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SUPERVISOR'S USE ONLY

91606

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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

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.

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Low Merit

TOTAL 14

ASSESSOR'S USE ONLY

1C

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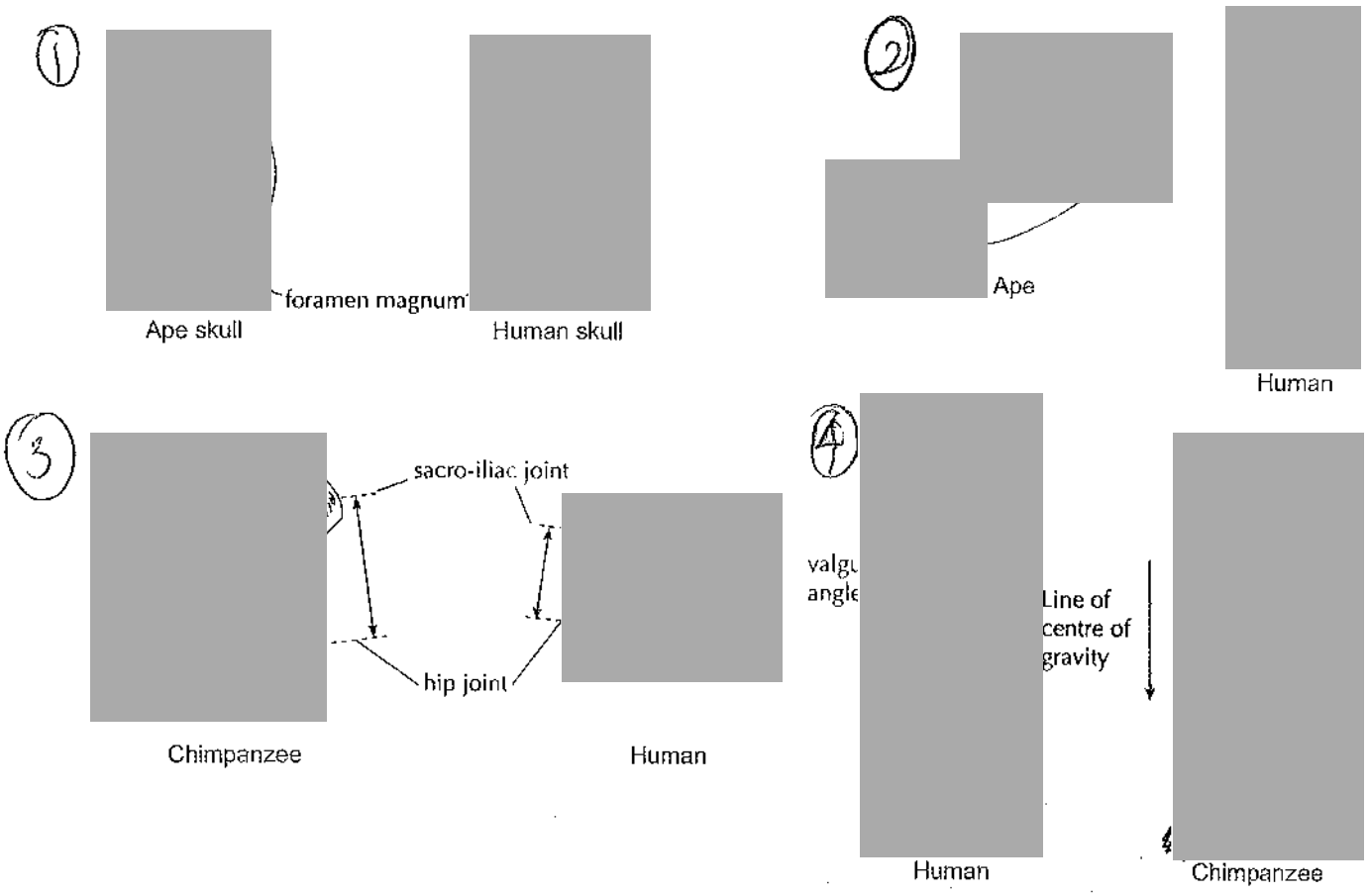
QUESTION ONE

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.

A quadraped is an organism that travels (walks) on 4 limbs whereas a biped is an organism that travels (walks) on 2 limbs. The form of locomotion changing to bipedalism is significant in the evolution of humans and can be discussed with the images above.

1C

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In picture ①, it shows the shift of the foramen magnum from the back of our head/skull, to the centre. This change occured as humans became bipedal as the weight of the head was moved to be directly above the spine, in order to be balanced. In the ape, the foramen magnum is farther back as the apes were quadrapedal and had their centre of gravity further forward than the humans. The movement of the foramen magnum means that human heads can balance on top of the spine without "drooping" forward and are balanced to look and see farther out

In picture ②, it shows how the shape of the spine has changed form a more C-shaped spine in the ape to an S-shaped spine in the human. The human's lumbar spine is better able to absorb impact from being bipedal and provides greater support for walking with ease. The ape spine is C-shaped because it is quadrapedal and it's centre of gravity is further forward. The S-shaped spine however can cause lower back pain due to the pressure on the lower part of the spine.

In picture ③, it shows the change of the humans pelvis → leg area, where the valgus angle of the human is smaller than the ape. The smaller valgus angle supported the change from quadruped into a ~~bip~~ biped.

There is more space for your answer to this question on the following page.

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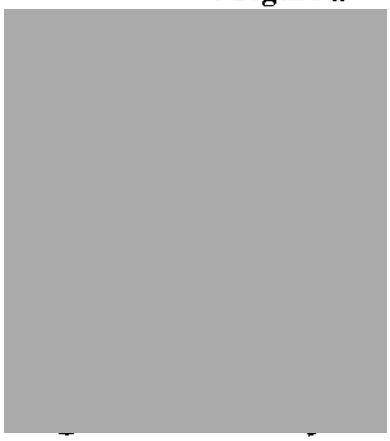
The smaller valgus angle means that the centre of gravity for humans is closer to the centre and the structure of the human body is more compact and easier to move around. Humans became more efficient walking longer distances and could sustain this bipedal locomotion due to these (3) changes in body structure as it balanced the body to suit the needs of the biped, and meant that movement was more efficient and effective compared to if they had not adapted from the ape.

Bipedalism allowed humans to evolve into one of the most genius species to occupy Earth today. Bipedalism freed the hands so that humans could hunt and throw weapons or carry weapons, food, children etc. It meant they could see over longer distances to spot food/prey to hunt and were more intimidating to prey. It meant that humans had a larger surface area, meaning they could cool off in the wind and also a smaller surface area for the sun, which meant they did not overheat and could chase prey over longer distances, tiring the prey out until they could catch it. It set aside humans from other species and assisted the evolution and survival of humans. It is an adaptive advantage that assisted in the survival of this species.

QUESTION TWO

ASSESSOR'S USE ONLY

Tool Culture Figure 1	Tool Culture Figure 2	Tool Culture Figure 3
 Mousf	 old	 achev
http://zinken.typepad.com/palaeo/images	https://en.wikipedia.org/wiki/Stone_tool#/media	https://upload.wikimedia.org/wikipedia/commons/8/89

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.

Figure 2 shows Oldowan tools which were linked to homo habilis. Figure 3 shows Acheulean tools which were linked to homo erectus. Figure 1 shows Mousterian tools which were linked to homo neanderthalensis. The first tools were Oldowan tools which were very simple & required little intelligence to make. The tool consisted of a flake struck from a river pebble to create a cutting edge. There had to be some hand dexterity to strike the pebble at the right angle, & an ability to find the right rock to make the tool. Oldowan Acheulean tools required greater intelligence to make & were used for a wider range of tasks. The process of making the tools was multi staged, as a series of

There is more space for your answer to this question on the following page.

flakes had to be struck of a central core, so this required some ability to concentrate & plan ahead. This knowledge would have had to been passed onto others as so cultural evolution was occurring. Mousterian tools were significantly more sophisticated & required some imagination to create. This indicates that neanderthals were able to communicate & inter-debate over the manufacture of these tools, advancing cultural evolution significantly. The different range of tools & levallois technique used to make these tools shows the advanced mental capacity for abstract thought & passing on of knowledge to other members of the group.
Fire & tools meant that food was easier to be hunted & meat easier to be obtained as tools increased the ease of hunting & ability to kill large game. This increased food & increased nutritional value meant more energy was available for brain development. Fire & tools also meant food could be processed & so was easier to digest, leaving for more energy for other tasks. The brain development resulted in a positive feedback cycle as better tools could be made, and then more food obtained & then more brain development.

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QUESTION THREE

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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.

o the lifestyle of a hunter-gatherer would have been one which they would of had to move around and change camp a lot. this could of been due to the fact that once they had hunted in a specific area they would of had to move in order to find another place to source more food. The lifestyle of a early farmer would have been different because you could be more grounded and live somewhere for a long time as a lot of your food would be from growing crops.

o The cultural trends would of been by learning from

There is more space for your answer to this question on the following page.

→ wider food source. variety

one another in order to expand your thinking of how to grow and produce food. This also would have meant speech would have been developed through sharing ideas. Trail and error through things not growing. knowledge being passed down through generation to allow hominins not having to solely survive on hunting & gathering but transition into an agricultural lifestyle.

- A disadvantage of this transition from hunter gatherer to agriculture or farming would have been the number of trails it would of taken to know what to grow, how and when. This would of been time and energy consuming.
- An advantage of the transition was the communication development between hominins and also the variety of food available through growing crops.

Low Merit exemplar for 91606 2015		Total score	14
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 a third feature supports bipedalism they would have scored an M6.	
2	M5	The candidate explains the trends shown in the development of the tool cultures and the associated progression in the cultural evolution of the hominins. The identification of one tool culture is incorrect. The candidate makes an attempt at explaining the effect of tools and fire on biological evolution.	
3	A4	The candidate provides sufficient evidence for A4 in this question by describing the lifestyles of the hunter/ gatherer and the farmer and also describes the farmer as working towards producing a steady food supply.	

91606

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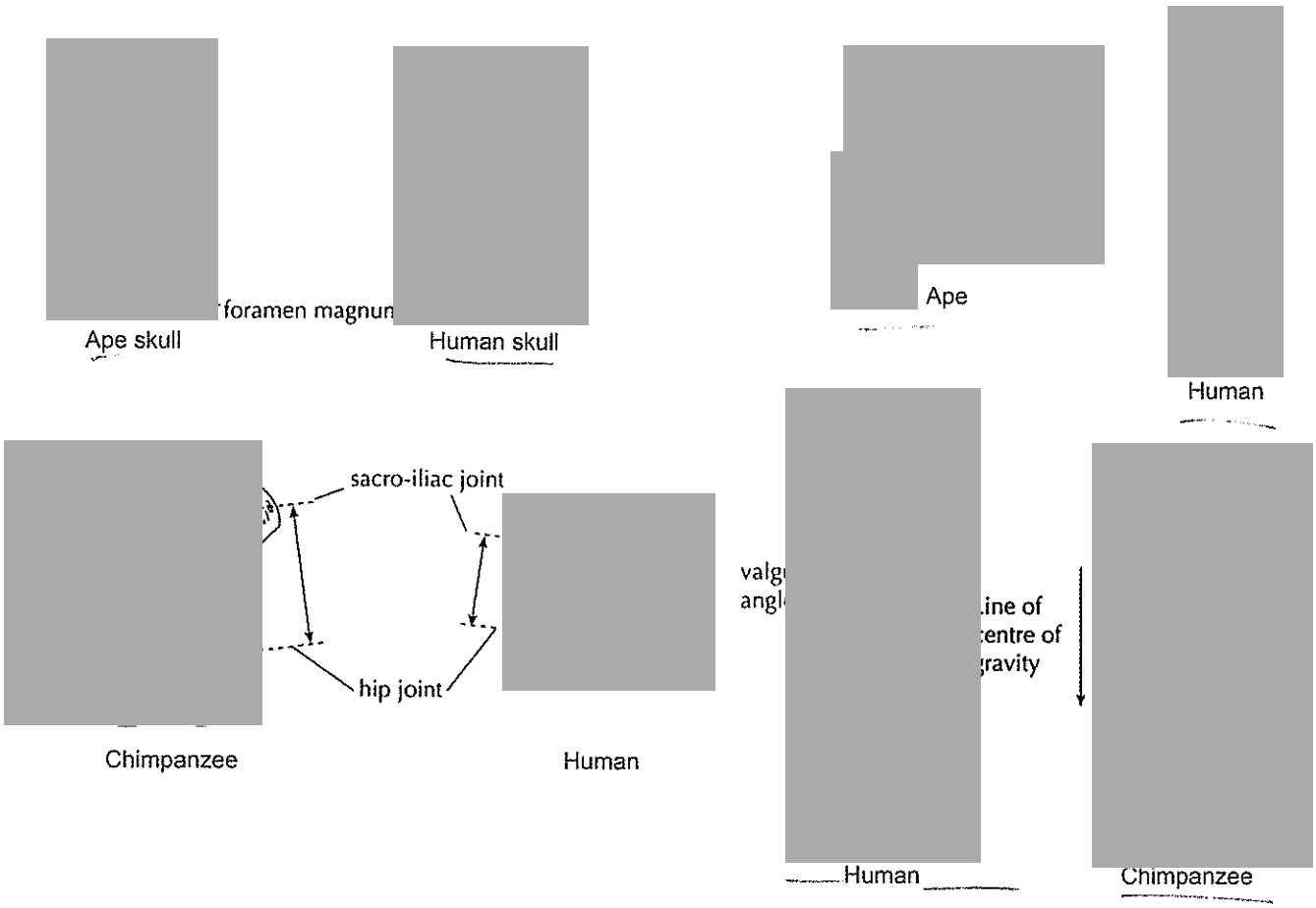

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Quadrapedalism is the locomotion of using four limbs, two arms and two legs. In contrast to this, bipedalism is the locomotive movement using two limbs (the legs) and is done in an upright position.

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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 spine 'C' shape connects to the skull. The foramen magnum must be posterior for the Ape to have quadrapedal 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 effecient way for the four (quad) limbs to lay underneath the body, allowing for quadrapedal 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

There is more space for your answer to this question on the following page.

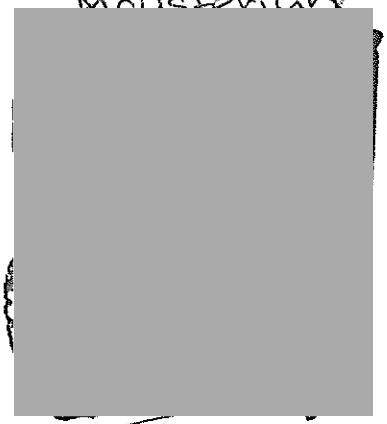
position for bipedal locomotion.

The leg bones also confirm the transition of quadrapedal 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 ~~centre~~ 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 manor. As well as this, the now smaller surface area from birds-eye-view meant less sun could touch the bodies, and thus causing them to over heat. M5 cont...

QUESTION TWO

ASSESSOR'S USE ONLY

Tool Culture Figure 1	Tool Culture Figure 2	Tool Culture Figure 3
Mousterian	Oldowan	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

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Oldowan tool culture.

Tool Culture Figure 2. is linked to Homo Habili's 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 Cult~~ used approximately 1 million years ago. Tool culture Figure 3 is linked to Homo Saplens 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

There is more space for your answer to this question on the following page.

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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 levallibus 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 symetrical. However, the development of cultural evolution is present as the tools were now designed in a more urgenomical 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 symetrical. 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 culture evolutional 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

M6

M6 cont..

QUESTION THREE

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

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

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- discuss any advantages and disadvantages a transition to agriculture from hunter-gatherer involved.

A hunter-gatherer would of been constantly on the move for a new source of food and water. No-permanent settlements were ever made, and there was never any comfirmation 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 farm 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

There is more space for your answer to this question on the following page.

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 off, leaving the community with no food source.

M5

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

QUESTION NUMBER

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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.
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QUESTION NUMBER

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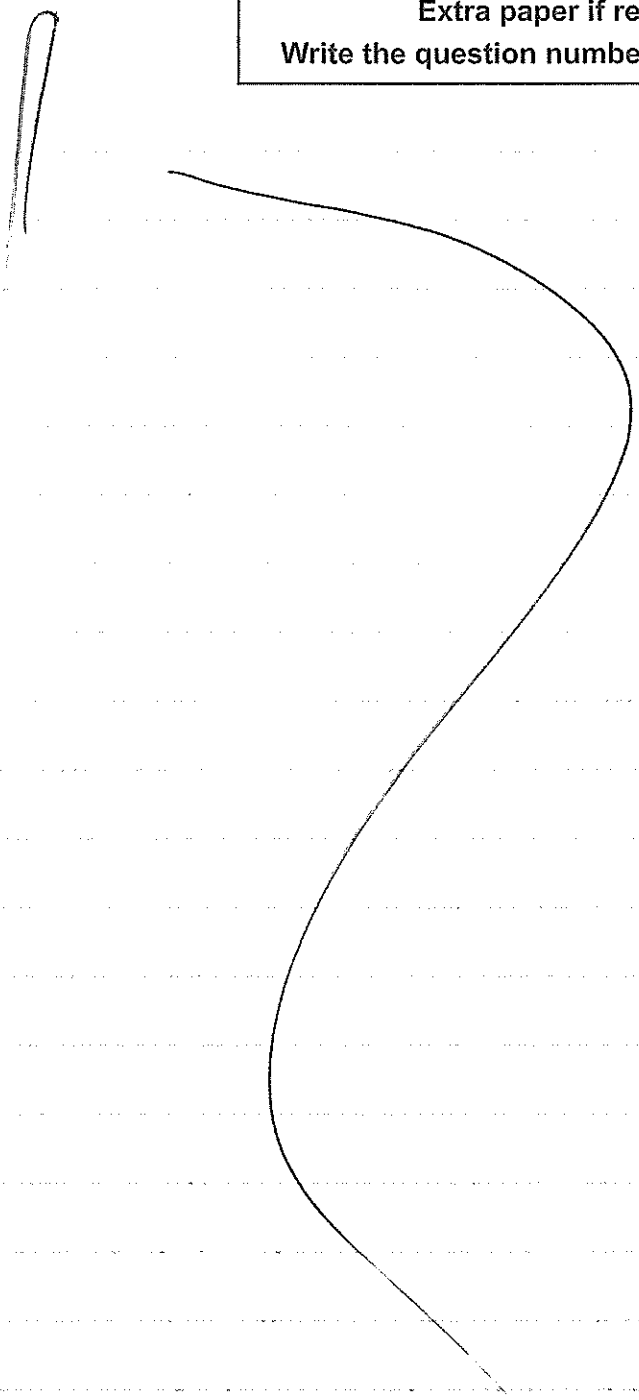

Merit exemplar for 91606 2015		Total score	16
Q	**Grade score**	**Annotation**	
1	M5	This question provides good explanations for two of the skeletal features supporting bipedalism. If the candidate had added a satisfactory explanation for how the third feature supports bipedalism they would have scored 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.	