



GRADE 12 LIFE SCIENCES

TRIAL EXAMINATIONS

PAPER II MEMO

1.1.1	Two different species are genetically related ✓ But shared a common ancestor very long ago ✓	(2)
1.1.2	Two genetically similar individuals ✓ that can interbreed ✓ and produce fertile offspring ✓	(3)
1.1.3	The gradual change ✓ of characteristics of a particular species over time ✓	(2)
1.2	Convergent evolution ✓ The sugar gliders and flying squirrels both developed flap like structures to fly, but they developed them separately. ✓ Sugar gliders evolved in New Guinea and Australia and is closely related to kangaroos ✓ Flying squirrels evolved in North America and developed into a placental ✓ Any THREE points	(3)
1.3	No ✓ These are analogous structures. The adapted the piece of skin that allows them to 'fly' separately ✓ and developed separate lineages. ✓ OR 'Wings' / flaps of skin look similar ✓, but developed/evolved separately ✓.	(3)
1.4	In both populations there would have been genetic variation ✓. Some squirrels and gliders had the ability to 'fly' whereas others did not ✓. The gliders and flying squirrels that were able to 'fly' was more suited for survival ✓ as they could escape predators ✓ more easily. The gliders and squirrels that did not have the ability to 'fly' was preyed upon and died out. ✓ The gliders and flying squirrels that were able to 'fly' passed the trait on to their offspring. ✓ Over time, there were only gliders and squirrels with the ability to 'fly'. ✓ Any SIX points	(6)
1.5	The gliders and flying squirrels would have needed a feature to effortlessly cover distances between trees. ✓ As they tried to jump from tree to tree, they would have had to stretch their legs ✓. Over time, the piece of skin would have stretched into what they have currently ✓, and they passed on that trait to their offspring. ✓	(4)
1.6	Allopatric/Geographic speciation ✓ The sugar gliders and flying squirrels would have been separated by a geographical barrier ✓ – the ocean ✓. Sugar gliders evolved in Australia and Flying squirrels evolved in North America.	(3)

1.7	Similar – Both have fur, same size, big eyes, white belly, glide from treetops using a thin piece of skin stretched between their legs ✓ Any ONE Difference – Sugar gliders have a pouch, flying squirrels have no pouch; Sugar gliders are marsupials, flying squirrels are placentals; Sugar gliders have more teeth than flying squirrels; Sugar gliders have multiple holes in the bone that forms the top of the mouth, and flying squirrels do not ✓ Any ONE	(2)
1.8	The distribution of the species is most likely due to continental drift ✓ occurring, separating individuals of the same species ✓ and then they evolved separately on different continents. Both have a common ancestor on Pangea ✓	(2)

[30]

2.1.1	True ✓	(1)
2.1.2	False ✓	(1)
2.1.3	True ✓	(1)
2.2	This led to more social behaviour, development of conversation/language and permanent dwelling sites. ✓ More protection from predators at night. ✓ Cooperative hunting ✓ Meat could be softened by cooking, leading to more protein being eaten which may have aided brain development. ✓ Allowed <i>H. erectus</i> to migrate out of Africa and survive in colder climates. ✓ Any TWO	(2)
2.3	DNA evidence suggest that there is a shared common ancestor ✓ between <i>Homo sapiens</i> , <i>Homo neanderthalensis</i> and the Denisovans. ✓ Some modern humans have Neanderthal DNA present in their genome. ✓	(3)
2.4	Neanderthals live until about 40 000 ✓ years ago, where as <i>Homo sapiens</i> has been around for about 200 000 years. ✓ This indicates that both <i>Homo sapiens</i> and <i>Homo neanderthalensis</i> were around for approximately 160 000 years. Some humans have 2% neanderthal DNA ✓ – reproduced with each other ✓	(2)

2.5	<table><tr><th>Feature</th><th>Benefit to bipedalism</th></tr><tr><td>Foramen magnum</td><td>Positioned at the centre to place the centre of the skull on the spine</td></tr><tr><td>Longer feet with stable arch</td><td>Supports the whole body weight for walking/running</td></tr><tr><td>Bows shaped pelvis</td><td>Supports the trunk in an upright position</td></tr><tr><td>Femur</td><td>Longer and set further apart to allow knees to slant towards the midline – makes walking and running more efficient</td></tr><tr><td>Spine</td><td>S-shaped curve to keep the trunk centred above the pelvis to aid upright walking</td></tr></table>	Feature	Benefit to bipedalism	Foramen magnum	Positioned at the centre to place the centre of the skull on the spine	Longer feet with stable arch	Supports the whole body weight for walking/running	Bows shaped pelvis	Supports the trunk in an upright position	Femur	Longer and set further apart to allow knees to slant towards the midline – makes walking and running more efficient	Spine	S-shaped curve to keep the trunk centred above the pelvis to aid upright walking	
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	Three features identified ✓ ✓ ✓ Explanation as to how it contributes to bipedalism ✓ ✓ ✓ Table correctly formulated ✓	(7)												
2.6	<i>Homo neanderthalensis</i> has a cranial capacity between 1200 and 1750 cm ³ whereas <i>Homo sapiens</i> have a cranial capacity of around 1350 cm ³ . ✓ This indicates that the Neanderthals possibly had larger brains than modern humans ✓, but it was in proportion to their body size – therefore it does not indicate that they were more intelligent than modern humans. ✓ Regions of the brain could be more/less developed ✓	(3)												
2.7	Increased competition between <i>Homo neanderthalensis</i> and <i>Homo sapiens</i> .	(1)												
2.8	They have a very small sample size ✓ to make a valid comparison, they will need to find more fossils ✓ with mtDNA in tact in order to reach a valid conclusion. ✓	(3)												
2.9	<i>Homo erectus</i> left Africa and evolved into <i>H. neanderthalensis</i> ✓ 1 – 2 million years ago. 60 000 years ago, there was a major wave of <i>H. sapiens</i> ✓ that left Africa. They replaced the existing species in Asia and Europe. ✓	(3)												
2.10	A small number of individuals ✓ of <i>H. sapiens</i> arrived in Australia. They evolved separate features ✓ and found a new population of <i>H. sapiens</i> in that area. ✓	(3)												

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	Yes, there is enough evidence for Punctuated Equilibrium	No, there is not enough evidence for Punctuated Equilibrium
Source A	Definition of punctuated equilibrium (can be extended for OK)	Definition of gradualism (can be extended for OK)
Source B (credible)	Most individuals do not fossilise, so that chances of finding transitional fossils is low. Rapid changes can occur due to selection pressures to fuel allopatric speciation. Speciation occurs in a short space of time. Available fossil record is adequate to assess questions about evolution. Gaps in fossil record gives us more information on evolution.	There is a lack of transitional fossils. Imperfect fossil record – jump in species is due to incomplete record.
Source C (no source of credibility)	There is experimental evidence for a sharp change in conditions/intensive selection leading to a sharp increase in variability. A new species can arise due to a destabilized population. 22% of DNA difference occurring during brief periods of intensive speciation.	The difference in fossil record could be due to the movement of species. Evidence for a sharp change in conditions/intensive selection is experimental. 78% of DNA differences occur gradually over long periods of time.
Source D	The fossil record shows rapid evolution.	The gaps in the fossil record could be due to fossils not forming in time.
Source E (credible)	Fossil record shows a long period of stasis with bursts of change.	Darwin's observations led to a conclusion that there is a steady accumulation of small modifications over time.

	Gradual changes are not always visible in the fossil record. Research shows that stasis is a real phenomenon.	
Source F (not credible)		Not everything that dies becomes a fossil. Not all fossils have been found. Not all fossils that have been found, are intact enough to study. Only animals with body parts made of hard materials fossilize well. Soft bodied organisms don't fossilize. Conditions must be perfect for fossilization to occur. Animals that eat other dead animals often spread-out bones and shell parts. Sediment isn't always present. Tectonic activity could dislodge a fossil. Volcanic ash could cover the rock containing a fossil, which means it will take longer to be exposed. Fossils could easily be destroyed.
Source G (credible)	Many studies are done with collaboration from other scientists.	Most palaeontological data is from researchers in high- and upper-middle-income countries, therefore many areas of the world not yet studied.

OK – examples of gradualism/punctuated equilibrium.
Any information regarding the study of fossils.
Definition for gradualism/punctuated equilibrium extended beyond what is given in the text.
Any information regarding transitional fossils (archaeopteryx)