Assessment Schedule – 2012

Biology: Describe trends in human evolution (90719)

Assessment Criteria

ONE	A: Describes aspects of skull and endocranial features (4 bullet points)	M: Explains the way of life of 2 species (2 different points)	E: Compares the *sapiens*' success in terms of brain specialisation and way of life, to both other species
	Describes how features of the skulls differ in three species: • sagittal crest present in *Pr* • zygomatic arch largest in *Pr* / smallest in *Hs* • cranial capacity / brain size small in *Pr* / big in *Hs*, *Hn.* • brow ridge large in *Pr* and in *Hn* • teeth size / jaw size large in *Pr*. Describes significance of features: • sagittal crest / teeth size (large) / zygomatic arch (large) / brow ridge indicates low quality diet • cranial capacity indicates culture, language.	• *Pr*, with large zygomatic arch / sagittal crest / teeth / brow ridge had a low-quality diet, such as seeds and roots. • *Large zygomatic arch / sagittal crest / brow ridges linked to larger jaw muscles indicating low-quality diet.* • A small cranium indicates an inability to make tools or language. • *Hn* has a larger cranium, indicating more intelligent species. • They had a culture including tools and a more refined diet as indicated by the smaller teeth, zygomatic arch and no sagittal crest. • Speech centre / Broca's / Wernicke's area indicates a spoken language.	• *Hs* have a large brain, similar in size to *Hn*, but more specialised. The cultural advances were greater, such as more refined tools. Language was more advanced as well, utilising specialised areas for making (Broca's) and understanding (Wernicke's) language. This allowed Hs to survive better / outcompete *Hn*. *Pr* was specifically adapted for eating low quality vegetation, such as seeds and roots, which made them well suited for a specific niche. With no tools or fire, when environmental change occurred they were probably unable to respond fast enough as a species.
	A = 4 x a	**M** = 2 x m	**E** = 1 x e

TWO	A: Aspects of fire described (3 bullet points).	M: Explanation of impact on biological or cultural evolution (2 bullet points).	E: Discusses the impact fire had on the linking of biological and cultural evolution (at least 1 <u>biological</u> and 1 cultural aspect interacting).
	Uses of fire: • increased light hours (for making tools / socialising) • protection from predators • warmth in cold environment • tool making • cooking– food easier to digest / better nutrition / kills parasites / increased range of food • herding animals.	• More light time therefore tools were of higher quality, advancing the culture / Tool making was improved as the fire could harden points, (increasing hunting success implied). • Use of fire to herd animals led to increased hunting success. • Cooking – food easier to digest allowing more nutrients / energy / increased range meant that new food / resources could have been exploited. • More time to socialise could allow more time for the development of language. • Warmth in cooler areas so enabled migration out of Africa / move into colder areas / Europe / Asia. • The charcoal remaining from the fire could have been used as an art material for cave paintings.	<u>Cultural</u> • More light time therefore tools were of higher quality, advancing the culture / tool making was improved as the fire could harden points, increasing hunting success. • Being able to cook foods resulted in improved digestion, destroying parasites, so improved health and fitness for hunting. • More time to socialise by the fire meant better communication, which would lead to better hunting techniques (greater cooperation). <u>Biological</u> (must link to diet) • Better communication and more sophisticated tools enabled better hunting success, so improved diet, leading to greater brain growth and development. • Cooking – food easier to digest enabling more nutrients / energy from food, allowing greater brain development. • These cultural changes led to higher protein diet and more regular food supply, which would have led to greater brain growth and development, more developed communication centres in the brain (biological).
	A = 3 x a	**M** = 2 x m	**E** = 2 x e

THREE	A: describes dispersal theories (2 bullet points)	M: Explains 2010 or 2011 evidence in terms of theories (1 bullet point)	E: Discusses **both** sets of evidence in terms of the theories.
	Describes theories: • OOA: *H. sapiens* originated in Africa and replaced all other hominin species (in the last 60 000 years). • Multiregional: *H. sapiens* evolved simultaneously in the 3 continents / over the world / out of Africa (over the last million years) / the arrows represent gene flow / interbreeding between populations. Must state ***H. sapiens* / modern humans** for theory descriptions	Suggests *Neanderthal* and *Homo sapiens* interbreeding and / or *Homo sapiens* and Denisovans interbreeding. • 2010 data shows that extinct hominins / Neanderthals / Denisovans have been "absorbed" / mixed / interbreed / hybridised into modern human DNA. Explains 2011 data as OOA / does not support multiregional. • 2011 data shows a **recent** common ancestor thus supporting the OOA theory / does not support the MR theory.	• As the 2011 data indicates a common ancestor of recent (140 ky) African origin, and the 2010 data shows that extinct hominins have been "absorbed" into modern human DNA, this would support the idea of mixing / interbreeding / hybridisation. **OR** • The multiregional theory assumes a much earlier ancestor (about 1 mya). Although the gene flow indicated by the 2010 data may support the multiregional theory, the timeframes of the 2011 data do not. •
	A = 2 x a	**M** = 1 x m	**E** = 2 x e

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
2 **A**	2 **M**	2 **E** *OR* 1 **E** + 1 **M** + 1 **A**

Assessment Schedule – 2011

Biology: Describe trends in human evolution (90719)

Assessment Criteria

QUESTION ONE

Achievement	Achievement with Merit	Achievement with Excellence
Describes features for bipedalism and arboreal life or explains one, Eg: • Long arms (arboreal) • Valgus angle in femur (bipedal). • Foramen magnum centred under skull (bipedal) • Reduced nuchal crest (bipedal) • Divergent big toe (arboreal) • Grasping feet (arboreal) **Describes key aspects of bipedalism**. Eg: • More efficient walking means that *Ardi* could cover longer distances. • Hands free to carry things. • Height advantage means that *Ardi* could see further – water, food, predators, etc. • Less exposure to Sun because of upright stance. **(Any TWO ideas)**	**Explains how skeleton gives evidence for ONE feature**. Eg: • Ardi has long arms indicating efficient brachiating through trees. • The valgus angle in her femur to bring feet / knees beneath hips / directly below the centre of gravity thus indicating bipedalism. • The valgus angle – greater stability when walking bipedally • Foramen magnum under skull showing spine was vertical indicates bipedalism • Reduced nuchal crest means less neck muscles to hold head up indicates bipedalism • Divergent big toe – for grasping branches **Explains how changes affected Ardi's way of life (ONE idea)**. Eg: • *Ardi* can cover more distance to gather more resources as bipedal locomotion is more efficient. • *Ardi's* height makes her more visible to predators (vulnerability implied) • Upright: Less likelihood of overheating when walking in the open / doing other activities • The changing climate means that Ardipithecus' niche is diminished, forcing her to leave the trees. • As bipedalism leaves her hands free, Ardi can carry resources from place to place, giving her a survival advantage.	**Discussion of advantages (at least TWO) of bipedalism in the changing climate outweigh the cons (at least ONE)**. **Overall, bipedalism's advantages must have been more significant, or it would not have been selected for.** Eg, most of: As the climate changed and less forest was available, Ardi would have had to walk further to gather food. Longer legs and straighter spine for bipedalism gave a height advantage, allowing *Ardi* to be able to see further, allowing her to find resources more easily. However, being taller might have made her more visible to predators. In addition having hands free means that she could carry items such as tools for gathering more food, or food from another place to consume at a later date. However, changes to bipedalism make *Ardi* less well adapted for arboreal life, potentially reducing protection and food gathering.

QUESTION TWO

Achievement	Achievement with Merit	Achievement with Excellence
Describes domestication OR cultural evolution *Domestication:* • Using local plants and animals for increased / regular / stable food supply. • Climate change / end of ice age / increase in moisture meant that crops could be farmed. *Cultural evolution:* • Learned behaviour / knowledge / ideas that are passed on through generations **OR** **Describes benefit:** • did not need to move for food • more available food (*can only be used once) • bigger populations • more specialised tools • specialisation of labour OR farm-type occupation • trade / bartering. **OR** **Describes disadvantage:** • increase in diseases • attracts pests • waste disposal • ownership disputes • reliant on few crops • seasonal boom / bust • reduced variation in diet **One way of overcoming**: • food storage – pottery • trade / economics.	**Explains ONE aspect of how agriculture increased cultural development**, Eg: • Domestication happened, using crops and animals from the local environment, and adapting them to provide regular food supply for a group of individuals. • Climate warming meant that agriculture appeared suddenly in many places as crops could be grown there [*change*]. This meant that people did not need to move to gather food, so could conserve energy and support larger populations [*advantage*]. • With more food available, larger populations could be supported [*advantage*]. However, this meant that there was more waste to deal with, potentially bringing pests and diseases [*disadvantage*]. • With crops being harvested at one point in time, food supply would be erratic through the year [*disadvantage*]. New technologies such as pottery containers for food storage would have been one solution to this [*solution*]. • With domestication of crops came a reduction in the variety of food available compared to hunter-gathering. {*disadvantage*}. Trading between different groups gave greater food variety {*solution*}	**Discussion linking domestication to the ability to plant crops and subsequent benefits of sedentary life.** **At least TWO points linked.** Eg: • Domestication allowed individuals to use crops and animals from the local environment, adapting them to provide regular food supply to enable development of stable settlements. • Climate warming meant that agriculture appeared suddenly in many places as crops could be grown there [*change*]. This meant that people did not need to move to gather food, so could conserve energy and support larger populations [*advantage*]. With crops being harvested at one point in time, food supply would be erratic through the year [*disadvantage*]. Food supplies might be damaged or unusable [*disadvantage*]. New technologies such as pottery containers for food storage or shelters for food from extreme weather would have been two solutions to this [*solutions*].

QUESTION THREE

Achievement	Achievement with Merit	Achievement with Excellence
Describes TWO tool cultures from the given time periods: Eg: • Acheulean – bifacial, tear-drop shaped, flaked, hand axes for chopping / scraping (butchering food). • Mousterian – made from flakes, re-sharpened edges, Levallois method; scrapers & spears, attached stone tools to handles, flint. • Palaeolithic – specialised, made from several materials (flint & bone), precision / refined / intricate, fine blades & points; spear thrower, bone needles, fish hooks, wide range of uses **Description could be:** • structure • purpose • example.	**Explains how the tool culture has changed in manufacture and / or design between all THREE of the given periods.** • Cover all **three cultures** • At least **FOUR points** explained Eg: Tools have progressed from the basic removal of stone flakes to create tear-drop shaped hand axes in the Acheulean culture. Next was the Mousterian culture where the Levallois method was used to remove a sharp-edged flake of stone. Lastly came the finer detailed Palaeolithic tools such as needles and hooks made from bone and flint.	
Describes a reason for using mtDNA evidence. Eg: mtDNA is not affected by meiosis. OR mtDNA mutations happen at a steady rate. OR mtDNA can be used to identify common ancestors via mother-child inheritance. OR mtDNA is genetically stable compared to nuclear DNA OR **Describes the Out of Africa dispersal model** Eg: Modern humans / *H. sapiens* moved out of Africa (approx 70 000 years ago), replacing (*H. erectus* and *H. neanderthalensis)*. OR **Describe a reason for more diversity in modern African *H. sapiens* populations** Eg: The modern *H. sapiens* population is older / has had longer time to develop OR has undergone founder effect / bottleneck effect	**Explains why mtDNA evidence was used to support the Out of Africa model.** Eg: • mtDNA has been used because it is passed on from mother to child and is not changed due to meiosis. OR • Mutations occur at a steady rate in mtDNA and can be used to estimate how long ago two species shared a common ancestor. OR **Explains about the variability in genetic diversity of *H. sapiens.*** Eg: • The greatest variability is found within African populations which are the oldest. There is less genetic diversity in Asian and European populations, which suggests they are not as old as African populations. OR • There is less genetic variability in European / Asian populations because only a very small number of early human left Africa and therefore they would have reduced alleles / genetic diversity.	**Discusses the Out of Africa dispersal model and the evidence that supports it. (TWO points needed)** • mtDNA has been used because it is passed on from **mother to child** and is not changed due to meiosis. OR • Mutations occur at a steady rate in mtDNA and can be used to estimate how long ago two species shared a common ancestor. OR • Populations inside Africa show greater variability than other populations, which is to be expected, as they were the first modern humans, they have had a longer time to develop greater diversity. OR • Founder / bottleneck effect explained (as per 'Merit' column) OR • All people alive today (and living outside of Africa) can be traced through their mtDNA to one of a small group of women living in Africa (about 170 000 years ago).

2 × a	2 × m	1 × e

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
2 **A**	2 **M**	2 **E**

Assessment Schedule – 2010

Biology: Describe trends in human evolution (90719)

Evidence Statement

Q	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	**Describes biological and cultural evolution.** Eg biological evolution is the transmission / passing on / evolution of genetic information (from parent to offspring) OR Cultural evolution is the transmission / passing on / evolution of learned behaviour / ideas / knowledge / non-genetic information		
(b)	**Gives a reason why biological evolution is slower OR cultural evolution is faster.** Eg cultural evolution can happen within a lifetime / generation. OR Biological evolution can happen only once from generation to generation / occurs over many **generations** (or similar).	**Explains why cultural evolution is much faster than biological evolution, comparing the two processes.** Eg cultural evolution can happen within a lifetime / generation. AND Biological evolution can happen only once from generation to generation / occurs over many generations. (or similar).	

(c)	**TWO examples of scientific evidence identifying trends in cultural or biological evolution are described.** Note that trends should relate to Neandertal (accept early Homo sapiens). Biological Eg. The skeletal remains will produce evidence of body shape / size / type. (NOT for bipedalism) The skull will provide evidence of brain size / organisation. The skull will provide evidence of diet. The bones could be analysed for DNA sequences Cultural Eg the skeleton has been buried in a purpose made grave, in a specific way, providing evidence of burial. The existence of "worked" fragments provides evidence of a type of tool making. The existence of fire places provides evidence of fire use Large animal bones provides evidence of group hunting	**Examples of scientific evidence identifying biological AND cultural evolution are identified and how at least TWO piece of evidence can be used to identify a trend is explained.** Biological – (ONE) The cranial capacity and shape of the skull can indicate ability for speech / language / tool making ability / high intelligence *(must have consequence of high intelligence)*. The (reduction in) sagittal crest / zygomatic arch / jaw size / tooth shape or size can indicate dietary change / cooked food DNA analysis could indicate how closely related the bone / fossil is to other fossils Cultural – (ONE) The way in which the skeleton has been buried can indicate the development of spititual beliefs / greater level of care / sign of respect The material used and the method used in making the 'worked' fragments can indicate learned / cooperative behaviour / foresight / planning. The presence of fire places can indicate a trend towards cooking food / dietary changes The presence of large animal bones can indicate cooperative behaviour / communication / planning	**Examples of scientific evidence identifying biological and cultural evolution AND how the evidence can be used to identify trends in both is fully discussed.** Eg the way the skeleton has been buried can be compared to other burial sites of the same age to identify significant similarities in the evolution of spiritual beliefs and care for the dead. The production of and the material used in the 'worked' fragments can be compared to sites of the same age, to establish a broader understanding about a particular tool culture. Charcoal from the fire places and skeletal bone can be dated using radiocarbon techniques, as the site is likely to be Neandertal or archaic Homo sapiens and therefore not older than 50,000 years, for which radiocarbon dating can be used. The skull detail, such as cranial capacity, DNA and age can be analysed and compared to others of similar age and / or genus, to confirm existing evidence or identify new trends / variations in biological evolution of Neandertal.
Suff	2 × a	1 × a + 1 × m	1 × a + 1 × e
TWO (a)	**Describes Oldowan tools as less sophisticated / less refined / fashioned on one side only compared to Acheulian tools which are more sophisticated / more refined / bifacial.**	**Explains how Oldowan tools compare to Acheulian tools in their design AND manufacture.** Eg Oldowan tools are **pebbles** with a **few flakes** removed from one side. AND Acheulian tools appear to have a **tear-drop shape**, made with greater precision and many more finer blows to remove more flakes to produce specific shapes such as the **hand axe**. Acheulian tools required more planning to make and more stages in their manufacture.	

(b)	**Describes TWO items of evidence from the fossil data** Eg *H. erectus* found at sites outside of Africa, in Asia. *H.erectus* has larger cranial capacity than other hominins believed to be around at the same time or earlier. *H.erectus* fossil sites show evidence of Acheulian tools. *H.erectus* fossil sites show evidence of the use of fire.	**Uses TWO items of evidence from the fossil data and links it to the ability of *H. erectus* to survive outside of Africa and describes ONE conflicting item of evidence OR discusses TWO items of data that conflicts with evidence that *H. erectus* was first to leave Africa.** Eg *H. erectus* skulls show increased cranial capacity and fossil sites a more advanced Acheulian tool culture, which would have been better for hunting and scavenging. *H. erectus* skulls show increased cranial capacity indicating better communication / planning / cooperation leading to improved chances of survival. *H. erectus* have more advanced Acheulian tools therefore would have had the ability to access meat as a supply of additional calories / energy. *H erectus* used fire – able to keep warm in cooler regions / Use of fire lead to better / stronger tools → more successful hunting and increased food / Use of fire to cook food / meat to access additional protein / energy / Use of fire as protection from predatory animals. AND Desribes ONE conflicting item of evidence (see below) OR (TWO items) Conflicting evidence about being the first hominin to leave Africa comes from Georgia (Europe / Asia) where a species, named *H. georgicus*, dated earlier than *H. erectus* 1.6-1.7 mya), with a cranial capacity of only 600-780cm^3 and associated with Oldowan tools has been found. *H. georgicus* is not associated with fire or the ability to produce the more advanced tool culture for accessing high protein food, thought necessary to survive outside of Africa.	**Discusses TWO items of evidence from the fossil data, linking it to the ability of *H. erectus* to survive outside of Africa AND discusses TWO items of evidence that conflicts with the view that *H. erectus* was the first to leave Africa.** Eg *H. erectus* skulls show increased cranial capacity and fossil sites a more advanced Acheulian tool culture, which would have been better for hunting and scavenging. *H. erectus* skulls show increased cranial capacity indicating better communication / planning / cooperation leading to improved chances of survival. *H. erectus* have more advanced Acheulian tools therefore would have had the ability to access meat as a supply of additional calories / energy. *H erectus* used fire – able to keep warm in cooler regions / spend time making tools for hunting or processing meat at a home base / Use of fire lead to better / stronger tools → more successful hunting and increased food. *(Additional evidence may be introduced, not given on the table, to support discussion and should be accepted provided it is correct).* AND Conflicting evidence about being the first hominin to leave Africa comes from Georgia (Europe / Asia) where a species, named *H. georgicus*, dated earlier than *H. erectus* 1.6-1.7 mya), with a cranial capacity of only 600-780 cm^3 and associated with Oldowan tools has been found. *H. georgicus* is not associated with fire or the ability to produce the more advanced tool culture for accessing high protein food, thought necessary to survive outside of Africa.
Suff	2 × a	1 × m	1 × e

THREE (a)	**Skull structures relating to mode of locomotion are identified for each species. Eg centralised foramen magnum or nuchal crest.** **(TWO)** Eg: • Foramen magnum at **back** – gorilla is quadrupedal / knuckle-walker • Foramen magnum more (centred) / forward – *Australopithecus* is mostly bipedal. • Foramen magnum is centred **under** the skull – *H sapiens* is bipedal. (NOT middle of skull)	**Trends in skull structure. Eg centralised foramen magnum AND nuchal crest are linked to the mode of locomotion for each species, to explain how they assist in movement.** **(THREE)** Eg: • Foramen magnum at back,– gorilla is quadrupedal and relies on **nuchal crest / neck muscles** to keep head upright. • Foramen magnum more forward – *Australopithecus* is mostly bipedal but relies on nuchal crest / neck muscles to keep head upright. • Foramen magnum is centred under the skull – *H sapiens* is fully bipedal with head balanced on spine.	
(b)	**The relationship is described.** Eg as body height increases, brain size increases (OR vice versa).	**The relationship is explained.** Eg as body height increases, brain size increases (OR vice versa). AND **A link to other biological development trends is made.** Eg increased endocranial capacity is linked to the ability to make speech and understand sounds. / Eg A change in diet to meat provided greater protein / energy which lead to increased brain developmen OR **Increased endocranial capacity is linked to the development of bipedalism.** Eg pipedalism freed hands so tools could be used to obtain "better" food.	**The relationship is discussed and linked to other trends in biological development in hominins.** Eg as body height increases, brain size increases (OR vice versa) (as each genus has become more complex in its development). AND **The importance of bipedalism is identified and discussed.** Eg bipedalism freed the hands which enabled hominins to develop tools, which have in turn enabled them to access meat, which is rich in protein and energy needed to increase brain development and therefore endocranial capacity, leading to development of speech, understanding and conceptual thought (Broca's, Wernickes and increased cerebrum). OR Bipedalism also freed the hands to allow for tool development and learning of more complex skills, and therefore selection for larger brains, requiring increased endocranial capacity.
Suff	1 × a	1 × m	1 × e

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
2 **A**	2 **M**	1 **M** + 1 **E**

Assessment Schedule – 2009

Biology: Describe trends in human evolution (90719)

Evidence statement

Q	Evidence for Achievement	Evidence for Merit	Evidence for Excellence
ONE (a)	Answer must relate to **Neandertal** (or 'opposite' comparison for gorilla) ONE of: • Finer / precision grasp / grip (NOT better grasp / grip) • Greater dexterity (not for fingers) • Fine motor control • Opposable / dexterous thumb • Manipulate smaller objects	Explain **how** OR **why.** Eg precision grip is achieved because of the **opposable thumb**. OR explanation of how opposable thumb works. Eg thumb able to touch finger (tips) for precision grip. (Note: 'tips' not necessary)	
(b)	Advantages of ONE feature. • Valgus angle shifts knees under centre of gravity / body (or explanation, eg improves balance when **walking**). • Broad & shallow (cup-shaped) pelvis supports (not protection)internal organs / better attachment for large leg muscles. • Non-divergent toe allows "thrust" in walking (NOT balance). Note: Pivot and lever not accepted – must be thrust / push.	Any TWO features explained.	All THREE features. **Includes:** Discussion of **why** more efficient? Eg. Valgus angle eliminates swagger / side to side movement
TWO (a)	Spiritual / religious / afterlife beliefs. OR Co-operation / division of labour / use of tools / home base / living as a group.	Use the given evidence to explain the social behaviour or abstract thought. Eg a concept of the afterlife is shown by the ivory beads left by the dead – a gift for them (in another life). Eg the idea that death was not the end and the mammoth shoulder-blade could be used for protection in the next life.	
(b)	Any TWO points covered: • planning • communication • cooperative behaviour • division of labour • suggests a larger group (NOT just communities) • suggests a home base.	Any THREE points covered: • planning • communication • cooperative behaviour • civision of labour • suggests a larger group (NOT just communities • suggests a home base. (Note: Planning can be implied)	Link reasons for changed social structure to allow mass kills Eg specific roles of individuals (ONE role – **not** hunter or leader).

THREE (a)	Correctly identifies the **Out-of-Africa** OR **Replacement** OR **Eve** theory as being best-supported by these data.	Modern African populations tested are 'older' than the non-African groups. OR Greater genetic diversity in African populations compared to non-African groups.	
(b)	ONE of: Neandertals and *sapiens* ancestors diverged about 500 000 years ago. OR Neandertals less diverse (on this evidence) than *sapiens*. OR Neandertals also migrated / dispersed across Europe, beginning at least 250 000 years ago. (Must indicate where they dispersed to.) OR Neandertals have disappeared soon after modern humans left Africa. OR Modern humans / *H. sapiens* appeared / dispersed in **Africa** at least 170 000 years ago. OR *Modern humans / H sapiens* first migration out of **Africa** much more recent (than 170 000 years). Diverged ≈ dispersed	TWO of OR ONE of PLUS A linked reason for dispersal (related to environmental changes). Eg changes in sea level leading to formation of land bridges (or explanation of). NOT just 'ice age'	THREE of OR TWO of PLUS A linked reason for dispersal (related to environmental changes). Eg. Changes in sea level leading to formation of land bridges (or explanation of). NOT just 'ice age'. Note: Must include at least: • ONE reference to Neandertal AND • ONE reference to modern humans. Note: "Modern humans moved out of Africa 170000 years ago" - incorrect and limits grade to 'M'.

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
4 **A**	3 **M** + 1 other	2 **E** + 1 **M** + 1 other

Assessment Schedule – 2008

Biology: Describe trends in human evolution (90719)

Evidence statement

Q	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	• *Erectus*:	• *Erectus*: overall endocranial / brain shape / structure (or implied) / bulges / size / capacity much closer to that of *erectus* than to that of the other species shown.	
(b)	Describes ONE feature of the postcranial skeleton that suggest bipedalism: • Broad / cup-shaped / short AND wide pelvis • Valgus angle of femur • Legs are longer than arms (or similar) • Large knee buttresses / larger condyles.		
(c)	Any one point: • Arms used to **support weight** (or implied), eg. knuckle-walking, quadrapedal, brachiating • Spine not taking full weight / (lesser role for spine than in modern humans) • Recognises contradiction.	• Recognises contradiction (bipedal with quadrapedal features) AND • Provides ONE piece of evidence from data or photo.	
TWO (a)	Transmission / passing on / evolution of <u>learned</u> behaviour / ideas / beliefs / abstract thought / knowledge between generations (not within a generation).		
(b)	Any ONE point • Climatic change / conditions (weren't right for agriculture any earlier.) • Food shortage existed • Regional populations exposed to similar population / selection pressure • Increasing population numbers • Sufficient brain / cultural evolution. (**A only**)	ONE idea with reason explained: • World had come out of the last glacial period : warmer and moister conditions more suitable for establishing agriculture. • Food shortage / high population numbers – therefore grew more plants to provide more food.	
(c)	Domestication and milking of cattle / goats / sheep (a **named** animal).		

(d)	• Population increased because more food available (NOT just population increased). OR (**A only**) • One point from the 'M' column.	This resulted in: (explanation of TWO) <u>Advantages</u> • Development of economic activities (eg: trading surplus goods for other items) • Division of labour. (eg. some cultivated plants, others tended animals, others made tools) <u>Disadvantages</u> • Negative effect: large numbers of people in close proximity → easier / faster spread of infectious disease. • City-dwellers had poorer health than hunter-gatherers due to increased reliance on high-carbohydrate diet. • Contamination of stored food (fungi / weevils) lead to starvation / disease over winter. • Adverse climatic conditions destroy the crop (or similar).	Discussion includes THREE points with at least ONE advantage **and** ONE disadvantage <u>Advantages</u> • Development of economic activities (eg: trading surplus goods for other items) • Division of labour. (eg. some cultivated plants, others tended animals, others made tools). <u>Disadvantages</u> • Negative effect: large numbers of people in close proximity → easier / faster spread of infectious disease. • City-dwellers had poorer health than hunter-gatherers due to increased reliance on high-carbohydrate diet. • Contamination of stored food (fungi / weevils) lead to starvation / disease over winter. • Adverse climatic conditions destroy the crop (or similar).
THREE (a)	Out-of-Africa hypothesis / Eve hypothesis / Replacement hypothesis.		
(b)	<u>Definition</u> (ONE) <u>OOA</u> – Early hominins **left Africa** and **spread to Asia/Europe**. All died out. **Replaced by H. sapiens** leaving **Africa** (2nd exodus) relatively recently <u>MR</u> – Early hominins (H. erectus) **left Africa** and **spread to Asia/ Europe**. **Gene flow** between separate populations. All **evolved into H. sapiens**. OR ONE <u>example of evidence</u> in support of OOA: • Oldest **H. sapiens** fossils only found in **Africa** • **Transitional fossils** only found in **Africa** • Modern humans appeared in Africa before Neanderthals disappeared • mtDNA can be used to trace lineage back to Africa • mtDNA very similar in all modern humans • Greater variability in DNA/genes in modern African populations compared to other regions • Older **Upper Paleolithic** tools only found in **Africa.**	Links definition (or implied) to TWO items of evidence in support of **Out of Africa** hypothesis.	Discusses why evidence supports Out of Africa hypothesis (ONE reason) AND • Why evidence does NOT support Multi-regional hypothesis (ONE reason) OR • Outlines ONE limitation of evidence used to support Out of Africa hypothesis. Examples: • High levels of gene flow would be needed for Multi-regional hypothesis (very unlikely). • Transitional fossil found in China (against OOA). • mtDNA data can be interpreted in different ways (not necessarily support of OOA).

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Total of FIVE opportunities answered at Achievement level or higher. 5 × A	Total of at least FIVE opportunities answered with TWO at Merit level or higher. 2 × M + 3 × A	Total of at least FIVE opportunities answered with ONE at Excellence level and TWO at Merit level or higher. 1 × E + 2 × M + 2 × A

Assessment Schedule – 2007

Biology: Describe trends in human evolution (90719)

Evidence Statement

Q	Achievement	Achievement with Merit	Achievement with Excellence
One (a) (i) & (ii)	Correctly identifies and clearly states the nature of ONE difference: • Big toe separated from other toes in chimpanzee / big toe in line with other toes in hominin /opposable toe (not thumb); OR • Presence of an arch in hominin foot. ***Must be qualified if for hominins.s***	Explains the significance of this feature: linked to **bipedalsim** • Toes in line → improved locomotion as big toe acts as a pivot for thrust. • Arch gives extra "spring" in step.	
(b)	Describes TWO **features** of the pelvis that differ in chimp and hominin (must clearly state nature of difference): Pelvic bones in **chimp** are • pelvis overall is longer • narrower than in homin • femur attachment point vertical. OR pelvic bones in **hominins** • pelvis is shorter • broader • more cup/bowl-shaped. • Femur attachment point angled. NOT pelvis is larger or smaller		
(c)	Describes any ONE feature • Muscle attachments **different** or changed • Bowl-shaped pelvic girdle supports internal organs **(A only)** • Changes the carrying angle / valgus angle (or implied) (eg. knock-kneed).	Recognises that the changed shape of the hominin pelvis is **beneficial** in locomotion: • Changes position of **muscle attachment** → more **efficient** locomotion; • Carrying angle – more efficient locomotion because movement not side to side (or implied) / balance / stability when walking. ***NOT just "more efficient movement".***	
(d)	Recognises that the diameter of the pelvic inlet is related to the size of the infant **head/brain**.	Increased diameter of inlet in *sapiens* → modern infants are **<u>born</u>** *(or implied)* with a proportionally larger head (cranial capacity) than *erectus* infants. ***Need to reference to at least 1 hominin.***	
(e)	Identifies at least ONE selection pressure: • Pressure for increased size of inlet – bigger brain/increased intelligence • Pressure for decreased size of inlet – better locomotion. ***Must mention pelvic inlet/girdle.***	Explains BOTH of these: • Human babies born with much larger brains than other primates – must be supported by larger pelvic inlet • Width of inlet affects locomotion. ***Selection must be implied.***	Discusses BOTH to some degree: **Trade-off** between +ve and –ve; • Ability to give birth to larger-brained babies • Impact on locomotion – more efficient with smaller pelvic inlet. ***Must mention selection or selection pressure*** *(not just implied).*

Q	Achievement	Achievement with Merit	Achievement with Excellence
Two (a)	Identifies TWO uses of fire • warmth • defence • cook food • provide light at night • herding animals (not hunting) • making tools.	**Benefits** of using fire (TWO) • at night/in colder areas NOT just "able to survive • anti-predator defences eg. fire scares away predators • easier to digest/destroy NOT easier to eat parasites/access greater range of food / more palatable / preserve food • for toolmaking/preparing food / planning NOT just 'activities' or 'socialising' • to get more food • harden points of wooden tools / weapons.	
(b)	Correctly identifies trend • Increasing cranial capacity in younger / more recent hominin species.		
(c)	*Describe trend in relation to cranial capacity* Cultural development appears to have a link with increasing cranial capacity: • simplest tools made by species (*habilis* or earlier australopiths) with lower cranial capacity. • increasing cranial capacity linked with more sophisticated / refined / complex tools / communication / artwork • domestication must be linked to sapiens with larger cranial capacity • fire / home base / cave art – only if linked to **cranial capacity**.	*Links **ONE or more named species** to give trend* Simplest tools made by earlier species,: • *habilis* and Oldowan tools; *erectus* and Acheulean culture; Mousterian of neandertals and early *sapiens*; extremely complex tool kits of later *sapiens*. • 2 or more specific examples of tool type OR details of tools Language: Broca's OR Wernicke's area linked to development of language w.r.t. ONE named species. AND states link with increased cranial capacity.	*Explains how their brain is linked to trend* Higher cranial capacity implies increased intellectual capacity. ***Must compare 2 named species*** • Examples of 2 or more tools used, eg. scrapers;hand axes; spears OR • How the tools were made, eg. chipping; flaking, perforated OR • ability to develop techniques for increasing number of tools created from one piece of stone OR • ability to plan co-operative group activities (where communication is required) such as hunting / tool making AND • states link with increased cranial capacity.
Three (a)	Migration was relatively rapid / fast / quick. This **must** be correct to get an "M".	*H. erectus* in Indonesia around 1.8 mya; oldest African fossils only 1.9 mya: implies relatively rapid migration of popn. ***Evidence w.r.t. Africa. Must state specific m.y.a.***	

Q	Achievement	Achievement with Merit	Achievement with Excellence
(b)	Describes changes to habitat. • Less food → needed to migrate for new resources / food NOT just water / cold **These don't have to be linked to migration:** • Habitat change forest → savannah • Drop in sea level → land bridge.	Explain how (ONE) change helps **migration** • change from forest to woodland / grassland areas • Potential for drop in sea level to expose new migration routes (land bridges) • Pressure to expand into new ranges; follow prey / food plants to **reduce competition.**	Links aspects to discuss – considers impact of TWO. • Habitat change with specific example of how this leads to greater survival, eg. new hunting / foraging areas to exploit • Pressure to expand into new ranges; follow prey / food plants to **reduce competition** • Potential for drop in sea level to expose new migration routes (land bridges).
(c)	Identifies tool-making ability and / or social behaviour and / or communication as necessary for boat/raft building. **Need TWO points** • making tools • abstract thought • communication • cooperation • curiosity.	Explains that boatbuilding would require: **Identify TWO points and *explain ONE (from tools or communication).*** • Some degree of abstract thought: *must have recognised that floating objects could make it across straits / what is beyond their shore?* • Communication –are able to communicate *because of* ***speech areas in the brain*** OR ***linked to co-operative behaviour*** • Capable of making the necessary relatively complex tools. *Eg. example of complex tool* • Co-operation – co-operation of **group** / **team** needed to complete task of building boat / raft.	Discusses at least TWO of these points: • Some degree of abstract thought: must have recognised that floating objects could make it across straits • Communication – are able to communicate because of **speech areas in the brain** OR linked to co-operative behaviour • Capable of making the necessary relatively complex tools. Either explanation or example of complex tool.

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
SIX questions answered correctly. Minimum of $6 \times A$	SIX questions answered correctly, including at least FOUR at Merit level. Minimum of $4 \times M + 2 \times A$	SEVEN questions answered correctly, including at least TWO at Excellence level and at least THREE at Merit level. Minimum of $2 \times E + 3 \times M + 2 \times A$

Assessment Schedule 2006

Biology: Describe trends in human evolution (90719)

Evidence Statement

Question	Achievement	Achievement with merit	Achievement with excellence
1(a)	Gives TWO primate skull features, eg • relatively large cranium • forward-facing orbits / binocular vision • brow ridge • walled off eye sockets • generalised dentition.		
1(b)	Describes a feature of the skull for or against bipedalism, eg • bipedal as foramen magnum under skull / more centralised • bipedal as reduced nuchal crest. • not bipedal as foramen magnum is located at the rear.	Relates the feature to the ability of the head to be balanced on the spine, eg • foramen magnum under skull / more centralised suggests that skull is balanced on top of vertical spinal column, implying bipedalism.	
1(c)	Describes **any two** features of a post-cranial skull that indicate bipedalism, eg • valgus angle • lower end of femur buttress flatter • big toe aligned with rest of foot • arches in foot • spinal column has S-curve • bowl shaped pelvis.		
1(d)	Describes two advantages, eg • can reach up higher • hands freed for other functions • see over grass / bush • more energy efficient • less surface area to sun • more surface area to wind • appear larger to predators.	Gives a reason why both are advantages, eg • can reach up higher allowing access to food / climbing branches • hands freed so can carry food / offspring / tools • see over grass / bush which allows better scavenging / improved ability to spot predators or prey • more energy efficient so can travel greater distances • less surface area to sun so energy not wasted in cooling down • more surface area to wind so cool down quicker.	Discussion that clearly compares the advantages in both habitats, eg • In both the savannah and forest bipedal hominins would have been upright allowing them to see predators. In the savannah they would have been less susceptible to heat exhaustion as less of their body surface is directly in the sun and they would be more exposed to cooler air breezes. In the forest it would have been easier to reach food. In both habitats movement is more efficient.

2(a)	Describes a feature of the human hand that allows greater precision and dexterity, eg • opposable thumb • sensitive skin • A longer thumb.		
2(b)	Describes a trend in tool manufacture, eg: • length of cutting edge increases • number of blows increases. • more precise tools • more refined tools • more time taken making tools.		
2(c)	Describes how **OR** why Cro-Magnon society supports the toolmakers, eg • (how) By being settled in one place. • (how) Role specialisation provides toolmakers with their needs eg food, clothing protection. • (why) Only some people would be toolmakers. • (why) The society enables toolmakers: more time to make tools / to make tools more effectively / provide tools for a wider range of activities. • (why) toolmakers were valued.	Links how **AND** why Cro-Magnon society supports the toolmakers, eg • By being settled in one place only some people would be toolmakers / toolmakers would have more time to make tools. • Role specialisation provides toolmakers with their needs so they can make tools more effectively.	Links reasons for how **AND** why with significance of specialisation (greater efficiency) eg: • By being settled in one place only some people would be toolmakers which enabled better-specialised tools for better hunting / opportunity for learning from specialists (specialisation of roles).
3(a)	Describes how humans were able to migrate so rapidly, eg • due to a lowered sea level • due to land bridges being created • constant food supply around the coast.	Explains how humans were able to migrate so rapidly, eg • It would be possible to reach many areas via land bridges as it means a shorter / safer route. • Straits between islands could be narrower – more likely to use boats / rafting to cross straits. • Coastal travel would be easier on newly-exposed continental shelf with ready food supplies in shallow coastal waters.	
3(b)	Describes why humans were slow to colonise Europe, eg • The coastal Asian route was potentially easier to travel. • Europe was heavily glaciated • Neanderthals were already present in Europe. • Much colder in Europe.	Explains why humans were slow to colonise Europe, eg • European climate much more severe than the more southerly coastal route, forcing more southerly travel / so harder to get food. • Neandertals were already present in Europe creating competition. • Too cold in Europe as adapted to warmer climates so migrated further south.	

3(c)	Describes how the data in Fig 5 supports rapid migration, eg • Very flat branching pattern in the phylogeny. • The sudden emergence of many populations 50-65,000 yrs ago. • The divergence occurred in all the coastal populations.	Links the rapid divergence with all the coastal populations, eg • The very flat branching pattern in the phylogeny shows all the coastal populations formed over a short period of time. • The sudden emergence of many populations 50-65,000 yrs ago in all the coastal regions.	
3(d)	Describes how the information relates to either the replacement or the multiregional hypothesis, eg • supports the replacement hypothesis • does not support the multiregional hypothesis.	Gives a reason why the information supports the replacement hypothesis **or** does not support the multiregional hypothesis, eg • The non-tasting allele / gene evolved arose before modern humans left Africa supporting the replacement hypothesis. • As there are lots more alleles in Africa than out of Africa it supports the replacement hypothesis.	Discusses how the information supports the replacement hypothesis **and** does not support the multiregional hypothesis, eg • The non-tasting allele arose before exodus ~100 000ya in Africa and then diversified in Africa after the exodus thus emigrants do not have 7 / newer / 5 extra versions / just non-tasting and original alleles. This supports the replacement hypothesis of homo sapiens evolving in Africa and then migrating throughout the world. This evidence does not support the multi-regional hypothesis as otherwise all the alleles would be found outside Africa.

Judgement Statement

Biology: Describe trends in human evolution (90719)

Achievement	Achievement with Merit	Achievement with Excellence
SIX questions answered correctly. Minimum 6 × A	SEVEN questions answered correctly, including at least FOUR at Merit level. Minimum 4 × M + 3 × A	EIGHT questions answered correctly, including at least THREE at Merit level and at least TWO at Excellence level. Minimum of 2 × E + 3 × M + 3 × A

Assessment Schedule – 2005

Biology: Describe trends in human biological and cultural evolution (90719)

Evidence Statement

Q	Achievement	Achievement with Merit	Achievement with Excellence
1(a)	Describes a feature of the skull that would show that *Homo floresiensis* walked upright Eg: • Foramen magnum underneath the skull • occipital condyles underneath the skull / pointing down • Small nuchal crest / neck muscle attachment area.		

Q	Achievement	Achievement with Merit	Achievement with Excellence
1(b)	Describes a feature of *Homo floresiensis* that shows it is a member of the genus *Homo* (i.e. compared to earlier hominins) Eg: • teeth small, similar to the genus *Homo* • has the narrow nose associated with the genus *Homo* • brain case proportionately larger compared to earlier hominins (like genus *Homo*) • brow ridge less prominent than that of earlier hominins • reduced muzzle / prognathism similar to genus *Homo* • flat face similar to the genus *Homo* • position of foramen magnum similar to that of genus *Homo* • size of nuchal crest small, similar to that of genus *Homo* **OR** that it is more like *Homo erectus* / not like *Homo sapiens.* Eg: • low brain case more like *H. erectus* • more prominent brow ridge more like *H. erectus* • no prominent chin unlike *H. sapiens* • has a proportionally wider zygomatic arch / cheek bone similar to *H. erectus* • size of jaw/teeth/molars larger than *H. sapiens.*	Explains a feature of *Homo floresiensis* that shows it is a member of the genus *Homo* **OR** that it is more like *Homo erectus* / not like *Homo sapiens.* Eg: • The teeth are small which is similar to the genus *Homo.* The Australopithecines, and present-day apes, have large teeth because they have a different diet. • Has a brow ridge which is not as prominent as the earlier hominins because *H. floresiensis* eats different food and the skull needs less buttressing. • *Homo floresiensis* skull shown has a low and broad brain case of a similar shape to *Homo erectus*, / not as rounded and high as *Homo sapiens*: which has a very large frontal region to the brain. • Zygomatic arches larger than *H. sapiens* because of differences in diet / food processing.	Discusses why a feature demonstrates that it is a member of the genus *Homo* **OR** why it is more like *Homo erectus* than *Homo sapiens* Makes links between the feature and the evolutionary trend Eg: • Members of the *Homo* genus have a smaller brow ridge than earlier hominins. As the evolution of hominins progressed, they ate a higher proportion of more refined foods such as meat instead of coarse foods such as root tubers. Later *Homo* species also cooked their food, further refining the food they ate. As food became less coarse, less grinding of food by teeth was required and the strain of chewing on the skull decreased. Therefore the skull required less structural support from the brow ridge, which diminished in size. *Homo floresiensis* has a brow ridge which is similar in size to other members of the *Homo* genus and not as prominent as that of the hominins prior to *Homo* genus eg *Australopithecus*. This supports the conclusion that *Homo floresiensis* belongs in the *Homo* genus. • *Homo erectus* has larger zygomatic arches than *H. sapiens*. *H. sapiens* ate a higher proportion of more refined foods such as meat instead of coarse foods such as root tubers. As food became less coarse, less grinding of food by teeth was required and the chewing muscles which pass through the zygomatic arches decreased in size. Therefore the zygomatic arches themselves diminished in size. *Homo floresiensis* has zygomatic arches that are similar in size to *H. erectus* and more prominent than those of *Homo sapiens*. This supports the conclusion that *Homo floresiensis* is more closely related to *H erectus* than *H. sapiens*.

Q	Achievement	Achievement with Merit	Achievement with Excellence
1(c)	Describes that Upper Paleolithic tools are associated with *Homo sapiens/neanderthalensis* **AND** that you would expect *Homo floresiensis* to be associated with Acheulean tools.	Explains that the brain size of *H. floresiensis* is too small to make complex tools **OR** *Homo floresiensis* is more closely related to / more closely resembles *H. erectus* (than *H. sapiens)* and *H. erectus* used Acheulean tools.	
1(d) (i)	Describes the function of Wernicke's area as the recognition / comprehension of **spoken words.** Not 'communication'.		
1(d) (ii)	Describes that coordinated hunting / hunting in groups needs good communication.	Explains communication allows reduction of risk / increased success / increased effectiveness.	
1(e)	Describes that the **ancestors** of *Homo floresiensis / H. erectus* used fire. Ie trends in evolution.	Explains that ***Homo erectus*** used fire and they are the ancestors of *Homo floresiensis* so they would be expected to use it too.	
1(f)	Describes 'S'-shaped.		

Q	Achievement	Achievement with Merit	Achievement with Excellence
2(a)	Describes **EITHER** the 'Out of Africa' / Replacement Theory / Hypothesis **OR** the multiregional theory Eg: *(H. erectus)* migrated out of Africa, formed populations that were not completely isolated in (Europe, Asia and Africa). ***H. sapiens* / modern humans** evolved from these linked populations. **OR** *(H. erectus)* migrated out of Africa and formed populations in (Europe, Asia and Africa). *H. sapiens* / modern humans evolved in Africa and dispersed into Europe and Asia, replacing (*H. erectus)* ie **2 waves described**.	Answer identifies which theory the information supports / explains why Eg: The pattern shown by the diagram supports the 'Out of Africa' theory because the diagram shows that: • *H. erectus* moved into Asia (and other *Homo* species moved into Europe): • The origin of *H. sapiens* was in Africa: • *H.sapiens* moved out of Africa: • The other *Homo* species eg *H. erectus* became extinct **which** are consistent with the 'Out of Africa' theory. **OR** Eg: The pattern shown by the diagram does not support the 'Multiregional' theory because the diagram does not show that: • The populations of *H. erectus* were not completely isolated : • *H.sapiens* evolved simultaneously / in paralell in different regions **which** are consistent with the 'Multiregional' theory. **OR** Eg: The pattern shown by the diagram supports the 'Multiregional' theory / does not support the 'Out of Africa' theory because the diagram shows that: • The populations of *H. floresiensis* and *H. sapiens* were not necessarily genetically isolated: • *H.sapiens* may have evolved independently in different regions **which** are consistent with the 'Multiregional' theory / not consistent with the 'Out of Africa' theory.	Discussion identifies that the information supports the 'Out of Africa Theory', and explains why **AND** does not support the multiregional theory and explains why. Eg: The pattern shown by the diagram supports the 'Out of Africa' theory because the diagram shows that: • *H. erectus* moved into Asia approx. 1mya (and other *Homo* species moved into Europe): • The origin of *H. sapiens* was in Africa: • *H.sapiens* moved out of Africa: • The other *Homo* species e.g. *H. erectus* became extinct **which** are consistent with the 'Out of Africa' theory. **AND** The pattern shown by the diagram does not support the 'Multiregional' theory because the diagram does not show that: • The populations of *H. erectus* were not completely isolated : • *H.sapiens* evolved simultaneously / in paralell in different regions **which** are consistent with the 'Multiregional' theory. **OR** Eg: The pattern shown by the diagram supports the 'Multiregional' theory **and** does not support the 'Out of Africa' theory because the diagram shows that: • The populations of *H. floresiensis* and *H. sapiens* were not necessarily genetically isolated: • *H.sapiens* may have evolved independently in different regions **which** are consistent with the 'Multiregional' theory **and** not consistent with the 'Out of Africa' theory.

Q	Achievement	Achievement with Merit	Achievement with Excellence
2(b) (i)	Describes a cultural change brought about by agriculture and the domestication of plants and animals. Eg: • development of settlements / towns / cities • less nomadic • increased care for animals • improved health/nutrition • better housing • division of labour • development of technologies incl. tools / commerce / communication / politics / transport • **increased development** of new ideas such as the written language / education / religion • **increased socialising.**		
2(b) (ii)	Describes a disadvantage of agriculture to *Homo sapiens.* Eg: • crops all matured at the same time • **group vulnerable to loss of food** by bad harvest caused by eg weather / diseased crops • conflict over ownership of resources • become reliant on agricultural skills • need to stay in one place / more dense population • increased specialisation • disease / parasites from animals.	Explains a disadvantage of agriculture to *Homo sapiens.* Eg: • storage required, wastage could occur • may have led to starvation or nutrition deficiency diseases • fighting over ownership of good growing land / animals would lead to injuries / the need for guard role / reduced labour force • whole group vulnerable to starvation or nutrition deficiency diseases if agricultural system breaks down eg drought / crop disease • difficulty in disposing of waste / using up resources / inability to follow migratory animals / spreading disease • lose ability to survive individually • reduced health.	

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Total of FIVE opportunities answered at Achievement or higher. 5 × A	Total of SEVEN opportunities answered with THREE at Merit level or higher. 3 × M + 4 × A	Total of EIGHT opportunities answered with at least ONE at Excellence level *and* THREE at Merit level. 1 × E + 3 × M + 4 × A