

## Assessment Schedule – 2014

### Biology: Demonstrate understanding of trends in human evolution (91606)

#### Evidence Statement

Q1	Evidence	Achievement	Merit	Excellence	
	<p>The changes to skull structure would have been a reduction in jaw / zygomatic arch size, loss of sagittal crest / reduction in brow ridge, prognathism, and tooth size etc</p> <p>The weakened muscles would no longer have required a sagittal crest / large jaw for larger muscle attachment and brow ridges to compensate for larger forces from larger jaw muscles. This means that the weakened muscles led to changes in skull structure, allowing cranium to become more dome shaped and forehead flatter.</p> <p>Both of these would have enabled brain expansion, as would have dietary changes in response to having weaker muscles and seeking nutrients from other sources that were softer and required less chewing.</p> <p>Possible scavenging of high protein and fat sources from animal kills further led to selection for brain expansion as it provided a survival advantage. Selection for brain expansion likely due to ability to, for example, predict where predators would leave kill so as to source food. Positive feedback would have therefore further reinforced the selection for brain enlargement as a result of the mutation for weaker jaw muscles.</p>	<p>Describes changes to skull structure including, for example:</p> <ul style="list-style-type: none"> <li>• reduction in jaw size / mandible</li> <li>• loss of sagittal crest</li> <li>• reduction in zygomatic arch / cheek bone less prominent</li> <li>• reduction / loss of brow ridges</li> <li>• reduction in prognathism / muzzle flattening of face</li> <li>• reduction in tooth size.</li> <li>• increased cranial vault / skull / cranium</li> <li>• change from U to V dental arch</li> <li>• development / appearance of chin.</li> </ul>	<p>Explains how weakened jaw muscles led to specific changes in skull structure, for example:</p> <ul style="list-style-type: none"> <li>• Zygomatic arch is no longer as prominent / big because less space required for smaller jaw muscle to pass under OR attach to.</li> <li>• Sagittal crest no longer required for attachment of stronger jaw muscles, (so cranium could become more dome-shaped).</li> <li>• Brow ridges reduced so forehead flattened due to no longer having to support large forces created by power of stronger jaw muscles.</li> <li>• Increased cranial vault because no need for large jaw muscles to attach to the Sagittal crest.</li> <li>• Reduced jaw muscle allows cranial vault to increase which then creates space for bigger brain.</li> <li>• Reduced jaw muscle means chin develops to assist chewing / is compensating for lack of chewing strength in jaw muscle.</li> <li>etc</li> </ul>	<p>Relates the implications of weakened jaw muscles to brain enlargement including, for example:</p> <ul style="list-style-type: none"> <li>• Weakened jaw muscles are related to 2 changes in skull structure explained, which in turn enabled bigger cranial vault which created space for brain expansion as attachment of larger muscles no longer selected for.</li> <li>• A change in diet (to foods that are easier to chew / softer eg meat) provided more energy / protein / nutrients which led to a change in brain size.</li> <li>• Adaptive advantage of brain expansion eg increased cognitive ability / communication / planning / predicting – could be a positive feedback loop.</li> </ul>	
	<b>Not Achieved</b>	<b>Achievement</b>	<b>Merit</b>	<b>Excellence</b>	
	<p>NØ = no response or no relevant evidence</p>	<p>N1 = 1 or 2 points</p> <p>N2 = 3 or 4 points</p>	<p>A3 = 5 points</p> <p>A4 = 6 points</p>	<p>M5 = 2 points</p> <p>M6 = 3 points</p>	<p>E7 = 1st bullet point</p> <p>E8 = 1st bullet point AND either BP 2 or 3</p>

Q2	Evidence			Achievement		Merit		Excellence	
	<p>The tool culture associated with <i>Homo habilis</i> is Oldowan, where they were pebble tools with flat faces at one end, and included the use of the flakes from their manufacture. The tools may have been sourced from nearby streams and manufactured by striking with another harder rock sourced from the hills. They could have been used to cut and crush food sources. This implies that their behaviour may have included the passing on of knowledge and skills to source, make and use the tools to others in group for survival. These tools would have allowed them to process food sources from scavenging, enabling access to more nutrients for group survival, eg bone marrow. This would have provided an adaptive advantage through the passing on of knowledge to enhance survival, eg the location of harder rock to better produce tools as this would have allowed the processing of different food sources that may have been previously unavailable, eg extraction of bone marrow.</p> <p>Eg use of tools would have allowed more time to reproduce, leading to greater reproductive success and passing on genes and successful phenotypes.</p>			<p>Identifies and describes the tool culture as Oldowan – pebble tools with flat faces at one end and the flakes that result from this.</p> <ul style="list-style-type: none"> <li>• Oldowan tool culture.</li> <li>• Pebble / stone / rock tools.</li> <li>• Tools with flat faces at one end / flakes removed from one side.</li> <li>• Flakes.</li> </ul>		<p>Explains how Oldowan tools sourced, produced and / or used, ie:</p> <ul style="list-style-type: none"> <li>• Made by striking pebble / rock at one face / edge / end with another (harder) rock to produce core or flake</li> <li>• Sourced from suitable rock in streams / rivers AND hills (may have been source of harder rock used to manufacture pebbles into tools).</li> <li>• TWO uses explained Eg used to cut meat / reeds crush bones / nuts / tough plant material work other materials, eg: wood into shape. skinning / scraping digging up edible bulbs / roots / tubers missiles.</li> </ul>		<p>Analyses how evidence contributes to understanding of behaviour of <i>Homo habilis</i> at Olduvai. Must include selective advantage.</p> <ul style="list-style-type: none"> <li>• <i>Homo habilis</i> would have travelled to source materials to produce tools for survival suggesting that there was some foresight or planning which provided a selective advantage.</li> <li>• <i>Homo habilis</i> recognized that the manufacture of tools was beneficial so it was taught to others which gave a selective advantage</li> <li>• <i>Homo habilis</i> may have had division of labour with specialised roles related to their tool culture. This division of labour gave a selective advantage.</li> <li>• Eg Processing of food done at one location and other activities, eg sourcing of materials for tools, in other places, suggests specialised use of both the wider local environment and resources within it. Selective advantage given.</li> <li>• Tools used to process food, eg crush bones to extract marrow, cut flesh off bones of scavenged animals (not to hunt) and this would have provided more nutrients / food. Selective advantage given.</li> <li>• Processing food with tools associated with foresight / planning and selective advantage given.</li> </ul> <p>Example of selective advantage:, using tools would have allowed more time to reproduce, leading to improved reproductive success and passing genes / successful phenotypes on.</p>	
	<b>Not Achieved</b>			<b>Achievement</b>		<b>Merit</b>		<b>Excellence</b>	
NØ = no response or no relevant evidence	N1 = 1 point	N2 = 2 points	A3 = 3 points	A4 = 4 points	M5 = 1 <sup>st</sup> bullet point	M6 = 1 <sup>st</sup> bullet point and 1 other	E7 = 1 point	E8 = 3 points	

Q3	Evidence			Achievement		Merit		Excellence	
	<p>The likely dispersal of modern humans from Africa would have been through the Middle East to Europe / Asia. They may have interacted with other pre-existing hominin populations as they dispersed further, ie Neanderthal and Denisova. The hominin populations would have been similar as they shared a common ancestor / DNA link, and different as they subsequently evolved in different areas / came under different selection pressures. Denisovans and Neanderthal more similar as shared more recent common ancestor / DNA link, whereas modern humans a less recent one.</p> <p>During the dispersal the sharing of some DNA indicates the possibility of interbreeding between populations (or alternatively this was from ancient DNA source / ancestor). The lack of genetic variation in modern humans is due to relatively recent dispersal from Africa and likely more than one dispersal event, as well as possibility of interbreeding with other hominin populations on the way. The DNA similarities were selected for, to continue to survive in modern human populations.</p>			<p>Describes likely pattern of dispersal of modern humans from Africa as being, for example:</p> <ul style="list-style-type: none"> <li>• North (from Africa) through to Middle East, and East-West distribution in Europe / Asia, and then likely North-South distribution followed.</li> </ul> <p>OR</p> <p>Later dispersal to rest of globe eg Asia / Melanesia (at least one place named).</p> <ul style="list-style-type: none"> <li>• coastal route taking into account geographical / ocean barriers / land bridges</li> <li>• Describes that evidence shows dispersal from Africa first / describes Out of Africa / Replacement / Eve hypothesis</li> <li>• Describes that there would have been more than one hominin group in different areas at same time.</li> <li>• Describes that there would have been more than one named hominin group in the <b>same area</b> at the same time.</li> </ul>		<p>Explains reasons populations both similar and / or different, for example:</p> <ul style="list-style-type: none"> <li>• Different groups / populations (dispersed to) in different areas / habitats therefore came under different selection pressures so evolved differently.</li> <li>• Example given of different selection pressure acting on named hominin population: Eg Neanderthals were more cold adapted during ice age. Eg Denisovans were more likely adapted to more extremes in climate conditions due to North-South distribution. Eg Floresensis on island with limited resources selecting for small size.</li> <li>• The dispersal of hominins to different niches prevented gene flow and therefore evolved into separate populations.</li> <li>• Two / three named species have diverged from a common ancestor so that they have genetic similarities.</li> <li>• Denisovans are more genetically similar to Neanderthals than modern humans as they shared a more recent common ancestor (or opposite).</li> <li>• Denisovans and Neanderthals similar possibly due to interbreeding resulting in sharing of genetic information.</li> <li>• Denisovans and Melanesians are genetically similar due to interbreeding.</li> <li>• Interbreeding between Non Africans and Neanderthal means that there are genetic similarities.</li> </ul>		<p>Evaluates implications, of evidence, to dispersal AND relative lack of genetic variation, for example:</p> <ul style="list-style-type: none"> <li>• Neanderthals are more closely related to non African populations because interbreeding occurred with modern humans as modern humans dispersed from Africa to Europe (share 2.5% of DNA with Neanderthals (or ancient DNA)).</li> <li>• There are similarities between Denisovans and Melanesian populations because before modern humans dispersed into Melanesia / Oceania they interbred with Denisovans.</li> </ul> <p>OR</p> <p>Denisovans and Melanesians share a common ancestor.</p> <ul style="list-style-type: none"> <li>• Before dispersal a common ancestor originated in Africa so all modern humans have genetic similarities.</li> <li>• Outcome is that waves of dispersal and possible interbreeding with existing populations likely to have resulted in relative lack of genetic variation we see in modern human populations.</li> </ul> <p>May state other hypothesis that links both Out of Africa and Multiregional and could be supported; for example, a “hybridisation” hypothesis.</p>	
	<b>Not Achieved</b>			<b>Achievement</b>		<b>Merit</b>		<b>Excellence</b>	
	NØ = no response or no relevant evidence	N1 = 1 point	N2 = 2 points	A3 = 3 points	A4 = 4 points	M5 = 2 points	M6 = 3 points	E7 = 1 point	E8 = 2 points

**Cut Scores**

	<b>Not Achieved</b>	<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<b>Score range</b>	0 – 6	7 – 12	13 – 18	19 – 24