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NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 3 Biology 2026

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 the margins (////). This area will be cut off when the booklet is marked.

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QUESTION ONE: Bipedal walking

The modern *Homo sapiens* skeleton is highly specialised for bipedal walking. *H. sapiens* are only able to walk bipedally. This shows that strong directional selection pressures influenced bipedal walking.

Ardipithecus ramidus and *Australopithecus afarensis* are important species for understanding the development of bipedal locomotion in humans (Table 1). *A. ramidus* is thought to have moved bipedally and arboreally, while *A. afarensis* was fully bipedal.

Table 1: Skeleton comparison

Ardipithecus ramidus **(Ardi)**	***Australopithecus afarensis*** **(Lucy)**	***Homo sapiens***
Bipedal and arboreal locomotion	Bipedal locomotion	Efficient bipedal locomotion

Discuss skeletal changes linked to efficient bipedal locomotion, and possible selection pressures that caused bipedal locomotion.

In your answer, include discussion of:

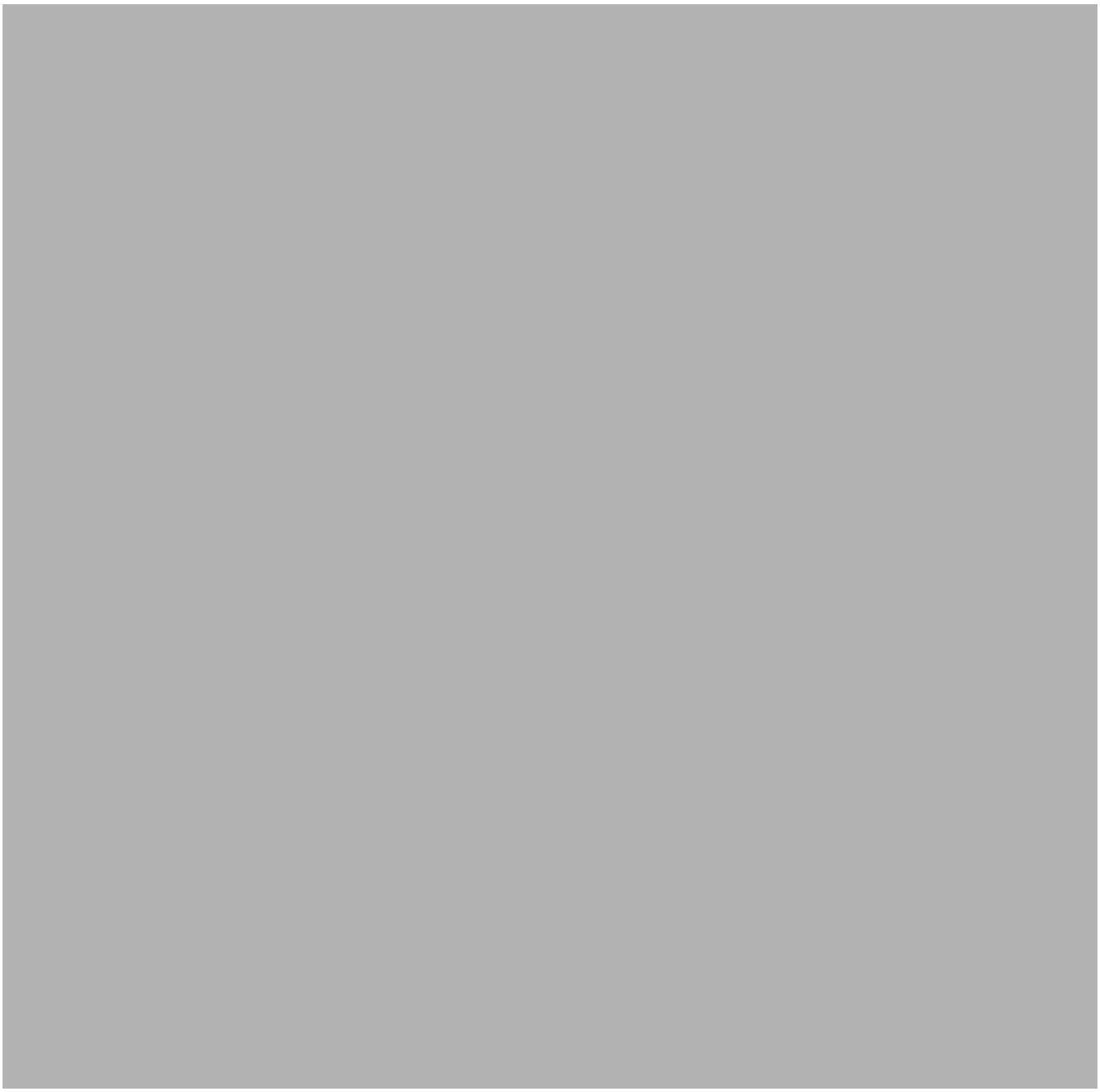
- one skeletal feature that shows *A. ramidus* was most likely bipedal and one skeletal feature that shows they were also arboreal
- two skeletal features showing *A. afarensis* was fully bipedal
- two skeletal changes that shows *H. sapiens* are more efficient at bipedal walking
- possible selection pressures that favoured bipedal locomotion in early hominins.

QUESTION TWO: Brain expansion and cultural evolution

Cultural evolution in hominins is thought to be closely linked to biological brain expansion. Significant brain expansion occurred in key species, such as *Homo habilis*, *Homo erectus*, *Homo neanderthalensis*, and early *Homo sapiens* (Figure 1).

Paranthropus sp. lived at the same time and in similar areas as *H. habilis*, however, biologists have found no tools associated with *Paranthropus sp*. Analysis of *Paranthropus sp.* teeth show it was a specialist vegetarian.

Figure 1: Hominin brain expansion over time



Discuss the relationship between cultural evolution, brain expansion, and the development of tools in hominins.

In your answer, include discussion of:

- biological and cultural evolution, and the relationship between them
- why *Paranthropus sp.* had a significantly smaller brain size compared to *H. habilis*
- how the different tool cultures associated with *H. habilis*, *H. erectus*, and *H. neanderthalensis* contributed to brain expansion in each species.

QUESTION THREE: Evolution models

There has been a lot of debate about where and when modern *Homo sapiens* evolved.

Two main models have dominated the debate:

1. the multiregional model
2. the replacement (Out of Africa) model.

Table 2 outlines evidence that supports one or both models.

Table 2: Evolutionary evidence

Fossil evidence	Fossils of modern *H. sapiens* appear first in Africa (~300 000 years ago).
Mitochondrial DNA (mtDNA)	Modern *H. sapiens* populations outside of Africa show low mtDNA variation and that the greatest variation occurs in African populations.
Nuclear DNA (nDNA)	Neanderthals interbred with modern *H. sapiens*, contributing small segments of their genomes (1.5–2.1%) to present-day populations outside of Africa, mostly Europe. Denisovans interbreed with modern humans, contributing to small segments of their genomes (1–6%) to present-day populations in Asia and Melanesia.
Comparative anatomy	Certain facial and cranial features are shared between Neanderthals and early modern Europeans.

Using the table, discuss which piece of evidence supports each or both models, and why the current understanding of how modern *H. sapiens* developed uses evidence of both models.

In your answer, include discussion of:

- the multiregional model
- the replacement (Out of Africa) model
- which piece(s) of evidence supports the multiregional model and the replacement (Out of Africa) model
- why biologists use evidence from each model to understand how modern *H. sapiens* developed.

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

Page 2
https://www.britannica.com/topic/Ardipithecus
https://www.youtube.com/watch?v=xT8Np0gI1dI
Page 6
https://www.bradshawfoundation.com/origins/images/brain_size_cultural_evolution.gif