

Student Name: \_\_\_\_\_



# **BIOLOGY 2017**

## **Unit 4**

### **Key Topic Test 5 – Human change over time**

Recommended writing time\*: 45 minutes

Total number of marks available: 45 marks

## **QUESTION BOOK**

\* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

**Conditions and restrictions**

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.
- No calculator is permitted in this test.

**Materials supplied**

- Question and answer book of 12 pages.

**Instructions**

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.**

**SECTION A – Multiple-choice questions**

**Instructions for Section A**

Select the response that is most correct for the question. A correct answer scores 1, an incorrect answer scores 0. Marks are not deducted for incorrect answers. If more than 1 answer is completed for any question, no mark will be given.

**Question 1**

Which of the following traits is unique to modern humans?

- A. Flat nails instead of claws.
- B. Well developed, differentiated teeth.
- C. All toes point in the forwards direction.
- D. The presence of five digits on hands and feet.

**Question 2**

Which of the following classifications is incorrect?

- A. Orang utans are primates
- B. Chimpanzees are primates
- C. Spider monkeys are hominins
- D. *Homo erectus* is classed as a hominin

**Question 3**

Compared to members of the Australopithecus genus, the pelvis of modern humans is referred to as being:

- A. Longer
- B. Squarer
- C. Narrower
- D. Bowl shaped

**Question 4**

Which of the following is suggested by the Out of Africa theory?

- A. The oldest hominin fossils would be expected to be found in Africa.
- B. Many different species evolved in Africa within a short time frame.
- C. The ancestors of all modern humans left Africa after climate change occurred.
- D. All of the hominins throughout the world lived in Africa before moving elsewhere.

**SECTION B - Short-answer questions**

**Instructions for Section B**

Answer all questions in the spaces provided.

**Question 1 (8 marks)**

The diagram below shows a possible interpretation of the distribution and ancestry of modern and ancestral humans.

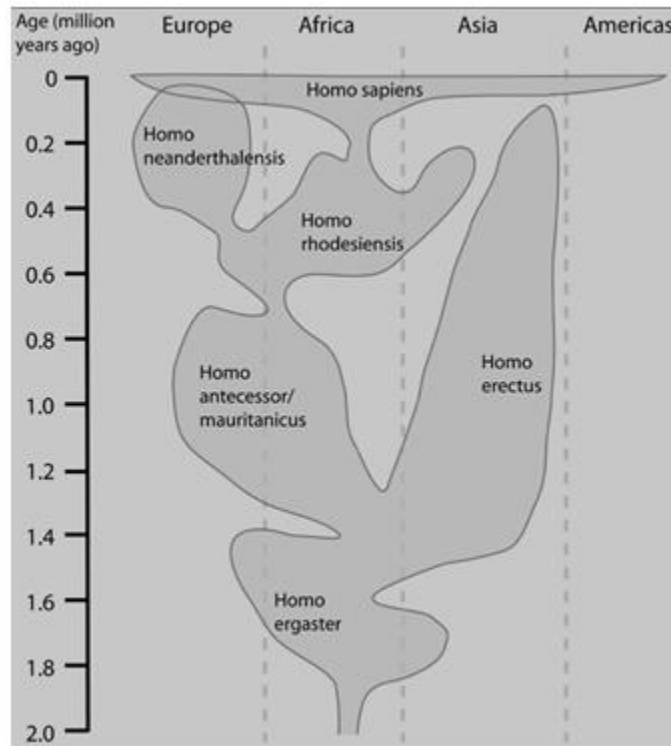


Diagram 1

- a. Identify the term that is used to describe all modern humans and their immediate ancestors.

1 mark

- b. From the data identify any other members of the *Homo* genus that were contemporaries of *Homo sapiens*.

1 mark

Diagram 2 also contains information about the possible ancestry of a variety of Homo species.

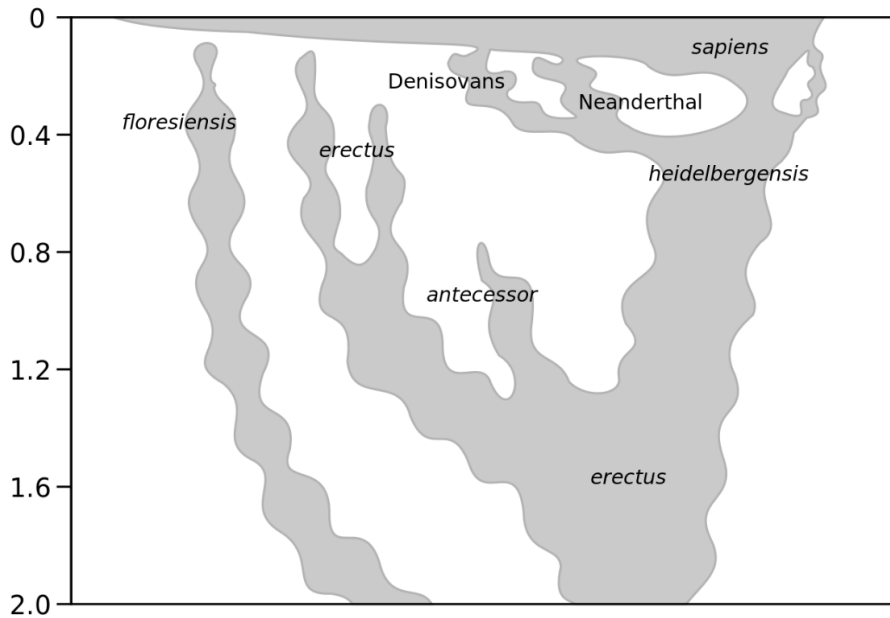


Diagram 2

- c. With regard to the evolution of *Homo sapiens*, compare the relationship *Homo erectus* to *Homo sapiens* in the models shown in diagrams 1 and 2.

2 marks

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- d. Our ideas regarding human evolution are constantly changing. Explain why this is the case. What information or evidence could be used to support a change to existing models?

2 marks

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- e. Discuss two pieces of information that could be used to identify that diagram 2 contains more up to date information than diagram 1.

2 marks

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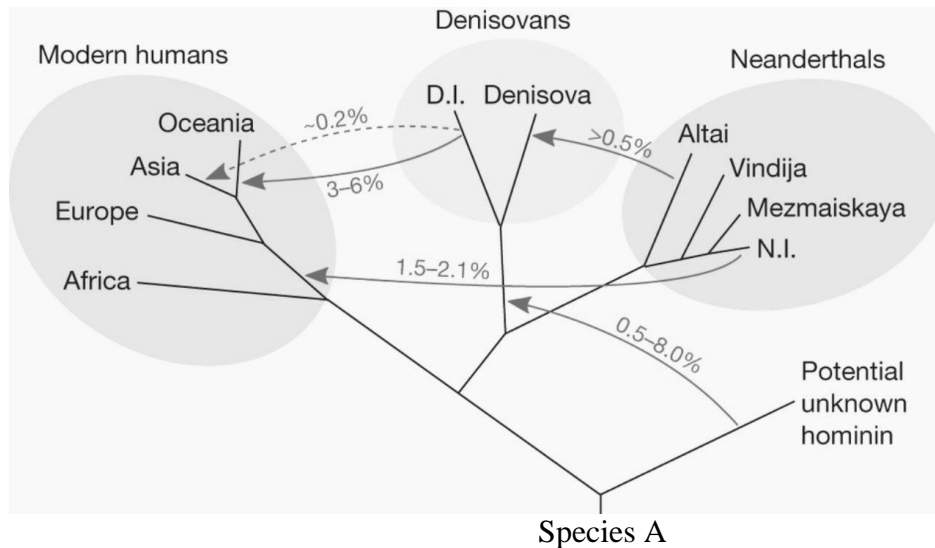
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**Question 2 (16 marks)**

According to one theory of human evolution, an ancestral group of *Homo heidelbergensis* left Africa approximately 300 000 years ago. Shortly afterwards this group is now believed to have split into two smaller groups. One of these migrated north into Europe and became the Neanderthals. It is believed that the other group migrated east and became a different species now known as *Homo denisova*. The remaining *H. heidelbergensis* are believed to have stayed in Africa and evolved to become *Homo sapiens*, before some eventually left Africa approximately 60000 years ago. This information is shown in the diagram below.



- a. Based on the information provided, identify species A. Provide a reason to support your answer.

2 marks

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In 2008 some remains were found in Denisova cave, Siberia. One of the remains was a small finger bone from a young girl. Genomic DNA was extracted from this bone and compared to those of modern humans and Neanderthals. It was found that although there were some similarities with Neanderthals, there was still a distinct difference.

- b.** Explain why the DNA from the finger bone was compared to that of Neanderthals and modern humans.

1 mark

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- c.** Explain why the DNA of the girl was more similar to those of Neanderthals than *Homo sapiens*.

1 mark

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- d.** Discuss the evidence that is used to support the idea that this girl was a member of a previously undiscovered group, now called *Homo denisova*.

1 mark

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- e.** The information in the diagram is supposed to reflect the theory outlined in the background information. Identify two modifications that might be made to this diagram to make it a more accurate reflection of the information. Provide an explanation for each answer.

4 marks

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Scientists have also found that there is a genetic overlap between the Denisovans and some modern Asian populations as well as Melanesians (who live in Oceania). These individuals have up to 5% of Denisovan genetic material in their genomes.

- f. Explain how Denisovan genetic material could have become incorporated into the genome of some modern humans from Asia and Oceania.

1 mark

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- g. Explain why Denisovan genetic material is not incorporated into the genome of modern humans from Europe.

1 mark

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- h. What information is the diagram conveying regarding interbreeding between *Homo sapiens* and Neanderthals?

1 mark

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- i. The skeletal remains of an individual were found in Northern Italy. Analysis of the remains indicated that the genomic DNA was of *Homo sapiens*, but the mitochondrial DNA was that of a Neanderthal. Explain the significance of these findings with regard to the individual and their parents. Provide reasons to support your answer.

3 marks

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- j. Provide a reason to explain why there is no genomic DNA or mitochondrial DNA from Neanderthals in modern humans whose ancestors have never left Africa.

1 mark

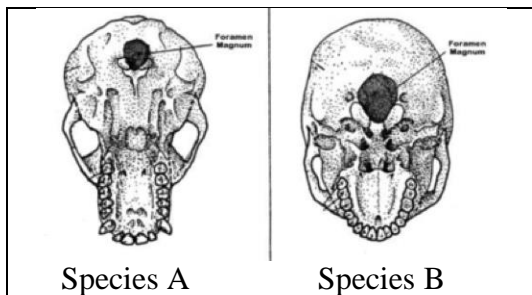
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**Question 3 (4 marks)**

The diagram below shows the lower surface of the skulls of two different species. The hole in the base of the skull is called the foramen magnum.



- a. Based on the position of the foramen magnum, which species is most likely to be a modern human? Provide a reason to support your answer.

2 marks

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- b. Identify two other trends in human evolution that can be observed in these skulls.

2 marks

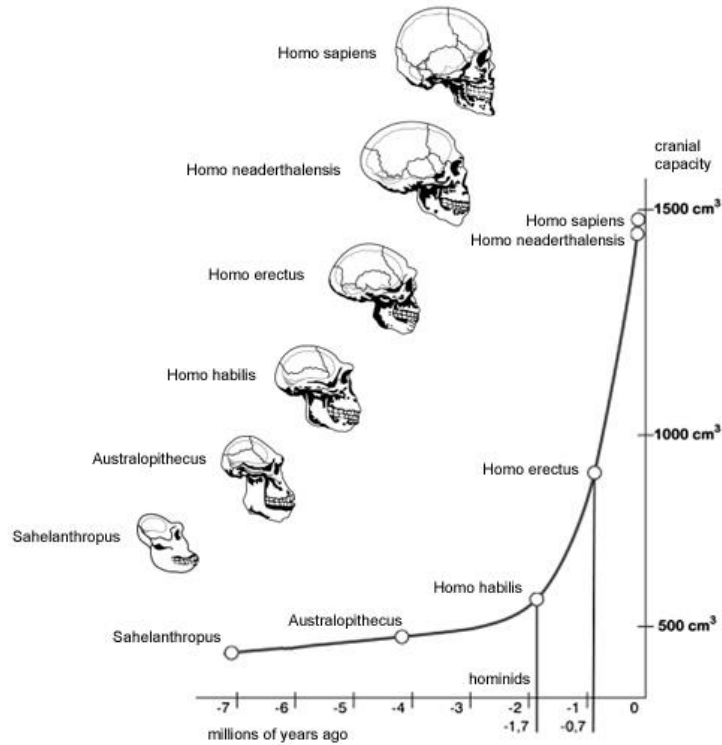
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**Question 4 (3 marks)**

The diagram below shows the trend in cranial capacity over time, beginning with Sahelanthropus more than seven million years ago.



- a.** Discuss the trend in the extent of change to cranial capacity between 7 mya and 2 mya. Compare this to the changes in cranial capacity of between 2mya and the present time.

2 marks

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- b.** As shown on the diagram, members of the *Homo* genus have a disproportionately large brain compared to their body mass. As time passed the cerebral cortex, the part of the brain responsible for problem solving and abstract reasoning, expanded at a greater rate. Explain why this may have occurred.

1 mark

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**Question 5 (10 marks)**

Due to a combination of possessing specific features and the impact of environmental forces, early humans began to learn ways of controlling their environment in order to increase their chances of survival. This learning and passing on of information is known as cultural evolution.

- a. Identify two aspects of cultural evolution and explain how each would have improved the chance of early humans surviving in challenging conditions.

4 marks

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- b. The development of language is thought to have been essential to cultural evolution. Explain why this is the case.

1 mark

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- c. Discuss the differences between cultural evolution, technological evolution and biological evolution.

3 marks

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- d.** Explain why the development of cultural and technological evolution was dependent upon biological evolution.

2 marks

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**END OF KEY TOPIC TEST**