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91606



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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 (// // // //). 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.

Achievement

TOTAL 11

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 bipedalism.

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 - *Q Shape*
- why modern humans are bipedal despite a named disadvantage of this characteristic. *Pregnancy*

The term "habitually bipedal" refers to the ability to consistently walk on two legs for long periods of time. The term "arboreal" refers to a quadrupedals ~~at~~ that has the ability to travel via *Swing branches* from branch to branch.

The modern human being has a *S-Shaped* spine that acts a shock absorber, and brings the body closer to the centre of gravity to maintain balance, while the chimpanzee has a *C-Shaped* spine which was essential to maintain for their bent posture.

A disadvantage of this characteristic is a increased tendency to back aches as the S-shape spine doesn't allow much bending over, lifting etc.

The modern human has a broad pelvis as it allows attachments of gluteus muscles (which give us stability when we only have 1 foot on the ground), however the chimpanzee have a long and narrow pelvis as they ~~don't need the extra attachment~~ aren't bipedal.

The disadvantage of this characteristic is that pelvis has become too broad making childbirth a difficult and harmful process, and in extreme cases even lethal.

The modern human ~~has~~ femur has a valgus angle, while the chimpanzee has a Q angled femur because

Bipedalism occurred due to a selective pressure ~~for~~ as temperature increased and it become drier, forests turned into Savanahs. ~~which meant to move around and~~

~~Bipedalism has multiple positive feedback loops for example~~
~~humans becoming bipedal meant we were able to grab things~~

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 140-150 blows, forethought, 1 final blow
- 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.
 - ↓ clothes blocker
 - ↓ cold
 - ↓ nets

The *Homo neanderthalensis* used mousterian tools. These tools were constructed out of flint, they required 140-150 blows to be made, with 1 final sharp blow at the end. This technique was called the levallois technique. This technique required a developed frontal lobe in the endocranial region as the tools required planning which requires the ability to think and have forethought. Forethought also enabled the *homo neanderthalensis* to understand the use of mathematical rope-making. With these skills the

Neanderthals were able to make basic clothing and clothes/blankets in order to stay warm, to prevent sickness in order to stay in good health.

In a cold European climate, the homo neanderthals weren't always able to go out to ~~the~~ hunt or ~~foraging~~ forage for food, as conditions were too dangerous and food sources would be hard to find. However, with their understanding of rope-making they would be able to create containers to store the food they hunt/forage on warmer days in order to eat/survive one day when they can't hunt/forage for food.

With twisted fibres neanderthals could have used their skills to make bandages to cover wounds to prevent infection and allow healing to ~~benefit~~ benefit their health.

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 60 000–100 000 years old, and stone tools made by this species date to between about 50 000–190 000 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.

tool making

Despite Homo ^{floresiensis} ~~floresensis~~ Small Size Still ^{Saw} ~~Still~~ Success during their times. Evidence of this can be seen through their large ~~these~~ teeth similar to recent hominins indicating they consumed meat in their diets. ~~giving them nutrients as that are~~ Diets like these promoted growth, development and Success.

More evidence of their Success can be seen through their Stone tools as they made them and even used them to hunt Small elephants and large rodents and defend themselves from predators such as giant Komodo dragons. However in order to do this they needed advanced Stone tools that they could hunt from/ defend from afar with to prevent being attacked. This would have required forethought in order to be made. Forethought is the ability to think this would have increased their Success.

The homo floresiensis relatively large feet ^{for their short legs} would have enabled their Success

The Small Size of Homo floresiensis might have enabled population Success for their population on their geographically isolated islands as there would have been limited food sources and resources if they were a larger size they would need more resources/food sources which may have lead to them running out and going extinct.

Substantial brain development would be a selective advantage to early hominin species as it allowed forethought (through frontal lobe) which enabled preiser tools to be made and used, and communication (through brockers and warners area development).

~~Communication~~ allowed cultural evolution and language which early

Achievement

Subject: Biology

Standard: 91606

Total score: 11

Q	Grade score	Marker commentary
One	A4	This response includes descriptions of arboreal and habitual bipedalism, the disadvantages of bipedalism, as well as the benefits of the S-shaped spine.
Two	M6	The response explains the connection between tools and health, the relationship between brain development and tool use, and the ability to carry food in cold conditions.
Three	N1	Although this response does not address each part of the question and tends to repeat itself, it does provide a description of how small stature of <i>Homo floresiensis</i> was an advantage on the island of Flores.