



91606

Mana Tohu Mātauranga o Aotearoa New Zealand Qualifications Authority

Level 3 Biology 2024

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 2–12 in the correct order and that none of these pages is blank.

Do not write in the margins (1/1/1/2). This area will be cut off when the booklet is marked.

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

QUESTION ONE: Movement of hominids and hominins

Chimpanzees find most of their food in trees, so they need to be able to climb and forage for food in an arboreal environment. They also need to be able to cover long distances of up to 5 kilometres per day between food spots. As a result, chimpanzees have a wide range of types of movement, both in the trees and on the ground. These include quadrupedal and bipedal walking. Research has found that the energy cost of bipedal and quadrupedal walking in the chimpanzee is quite similar. This similarity in energy cost suggests that carrying out bipedal walking would have had no effect on the energy costs for early hominin ancestors.

Habitual bipedalism, however, may have favoured changes of the hip to allow a more upright posture and the changes to the lower limbs that allowed for more efficient walking over long distances.



Chimpanzee with baby.



Modern human with baby.

Discuss factors relevant to quadrupedal movement and bipedialism.

In your answer, include discussion of:

- the terms habitually bipedal and arboreal, including descriptions
- reasons for the differences between the modern human and the chimpanzee, related to the forms of the spine, pelvis, and valgus angle
- why modern humans are bipedal despite a named disadvantage of this characteristic.

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QUESTION TWO: Neanderthal fibre use

Neanderthals (*Homo neanderthalensis*) made many tools. Numerous examples of their Levallois stone tools have been discovered. They may well have used other material such as wood or fibre; however, these break down easily and do not fossilise, so are not preserved.

Recently, a stone tool was discovered with evidence of Neanderthals having used twisted fibre made from bark. The fibre was a 3-ply cord, with the fibres arranged as shown in the image below. This method of cord-making is still in widespread use today. Twisted fibres provided the basis for clothing, rope, bags, nets, mats, and boats – all of which, once discovered, would have become important parts of daily life. This evidence of understanding and use of twisted fibres shows us that Neanderthals had use of complex, multi-component technology, as well as a mathematical understanding of pairs, sets, and numbers.



Fragment of twisted cord with the yarn structure highlighted in colour.



Ply confirms the number of yarns twisted together.

Discuss how the use of twisted fibres would have advantaged the Neanderthals.

In your answer, include discussion of:

- the Levallois technique
- the endocranial region that would have developed, allowing for the understanding and use of mathematical rope-making
- TWO explanations of how Neanderthal might have used tools, leading to an increase in health
- a reason **how** and a reason **why**, with the benefit of twisted fibre for food gathering, Neanderthals were able to succeed in the cold, European climate.

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QUESTION THREE: The island of Flores

Remains of one of the most recently discovered early human species, *Homo floresiensis*, have been found only on the island of Flores, Indonesia. The fossils of *H. floresiensis* date to between 60000–100000 years old, and stone tools made by this species date to between about 50000–190000 years old. *H. floresiensis* individuals stood approximately 110 cm tall, had small brains, large teeth for their small size, and relatively large feet for their short legs. Despite their small body and brain size, *H. floresiensis* made and used stone tools, hunted small elephants and large rodents, and coped with predators, such as the giant Komodo dragon. Recent evidence suggests that *H. floresiensis* did not use fire; previous evidence for the use of fire is now associated with the later *Homo sapiens*.

Flores, an island located in the Indonesian archipelago.

Artist's impression of *H. floresiensis* attacking a Komodo dragon.

Male Komodo dragons weigh 85 kilograms, on average.

Discuss reasons for the success of *H. floresiensis*. In your answer, include discussion of:

- how their small size might have enabled population success on the island
- the success of *H. floresiensis* despite not having controlled use of fire
- TWO reasons why substantial brain development would be a selective advantage to early hominin species.

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