

Assessment Schedule – 2013

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

Assessment Criteria

Q1 Expected coverage	Achievement	Merit	Excellence
<p>As the climate became warmer and dryer in Africa around 6 mya, the forests were receding and became scattered woodland. Hominins at the time would have to have travelled longer distances to gather resources. Being able to brachiate would become less important than being able to walk efficiently, as walking would be the most common mode of travel.</p> <p>OR</p> <p>Early hominins that were able to take advantage of available food most efficiently would be selected for. One way of taking advantage is by carrying more food away at one time. The individuals that could do this by moving on 2 legs and using both hands to carry food would be selected for.</p> <p>Skeletal changes enabling efficient bipedalism include: an S-shaped spine, a big toe in line with other toes, arched foot, a valgus angle of the femur, buttressed knee. Many of these would make brachiating more difficult. In addition, being exposed to the hot African sun would promote the adaptive loss of body hair to promote cooling. This, in turn, would make it difficult for infants to grasp onto their mothers, especially without opposable big toes. Thus, mothers must hold their infants, further supporting bipedalism. Once the hands were freed from brachiating or knuckle walking, there would have been an adaptive advantage to being able to manipulate objects more carefully, such as food or simple tools. Fingers became less curved and the thumb fully opposable, there was an increase in dexterity.</p> <p>The cerebellum, responsible for balance and fine motor skills, would have developed along with dexterity. Also, being able to interact more fully with objects</p>	<ul style="list-style-type: none"> Describes TWO advantages of bipedalism. Eg, more efficient / freed up hands / better thermoreg / see further / intimidate predators / find food more easily. Describes selection pressure for bipedalism as being the reduction of arboreal habitat and increase in savannah. Describes THREE skeletal features from: <ul style="list-style-type: none"> S-shaped spine valgus angle increased buttressed knee arched foot foramen magnum centered rib cage flattened pelvis shape now short and wide big toe in line with others. Describes TWO changes in the hand from: <ul style="list-style-type: none"> fully / more opposable thumb, (not just opposable thumb) straighter fingers increased dexterity precision vs power grip. Describes brain change as 	<ul style="list-style-type: none"> Explains significance of bipedalism in environment. Eg, TWO of: <ul style="list-style-type: none"> bipedalism increases efficiency in gathering scattered food so saves energy being upright allows for better cooling in hot climate so saves energy freed up hands, which allowed for carrying of food providing more energy / carrying of young resulting in better parental care / carrying objects such as tools to exploit more food sources improves predator avoidance through range of sight and larger more imposing form find food due to larger range for vision and foraging. Explains why manipulative ability of the hand would have occurred after bipedalism. Eg, before bipedalism hands were needed for balance, brachiation and knuckle walking and could not be / didn't need to be used successfully or independently for manipulation of tools etc. Explains why brain development would have occurred after 	<p>Discussion links the selection pressures for bipedalism preceding hand and brain, eg :</p> <ul style="list-style-type: none"> Discusses the link between the hand and brain changes, eg The advantages of bipedalism meant having hands free allowing for improved manipulative ability and tool production, promoting a bigger brain, which in turn promoted improved tool use / food gathering; this had a reciprocal effect on the brain, as better tool use provided more energy, and the cycle of brain and manipulative ability of the hand continued / began a positive feedback loop. <p>OR</p> <p>As the cerebellum enlarges from bipedalism (balance), fine motor skills can increase and so promote more dextrous hands, meaning more food can be acquired, increasing energy available for the brain, leading to better manipulative ability of hand.</p> <ul style="list-style-type: none"> Justifies why brain and hand development must have been after bipedalism. Eg, bipedalism was selected for due to a changing environment that led to different selection pressure / different favoured adaptations. Once bipedalism began to evolve the changes in the hand and brain were possible and <u>increased the overall advantage in this changed environment / new niche.</u>

could promote the development of the brain, resulting in a larger brain and more folding, as those that could make and use more complex tools were more likely to get enough food, and survive.	increased volume.	bipedalism. Eg, bipedalism freed the hands and enabled more efficient care of the young and more quality feeding and food collection to increase brain development.	
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NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	ONE point or multiple partial points.	TWO points.	THREE points.	FOUR points.	ONE point.	TWO points.	Discussion covers one aspect OR two aspects with lack of justification in discussion.	Both points fully discussed & justified.

Q2 Expected coverage	Achieved	Merit	Excellence
<p>Each of the tool cultures is more refined than the last, more specialised for specific tasks, more diverse in the materials used, and showed greater design ability and an increase in the dexterity of the species that used them.</p> <p>Oldowan tools were made by <i>H. habilis</i>, ~2 mya. The simple partly shaped (~6 blows) stones and flakes would have allowed them to access food that other species could not, such as scavenging bone marrow. (This may also have provided the protein required for further brain development.)</p> <p>Acheulean tools were fully shaped (~50 blows) and more refined. <i>H. ergaster</i> / <i>H. erectus</i> (~1 mya) would use the hand axes to dig roots, hack tree branches, and (for flakes) scrape and cut animal hides. This would have benefitted their users by providing more food and perhaps defence from predators.</p> <p>Mousterian tools (~500 kya) were more refined again (~150 blows), and more diverse in their form and functions. The blades were sharper, requiring more blows to produce. Each tool was more specialised. Rope may have been used to create spears for hunting, and awls were made for punching holes in hide which, with hide lacings, could be used to make clothing, benefitting the Neanderthals to survive in their cold environment in ice-age Europe.</p> <p>Upper Palaeolithic tools (from ~50 kya) were more finely worked again (~250 blows), and most significantly they used a variety of materials, including bone, ivory and antler. This enabled a diverse range of tools, including very finely worked and delicate items, to be made. This included fish hooks and harpoons, increasing <i>H. sapien</i>'s diet, and needles, improving their clothing and even enabling the manufacture of shelters. This could have allowed their range to increase and allowed for a rapid expansion and colonisation of new areas.</p>	<ul style="list-style-type: none"> Describes TWO trends in tool cultures, eg increasing refinement / number of blows / planning / materials used / specificity / time taken to make. Describes THREE tool cultures, eg Oldowan tools were simple partly shaped rocks and flakes. Describes benefits of TWO tool cultures, eg Oldowan tools allowed for increased food collection. 	<p>Explains advantages of TWO or more tool cultures over the previous tool culture.</p> <p>Eg:</p> <ul style="list-style-type: none"> Oldowan tools enabled more food to be collected by, for example, breaking open bones to collect bone marrow, increasing energy intake. Acheulean tools were more diverse and refined, so could be used in hunting and better processing meat / protect against predators. Mousterian tools were even more refined and diverse, so could be used to make basic clothing / improve effectiveness of hunting. Upper Paleolithic tools were the most refined and diverse tools, and could also be used for making shelters, hunting, fishing, stitching. 	<p>Discussion relates adaptive advantages to the hominins way of life.</p> <p>Eg:</p> <ul style="list-style-type: none"> Oldowan tools supported <i>habilis</i> / <i>erectus</i> as a scavenger as it allowed them to better process carcasses and access bone marrow. Acheulean tools supported <i>erectus</i> move from scavenging to hunting. Stone tools allowed better processing of meat, (such as carving up carcass for transport) and wooden spears for hunting. Mousterian tools provided a wider range of tools, allowing them to process clothing for use in colder environment, and improve hunting technology. Upper Paleolithic allowed production of more varied hunting tools and fishing technology – leading to a wider diet and exploitation of coastal areas.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	ONE partial point, such as describing two cultures.	ONE point.	TWO points.	THREE points.	Explains TWO advantages.	Explains THREE advantages.	Relates TWO tool cultures to way of life.	Relates THREE tool cultures to way of life.

Q3 Expected coverage	Achieved	Merit	Excellence
<p>Out of Africa (OOA) states that <i>H. sapiens</i> evolved in Africa and dispersed from there around 140 kya. As they spread into Europe, Asia, and beyond they outcompeted other such species from previous migrations and were eventually the only remaining hominin species.</p> <p>This is supported by points 1 and 2 above, which suggest that we are all descended from a population that were in Africa 200 kya, some of whom left about 140 kya and eventually populated the globe. This founder population would surely have less genetic diversity, accounting for point 4.</p> <p>The multiregional theory (MRT) states that hominins around the world formed a single species which, through interbreeding, evolved together into modern humans with regional (racial) differences.</p> <p>Point 3 is the sort of evidence that would support this theory. The “transitional fossil” that indicates an evolutionary link between <i>erectus</i> and <i>sapiens</i> is predicted by MRT.</p> <p>However, point 5 does not support either model exactly, (or could support either with suitable explanation), with far too little gene flow between Neanderthals and modern-day humans for MRT, but more than is predicted by the OOA (which is none). This suggests a combination of the 2 models, OOA with some interbreeding perhaps, which may account for all of the evidence provided, including the intermediate (hybrid) remains of Peking man.</p>	<ul style="list-style-type: none"> • Describes OOA theory, eg modern humans evolved in Africa and replaced other species OR <i>H. sapiens</i> spread from Africa recently (within last 140 000 years) to colonise the rest of the world. • Describes MR theory, eg <i>H. sapiens</i> evolved in parallel in many places (over the last 1my). • Correctly attributes TWO pieces of evidence to correct theory (or neither) eg point 1 and 2 both indicate OOA 	<ul style="list-style-type: none"> • Uses ONE piece of evidence to explain OOA (and describes MRT). Eg: - OOA theory is indicated by point 1, which shows that all non-African humans must have come from a founding population of Africans quite recently – too early for MRT OR - The greater diversity observed in african populations, evidence 4, indicates that this population is significantly older than the others whose lack of diversity may be the result of a founder effect as a small number of <i>H.sapiens</i> left Africa in the ‘second wave’. OR - Evidence 5 could be used to support the OOA model as the later dispersal of sapiens may have met and interbred with neanderthals as the moved out of africa taking a small amount of their DNA to asia and retaining some in europe. • Uses ONE piece of evidence to explain MRT (and describes OOA) Eg: - Point 3 indicates MRT, where modern humans are evolving throughout the world – the transitional fossil indicates this change. 	<p>Justification accounts for THREE of the five pieces of evidence in terms of the two main theories, eg the fact that all humans are related 200 kya and then non-Africans split away 140 kya quite conclusively points to a recent African origin (OOA). However, the Peking man fossil could indicate some interbreeding or transition outside of Africa, either of which are inconsistent with OOA. This population (or individual) may have been an anomaly, or even if it shows transition, it does not indicate MRT, as they were still outcompeted by <i>sapiens</i> when they emerged from Africa much later. Overall then, the evidence favours OOA.</p> <p>OR</p> <p>Justification for ONE theory accounted for considering all five points but SECOND theory is NOT discounted.</p> <p>For E8, discussion accounts for all five pieces of evidence where One theory is accounted for and the other is discounted (OR both accounted for or vice versa).</p>

					<p>OR</p> <ul style="list-style-type: none"> - OOA says that humans all evolved in Africa, so we wouldn't see <i>erectus</i> / <i>sapiens</i> hybrids such as Peking man/ transitional fossils in evidence 3. <p>OR</p> <ul style="list-style-type: none"> - Evidence 5 could be used to support the MRT model as it suggests that modern sapiens in africa and asia evolved from a transitional hominin that was not part of the african sapien lineage and retained evidence of their DNA whilst the Africans did not. 			
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	ONE partial point.	ONE point.	TWO points.	THREE points.	ONE point.	TWO points with no evidence incorrectly attributed to a theory.	ONE point (3 of 5 pieces of evidence OR 1 of the 2 theories).	Thorough coverage, inc. all 5 pieces of evidence, both theories considered.

Judgement Statement

	Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
Score range	0 – 7	8 – 13	14 – 18	19 – 24