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91606



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Level 3 Biology 2022

91606 Demonstrate understanding of trends in human evolution

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of trends in human evolution.	Demonstrate in-depth understanding of trends in human evolution.	Demonstrate comprehensive understanding of trends in human evolution.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–16 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (▨). This area may be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Achievement

TOTAL

9

QUESTION ONE: *HOMO BODOENSIS*

Source: www.dailymail.co.uk/sciencetech/article-10140669/Meet-Homo-bodoensis-Newly-identified-ancient-human-species-lived-Africa-500-000-years-ago.html

Source: <https://atlasvirtual.com.br/homobodoensis.htm>

Researchers suggest that a skull found in Bodo D'ar, Ethiopia, East Africa in the 1970s belongs to neither *Homo heidelbergensis* or *Homo rhodesiensis*, but instead, is a new species entirely. Both mitochondrial DNA (mtDNA) and nuclear DNA (nDNA) have yet to be sequenced.

Homo bodoensis has been suggested as a direct ancestor of our species *Homo sapiens*. The *Homo bodoensis* species hasn't been identified from new fossils, but on the re-examination of old ones. *Homo bodoensis* is currently estimated to have lived between 770 000 and 126 000 years ago, with the specimen shown dated to around 500 000 to 600 000 years ago.

The fossil of the skull has an enlarged cranium compared to *Homo erectus*, but smaller than *Homo sapiens*, which suggests it is an intermediate species between them. *Homo bodoensis* is not thought to be an ancestor of the Neanderthals or the Denisovans, as the cranium does not share similar features. The endocranial capacity is estimated to be approximately 1250 cm³.

A number of other remains previously thought to be *Homo heidelbergensis* have also been reclassified as *Homo bodoensis*. Based on these remains, there are suggestions that *Homo bodoensis* may have reached south-east Europe, but died out there about 200 000 years ago.

Discuss how new knowledge can lead to changes in human evolution theories.

In your answer:

- describe what is meant by the terms hominin and endocranial capacity
- explain how new DNA evidence (from mitochondria (mtDNA) and nuclear (nDNA)) can be used to approximate times of species divergence, and how this DNA evidence might support the Out of Africa Theory of modern human origins
- discuss how changes to the cranium and hand bones would benefit the lifestyle of *Homo bodoensis* compared with earlier hominins.

Hominin ~~means~~ refers to the bipedal hominoid species that would eventually evolve into modern day humans (excluding hominoids such as apes, gorillas, etc). Endocranial capacity refers to the size of the cranium, or how large the brain of the ^{organism} species would have been.

Having a bigger cranium could have benefitted Homo ~~balensis~~ as it would allow it to be able to think better and advance cultural evolution (e.g. tools, shelter, art, domestication, agriculture) as the hand bones I would assume to have become more precise to help them in crafting tools better to make better shelter as they, increase, their chance of surviving as a population.

Using DNA evidence when can determine the ~~last~~ time at which the organisms lived and where it diverged into new species. The DNA evidence might support the OOA theory as when can tell when the species was around in Africa (before it left as Homo sapiens, according to OOA).

QUESTION TWO: NEANDERTHALS



<https://www.smithsonianmag.com/science-nature/rethinking-neanderthals-83341003/>

Neanderthals evolved in Europe and Asia while modern humans were evolving in Africa. Judging from fossil evidence from northern Spain and England, Neanderthals were already well established in Europe by 400 000 years ago.

Neanderthals ranged widely – from Portugal and Wales in the west across to the Altai Mountains of Siberia in the east. The range changed a lot, due to the effects of the ice age, when at times, there were land bridges and at other times, ice or water. Around 300 000 years ago Neanderthals developed a stone tool technology known as the Levallois technique. This involved making pre-shaped stone cores that could be worked into a finished tool at a later time. It meant Neanderthals were free to travel away from sources of raw material and yet be able to make tools when needed.

The bone damage found on Neanderthals suggests they were assisted in their recovery after injury.

Ancient DNA began to be recovered from Neanderthal fossils in 1997, and this has led to the reconstruction of several complete genomes. These indicate that Neanderthals living from Spain to Siberia were relatively low in both population and diversity during their last 20 000 years. The genome of one female individual from the Altai Mountains also shows signs of long-term inbreeding in her population.

It seems that regular, and sometimes extreme, climatic fluctuations continually fragmented Neanderthal groups during the last 100 000 years, preventing them from building up large populations and continuous distributions across their range.

Discuss reasons for both the success of, and the extinction of, Neanderthals.

In your answer:

- describe how the ice age influenced the movement of populations of Neanderthals
- explain an advantage and a disadvantage to Neanderthal society of caring for injured group members
- discuss how even though Neanderthals were advantaged by having the Levallois technique for tool manufacture, the species did not survive past approximately 39 000 years ago.

By caring for injured group members, the Neanderthals got the survival advantage of that member's wisdom and they could help with other tasks that didn't require whatever they had injured, such as making clothes, fire, cooking or even gathering. This may have helped them survive a bit, but it is ~~not~~ likely outweighed by the disadvantage of having to spend ^{food and} energy looking after them that could otherwise be used for the ~~other~~ Neanderthals for survival and reproduction. ~~It is the~~

The ice age affected the Neanderthals' travel as it may have prevented them from crossing certain terrain that was ~~adequate~~ at some times not safe to travel at others, potentially locking them into areas with undesirable conditions like less food and lower temperatures, making it harder to survive and reproduce.

By having the Levallois technique, the Neanderthals were advantaged in that they didn't have to travel to places with the raw materials they needed and instead could make tools on the go, reducing the energy they used walking around made to be put to use surviving and reproducing. However, ~~they didn't~~ ^{this was not enough to keep them alive} as the changing climate separated Neanderthal groups, preventing them from reproducing to survive.

(as areas may have become inaccessible due to ice or flooding)

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QUESTION THREE: MOVEMENT OF HOMININS

Fossil evidence shows that our ancestors became bipedal first, and this was followed by changes to the teeth and jaws. It was only much later that our larger and more complex brains set us apart as *Homo sapiens*, leading to the domestication of animals such as the dog about 10 000 years ago, and the pig about 8000 years ago.

Discuss aspects of *Homo sapiens* evolution and movement into the Pacific.

In your answer:

- describe how a cooler and drier Africa resulted in a selection pressure for bipedalism
- explain what smaller teeth can tell us about the hominin lifestyle
- discuss how the more complex brain would have led to the success of domestication of dogs and pigs and how these enabled *Homo sapiens* to successfully migrate through Europe and into the Pacific.

As it got colder and drier, there would have been less trees, meaning hominins would have to stop being arboreal and move along the ground to get places instead of brachiating. This would have influenced bipedalism as it would be advantageous to be taller to see over grass and see predators further away, and make it easier to get around than knuckle-walking. Smaller teeth mean that they likely only ate fruits, as they were living in trees (arboreal) where the fruit is.

By having a more complex brain, they could have the cognitive capability to think, understand and imagine things better and learn how to domesticate animals to make it easier to get food for survival and reproduce. By having this imaginative ability, they could even construct boats to travel to areas with less competition, survival of the fittest and livestock ~~with~~ thanks to their ability to think ahead.

There is more space for
your answer to this question
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Extra space if required.
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Standard	91606	Display ID 668658	NSN 137128907 School 85	Total score	9
Q	Grade score	Annotation			
1	3	Succinct answer with a few descriptions			
2	3	Succinct answer with a few descriptions as well as some rewording of the question			
3	3	Succinct answer with a few descriptions, has a link to the Pacific that most do not.			