid	Column B – description
2.1.1		<i>Homo sapiens</i>	A. Fossil discovered in the Awash Valley in Ethiopia.
2.1.2		Mrs Ples	B. The first hominid to make tools.
2.1.3		<i>Homo habilis</i>	C. Fossil discovered in Border Cave, KwaZulu-Natal, Klasies River mouth.
2.1.4		Lucy	D. Fossil discovered in the Cradle of Humankind.

(4)

- 2.2 *Homo erectus* was the first hominid to migrate out of Africa.

- 2.2.1 Describe TWO ways in which the use of fire aided *Homo erectus* to migrate out of Africa and survive in new environments.

(4)

- 2.2.2 Bipedalism has played a significant role in hominid evolution. But bipedalism has also caused problems for hominids. Suggest TWO ways in which bipedalism may be a disadvantage (to hominids).

(2)

2.2.3 Discuss ONE line of evidence that scientists have used to support the 'Out of Africa' hypothesis that modern humans originated in Africa.

(2)

2.3 *Homo naledi* is classified as a member of the *Homo* genus and not the *Australopithecus* genus. Describe how scientists used each of the following types of evidence, discussed in the text, to support this classification.

2.3.1 Fossilised remains.

(2)

2.3.2 Genetic evidence.

(2)

2.3.3 Archaeological evidence.

(2)

- 2.4 Suggest a reason why the classification of hominids, like *Homo naledi*, remains a matter of scientific debate.

(3)

- 2.5 Refer to Figure 2.4 on page ix of the Source Material Booklet.

- 2.5.1 Name ONE similarity between the skulls of *Homo erectus* and *Homo sapiens*.

(1)

- 2.5.2 List TWO features of the *Homo naledi* skull that are less evolved and more ape-like.

(2)

- 2.6 Refer to Figure 2.6 on page xi of the Source Material Booklet.

- 2.6.1 Provide a suitable label for the part labelled X at the base of the human skull.

(1)

- 2.6.2 (a) How would the part labelled X have differed in *Australopithecus africanus*?

(1)

- (b) Give a reason for this difference in the part labelled X in *Australopithecus africanus*.

(1)

2.6.3 Refer to Figure 2.5 on page x of the Source Material Booklet.

- (a) How long ago did the earliest hominids live?

(1)

- (b) The rate of blood flow into the brain through the carotid arteries has increased by 600% from the earliest hominids to modern *Homo sapiens*.

The average rate of blood flow through the human carotid arteries is 650 ml/minute. Calculate the approximate rate of blood flow to the brains of the early hominids, in ml/minute.

(2)

[30]

60 marks

SECTION B

Refer to pages xii–xxi of the Source Material Booklet.

QUESTION 3

Consider the following statement:

Species can overcome the challenges created by climate change by adapting, evolving, and surviving.

Using the source material provided as well as your own knowledge, discuss your opinion on the statement in the form of an essay of 2½–3 pages.

To answer this question, you are expected to:

- Read the source material carefully.
- Take a definite stand on the statement and arrange the information to best develop your argument.
- Select relevant information from the sources in the Source Material Booklet.
- It is important to integrate your own relevant knowledge of Biology to support your point of view.
- Write in a way that is scientifically appropriate and communicates your point of view clearly.
- **Provide** a clear **plan** of your essay before you start writing. Note that the plan will be marked as part of the assessment of this question.
- **In your essay, ensure that you have discussed at least nine different facts from the sources.**

[40]

PLAN:

[illegible]

[illegible]

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40 marks

Total: 100 marks

ADDITIONAL SPACE (ALL QUESTIONS)

**REMEMBER TO CLEARLY INDICATE AT THE QUESTION THAT YOU USED THE
ADDITIONAL SPACE TO ENSURE THAT ALL ANSWERS ARE MARKED.**

[illegible]