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Draw a cross through the box (☒) if you have NOT written in this booklet

NZQA

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.

Merit

TOTAL 15

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.

Bipedalism is the ability for an organism to walk on 2 limbs. an arboreal environment is one where there are lots of trees so organisms in order to increase the likeayhood of ~~$~~urviving need to be able to be quadrupedal so they can use ~~quadrupedalism~~ bracheation in order to swing through trees.

In modern humans our spines have evolved to have a "S" shaped spine compared to Chimpanzees which have a "C" shaped spine. this allows the centre of gravity to shift and be over the pelvis. this reason for the evolved change in spine shape is due to the need to maintain a balanced centre of gravity. additional the "S" shaped spine allows for a shock absorbing feature. The valgus angle in humans is more angled in humans compared to chimps this evolution is nececary due to becoming bipedal as the valgus angle ~~has~~ ~~beco~~ similar to the "S" shaped spine acts as a shock absorbant allowing for ~~individuals~~ modern humans to travel longer distances and therefore find new ~~pla~~ places to inhabit. In modern humans their ~~spin~~ pelvis has become smaller due to the upright standing position. This has led to it being harder to push out babies in modern humans.

the reason we as humans had to adapt to this change is that if our pelvis did not become smaller and more centered ~~we~~ ~~it~~ our centre of gravity would not be in ligh as we would be walking with our legs outwards. A disadvantage of ~~bi~~ bipedal walking is that it led to our pelvis becoming smaller and thus ~~we~~ it ~~lost~~ became harder to ~~carry babies~~ be pregnant and push out a baby which decreased the rate of survival as it ment that ~~it~~ there were less successful births. however the advantage of being able to travel further distances outweighes the disadvantages as being bipedal allowed for ~~individua~~ humans to inhabit new areas ~~which~~ which increased their rate of survival as they could walk further distances ~~as~~ Additionally Biped al walking freed up the hands of individuals allowing them to do things like hold tools and their children. Habitual bipedalism is when organisms due to their environment are forced to be bipedal.

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. -ice age

The levallois technique was when one stone was B smashed against another to produce a flake. this flake was then used to cut fibres. the neanderthals may have used these tools to cut plants and make natural medicines that could have increase

their health additionaly by using the twisted fibres to make rope which led to them being able to make bags it allowed for them to carry more food such as nuts, berries and fish which increased the rate of survival as it allowed for them to gain the nececary ammounts of nutrients which allowed them to fight off diseases that could have harmed them if they did not have substantial energy. When the neanderthals inhabited the earth there was an ice age which made it incredibly difficult to find and gather food. The making of twisted fibre allowed for the neanderthals to ~~gath~~ make bags and nets to carry more food accross longer distances. They needed to do this due to the ice age. It ment that the neander thals were not able to find food to keep ~~them~~ ~~no~~ their nutrient levels

high enough for survival as if they did not have enough nutrients they could have died of malnutrition. thus due to the twisted fibre they were able to survive in the cold european weather which led to their succession.

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.

Homofloresiensis despite being small led to the success of their species. them being small allowed them to maintain more energy as the food they hunted for ~~allowed~~ was able to sustain them for longer periods of time. this increased their success on the island as a small elephant that they hunted for could sustain them for a longer period of time. additionaly due to them being small they were able to hide from their predators and sneak up on their prey more efficiently which increased their rate of survival as they were able to survive on the ground for longer without being found. this meant they were able to reproduce more successfully and therefore their species were able to survive for longer. despite not having control of fire like homo Erectos they were still successful in surviving. this is likely due to the fact that

fire allows predators to see where you are. for smaller individuals such as H. Floresinses ~~the~~ it would have allowed predators such as ~~the~~ giant komono dragon to ~~see~~ where they are and thes they may not have been able to defend themselves. In early homonins substantial brain development is important as it allowed for the Wernicks and broccas area in the prain to increase in size this allowed for organisms to ~~s~~ develop speech and language which they used to communicate with eachother. this ~~led~~ would be a selective advantage as (1) it would mean they would be able to come up with a plan for hunting which would increase the rate of survival for the hominins as they would be able to hunt in packs and know the plan ~~to~~ so therefore they would be more successful in getting food, thus they would be →

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

Q3 able to get the nutrients to have enough energy to reproduce successfully and thus the species would be more likely to survive. Another adaptave advantage of an increase in brain size and thus an increase in speech and language is that it means at they would be able to ~~come up~~ develop warning signals for if any predators were to come in and attack them this would increase their survival rate as they would be able to prepare for the predators and come up with a strategy to protect themselves, thus, increasing their rate of survival as they would be more likely to survive if they are aware that they are going to be attacked ~~they~~ this therefore leads to them being able to

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

03 reproduce more efficiently as they are able to survive for longer.

Acknowledgements
Material from the following sources has been adapted for use in this assessment:

Page 2
https://www.discoverwildlife.com/animal-facts/mammals/facts-about-chimpanzees
https://stock.adobe.com/453460915

Page 5
https://www.nature.com/articles/s41598-020-61839-w
https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1744&context=tsaconf

Page 8
https://www.komodoluxury.com/blog/flores-island-travel-guide/
https://x.com/Extinct_Animals/status/1361733833230483461/photo/3
https://www.ourbigjourney.com/komodo-island-land-of-the-komodo-dragon/

Merit

Subject: Biology

Standard: 91606

Total score: 15

Q	Grade score	Marker commentary
One	M5	The benefits of the S-shaped spine and an advantage of bipedalism are explained in this response. With more adequate explanations of other aspects, this response may have been awarded a higher score.
Two	M5	This response effectively links to the question by explaining both the connection between tool use and health, as well as the relationship between food gathering in cold conditions and the application of 3-ply knowledge.
Three	M5	The response provides explanations for the success associated with the small stature of *Homo floresiensis* and how the absence of fire may have contributed to their success.