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91606



NEW ZEALAND QUALIFICATIONS AUTHORITY
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QUALIFY FOR THE FUTURE WORLD
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SUPERVISOR'S USE ONLY

Level 3 Biology, 2015

91606 Demonstrate understanding of trends in human evolution

2.00 p.m. Monday 23 November 2015
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 and clearly number the question.

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

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

Low Merit

TOTAL

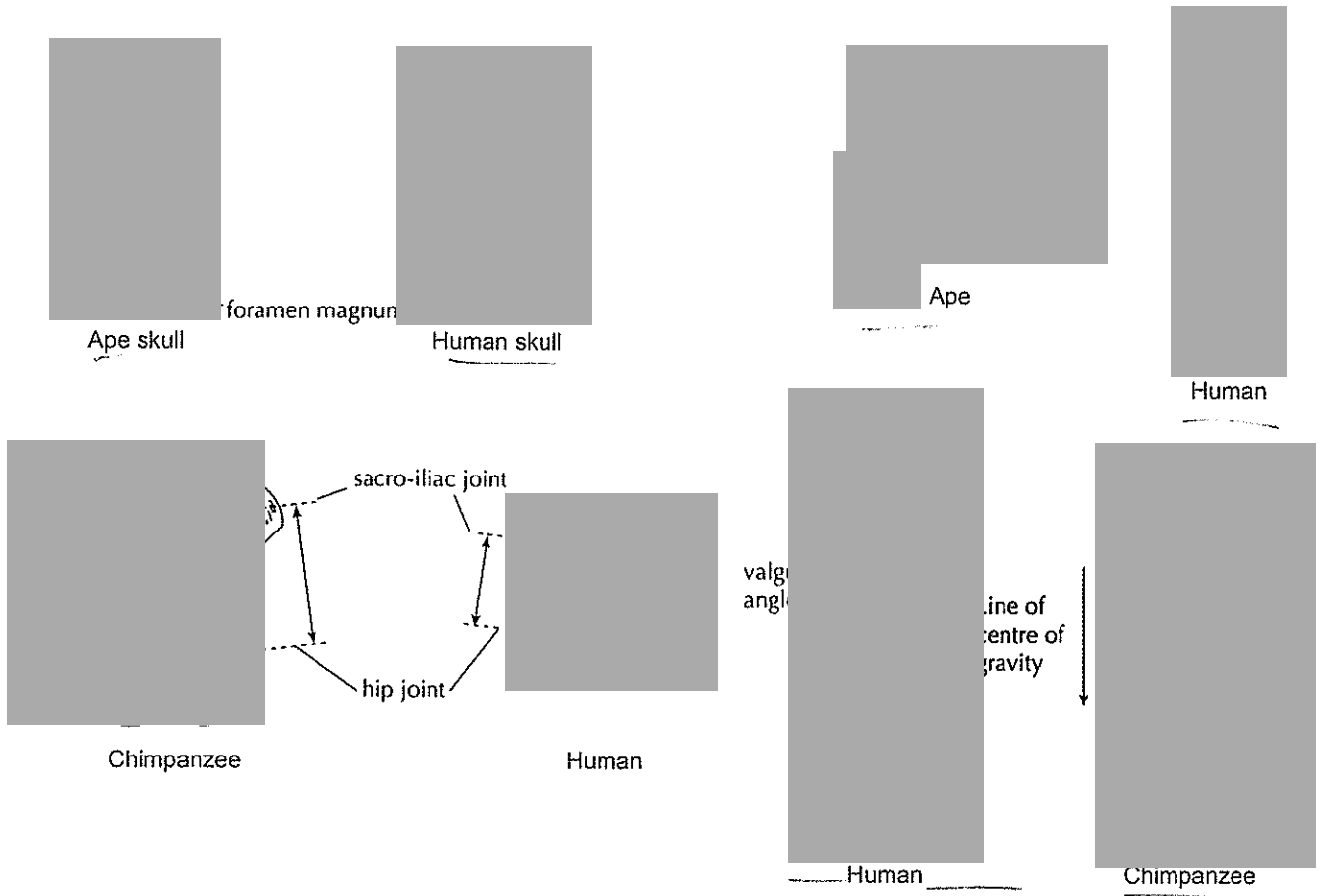
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QUESTION ONE

A distinguishing feature of hominins is habitual bipedalism. Comparisons of skeletal features of modern humans and extant (living) hominids such as the gorilla or chimpanzee, reveal several key features that are associated with the transition from quadrupedal species to bipedal species.

Some of the most important features are shown below.



Adapted from: Anna Roberts & Maria Sinclair, *ESA Study Guide: Level 3 Biology* (Auckland: ESA Publications (NZ) Ltd, 2013), pp 275–277

Discuss the importance of bipedalism in the development of hominins by linking the skeletal features to their adaptive significance.

In your answer:

- ✓ describe what is meant by the terms quadruped and biped
- ✓ explain how any three of the skeletal features (shown above) provide evidence for the form of locomotion changing to bipedalism
- justify why bipedalism was so significant to the evolution of hominins.

Quadrupedalism is the locomotion of using four limbs, two arms and two legs. In contrast to this, bipedalism is the locomotive movement using two limbs (the legs) and is done in an upright position.

As seen in the previous diagram, the foramen magnum is posterior in the Ape skull. This is a result of the head hanging in a forward facing direction, the connection of the spinal cord to the brain occurs in the foramen magnum, and thus this is where the ^{C' shape} spine connects to the skull. The foramen magnum must be posterior for the Ape to have quadrupedal locomotion. In contrast to this, the foramen magnum in the human skull is centred underneath the skull, holding the head on top of the spine in an upright position. This is because the body is more balanced at this position, allowing for bipedal locomotion.

The spine shape of the Ape is recognised as a 'C' shape. The 'C' shape allows for the ^{skull} head (as previously mentioned) to hang forward facing on the front of the body. The shape is also the most efficient way for the four (quad) limbs to lay underneath the body, allowing for quadrupedal locomotion. In contrast to this, the human spine is 'S' shaped and acts as a shock absorber for the body. The upright position of the spine also allows for an upright position of the body, and as previously mentioned, allowing for the skull to 'sit' upright on the body, the most efficient

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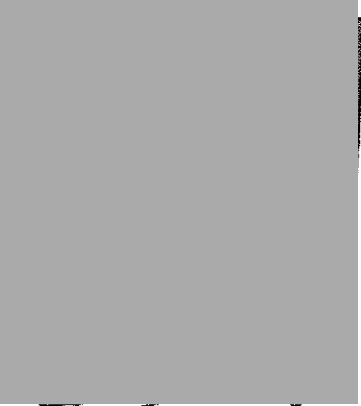


position for bipedal locomotion.

The leg bones also confirm the transition of quadrupedal locomotion to bipedal locomotion. The angle of the Ape knee to the hip joint is relatively 90° . This does not allow for efficient balance in an upright position as the weight of the body is not relatively centered. Whereas the Human body carries a valgus angle between the knee and the hip joint. This allows the femur to angle in to the line of gravity, in the body. Weight is most balanced at this position, and because the knees angle in here, the body is at the most balanced upright state whilst walking. As one foot comes off the ground for bipedal locomotion, the weight is still held centred, whereas for Apes, as one foot comes off of the ground, the weight falls to one side, leaving the Ape unbalanced.

Bipedalism was the most important stage of Human Evolution. Bipedalism allowed Hominins to travel longer distances over the now scarce African plains in a more energy efficient manner. As well as this, the new smaller surface area from birds-eye-view meant less sun could touch the bodies, and thus causing them to over heat.

QUESTION TWO

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Tool Culture Figure 1 Mousterian	Tool Culture Figure 2 Oldowan	Tool Culture Figure 3 Acheulean
		
Upper Paleolithic http://zinken.typepad.com/palaeo/images (3)	https://en.wikipedia.org/wiki/Stone_tool#/media (1)	https://upload.wikimedia.org/wikipedia/commons/8/89 (2)

The advance of the use of tools and fire had many effects on the evolution of hominins.

Discuss the likely impacts that the different tools and fire had on the different hominin species, and the evolutionary trends that can be linked to these developments.

In your answer:

- ✓ identify the three tool cultures as shown in the diagrams above, and link a species of hominin to each tool type
- ✓ explain the trends shown in the development of the tool cultures above, and how this shows a progression in the cultural evolution of the hominins
- ✓ discuss the likely effects that fire and the use and development of tools had on the biological evolution of the hominins.

Oldowan tool culture.

Tool Culture Figure 2 is linked to Homo Habilis also known as the 'Handy Man', as he was the first tool user, approximately 2.6 - 1.7 million years ago. Tool Culture Figure 3 is linked to Homo Erectus and is known as the Acheulean tool culture. ~~Tool culture~~ Used approximately 1 million years ago. Tool culture Figure 3 is linked to Homo Sapiens and Homo Neanderthalensis, and is known as the Upper Paleolithic tool culture.

Oldowan tool culture, also known as pebble tools were ~~one of~~ the first tools used and were

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developed through the flaking technique, but only using between 6-12 flakes. The tools were very basic, being used for only bone crushing, and had slight cutting ability. Little thinking or abstract thought was needed in the tool production and use. Next came the Acheulean tool culture. Homo Erectus used the Levallois technique in the production of the most common tool; the handaxe, as well as the flaking process. Between 50 and 100 flakes were used to make the handaxe, though the tool was not symmetrical. However, the development of cultural evolution is present as the tools were now designed in a more ergonomical position for it to be held, and the edge of the axe was now much sharper. The development of cultural evolution is clearly shown in the upper paleolithic tool culture, as many of the tools were now multi-purpose and symmetrical. For example, handaxes could also be used as spear heads. In addition to this, there was production of tools, to make other tools, showing forward thinking, as well as cultural evolutionary development. Tools/weapons could now be thrown, reducing the risk of injury and death during hands-on hunting. Fire was used to produce tools, as well as plant made rope. The effects that fire and tool development had on biological evolution was great. Greater tools allowed for greater ability to hunt larger game meat, such as mammoth. Fire allowed for the

QUESTION THREE

<http://madamepickwickartblog.com/wp-content/uploads/2012/01/cannibal4.jpg>

<http://io9.com/how-farming-almost-destroyed-human-civilization-1659734601>

One of the most important milestones in human evolution was the transition from ~~hunter-gatherer to agriculture or farming~~. Scientists have concluded that it is likely that the transition to farming was ~~due to migration and replacement of existing populations, and not due to cultural transmission from farmers to hunter-gatherer populations~~.

Discuss the cultural trends and any advantages and disadvantages a transition from hunter-gatherer to agriculture involved.

In your answer you should:

- / describe the lifestyle of a hunter-gatherer ✓ and the lifestyle of an early farmer ✓
- / explain the cultural trends involved in the transition from hunter-gatherer to agriculture
- / discuss any advantages and disadvantages a transition to agriculture from hunter-gatherer involved.

A hunter-gatherer would have been constantly on the move for a new source of food and water. No permanent settlements were ever made, and there was never any confirmation of a safe future. Life revolved around survival (finding food and water, as well as shelter), as a result, there was no time for them to relax and develop abstract thinking. In contrast to this, the life of an early farmer would consist of feeding the animals (commonly pig, cows and goat), as well as feeding the domesticated dogs. Caring for domesticated crops - wheat and barley, were also needed daily.

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There was confirmation of a food source, as well as spare time, used for abstract thought such as art, sculpting, and music.

A trend in culture developed as more time was spent on abstract thought, rather than the thought of survival. This spare time also allowed for further time to develop how to increase survival; domestication of animals and plants.

Agriculture allowed for small communities to develop together around a food source. There was confirmation of food and water availability, as well as the sharing of labour throughout the community. However, the domestication of plants decreased the variety of food available for communities, meaning, if a disease hit the animals or plants, there is a high risk of the plant/animal species dying, leaving the community with no food source.

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Extra paper if required.

Write the question number(s) if applicable.

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1. Bipedal locomotion allowed for the development of the brain growth, following from the reduction in teeth size. This as a result, allowed for the species to develop further skills and eventual abstract thinking, leading to modern day humans. // Seen

2. consumption of cooked and processed meat, allowing for a softer food diet, and the size reduction of canines, molars, and incisors. More meat through greater hunting ability allowed for more protein in the diet, and hence, capability for brain growth. As hunting became more efficient, spare time was produced. Allowing for abstract thought, such as: Art, drawing, and music. // Seen

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

QUESTION
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Merit exemplar for 91606 2015			Total score	16
Q	Grade score	Annotation		
1	M5	This question provides good explanations for two of the skeletal features supporting bipedalism. If the candidate had added a satisfactory explanation for how the third feature supports bipedalism they would have scored an M6.		
2	M6	The candidate explains the trends shown in the development of the three tool cultures and how this shows a progression in the cultural evolution of the hominins. In addition the candidate explains the effect of fire on meat to soften and .release nutrients. If the candidate had gone on to discuss more in depth how this could affect biological evolution an E7 would have been awarded.		
3	M5	The candidate provides sufficient evidence for M5 in this question by explaining 2 cultural trends associated with the change in lifestyle from hunter-gatherer to agriculture. If further trends were explained the candidate would have been awarded an M6.		