



NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2023

LIFE SCIENCES: PAPER II

MARKING GUIDELINES

Time: 2 hours

100 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

SECTION A**QUESTION 1**

- 1.1 1.1.1 (Bipedal) animals/primates/fossils
showing a mixture of ape-like and human-like characteristics /
humans
and their close extinct relatives
- 1.1.2 (Cumulative) genetic changes
in a population over time
The process by which different kinds of living organisms developed
from earlier forms
during the history of the earth /
changes that occur in species/populations
due to natural selection/genetic drift/founder effect/environmental
changes
- 1.2 1.2.1 *Australopithecus afarensis*
- 1.2.2 (3 670 000 – 500 000)
= 3 170 000 (if incorrect method, give mark for identification of correct
values)
- 1.3 1.3.1 A statement
predicting the results of an experiment /
proposed answer
to a question regarding a scientific phenomenon /
statement or predicted outcome
regarding a scientific phenomenon /
a testable statement
about the relationship between two or more variables /
a proposed explanation
for some observed phenomenon
- 1.3.2 (a) Hypothesis 1
- (b) The bones were still connected together
which wouldn't be possible if predators had pulled the bones
apart.
If the bodies decomposed, then bones would not be
connected.
The bones would have markings/damage on them from
predators that ate the body.
The bones would not be in one place if they were washed in
over time.
Accept other suitable explanations
- 1.4 1.4.1 2
1.4.2 1
1.4.3 none

- 1.5 1.5.1 Long grass in environment
– beneficial to be able to see over it to spot predators/prey
Lack of trees/increase in grassland
– bipedal locomotion is more efficient over long distances on ground
More sun exposure/less shade
– standing on two legs results in less skin exposed to sun
- 1.5.2 Bowl-shaped hips/long legs/
Neck vertebra below skull/
Foramen magnum vertically below skull/
Upright posture
- 1.5.3 (a) Large shoulders/
large scapula/
long arms/
divergent big toe
- (b) Large shoulders/scapula for attachment of muscles
for arms for arboreal behaviour in trees
Long arms more important than legs therefore more developed
for swinging in trees/knuckle walking
Divergent big toe – use of toe
to grip branches
Large molars indicate herbivory
therefore more likely to live in trees to access fruit/nuts
- 1.6 The fact that humans originated in Africa means that politically it is important
for the rest of the world to regard Africa as important and significant /people
often regard Africa as contributing nothing of scientific importance
It opposes apartheid/racist ideas/colonialist ideas
that Africans are 'behind'/'less than'
Europeans in ability/development/culture, etc.
Accept other reasonable answers
- 1.7 1.7.1 *Homo sapiens*
- 1.7.2 3,3–3,4 million years ago
- 1.7.3 B
- 1.8 The bones are embedded in breccia – need to distinguish between rock and
bone
Bones can be very fragile
– Need to remove breccia slowly and carefully/must not damage bone
Safety aspects – caves are dangerous due to rockfalls
Bones are very important scientifically
– therefore researchers cannot afford to damage them

QUESTION 2

- 2.1 2.1.1 Different groups of stick insects that cannot produce fertile offspring with one another
- 2.1.2 $31 \text{ mm} / 0,3 = 103,3 \text{ mm}$
- 2.2 2.2.1 When characteristics evolve that look similar/analogous structures evolve
and have the same functions
but do not have (a) recent common genetic/evolutionary origin/
characteristics are not the same genetically
Structures do not have a common evolutionary origin
- 2.2.2 Similar environment (students can give a description of the environment/an aspect of the environment, e.g. forested areas/areas with a similar climate)
And therefore similar selection pressures
in the two different locations
therefore natural selection may select similar characteristics that are favourable in the two locations
- 2.3 DNA evidence is more reliable
As all organisms have DNA
And this DNA is structurally identical between all species/made up of combinations of the same nucleotides
Therefore if sequence of DNA between two individuals is similar then the individuals must be related
whereas fossils are based on similarity in structure
Fossils are not easily available as not all organisms were fossilised
Characteristics in the fossil may be analogous and not homologous
Fossils could be misidentified
Fossils are difficult to find/extract
(at least ONE fact for DNA reliability and ONE fact for fossil unreliability and ONE explanation or other fact from either)
- 2.4 2.4.1 B
- 2.4.2 Punctuated equilibrium. The environment stays the same for long periods of time
and there isn't much change in the species' characteristics.
Changes only happen when the environment changes dramatically.
- 2.5 2.5.1 (a) The small population does not have the same proportion of each allele (i.e. allele frequencies)
as the original population /less genetic variation in the founding population
Therefore the characteristics of the new population are different
as some alleles of particular genes are not present/more common/less common
than in the source population
This is called the founder effect
- (b) D
B
F

2.5.2 Speciation occurs because the two populations are cut off by a geographic barrier/two populations are on different islands preventing gene flow.

Sympatric speciation occurs in the same area/with no geographic barrier to gene flow.

2.6 2.6.1 Outcompetes endemic species/hunts and kills them/uses nutrients/water more effectively/uses living space of endemic species/lack of natural predators

2.6.2 Increases tourism to area.

Sense of pride among inhabitants.

Increases status of area in terms of recognition as an important area to conserve.

Increases recognition of the area politically.

Protects a unique natural environment/prevents development/ building that will destroy ecosystems.

SECTION B**QUESTION 3**

Natural and artificial selection will maintain species biodiversity despite the effects of climate change.

Natural and artificial selection WILL maintain species biodiversity despite the effects of climate change	Natural and artificial selection WILL NOT maintain species biodiversity despite the effects of climate change
	Climate change effects Forest fires (A) Storms (A) Droughts (A) Rising sea levels (A) (All will result in loss of habitat/deaths) (A) Climate change too extreme for species to adapt (A) IPCC – up to ¼ species could become extinct (A) On verge of 6 th mass extinction (A) Modern climate change is extreme and rapid (A)
Extinctions Extinction increases relatively low – less than 1,4% (C) New species evolved after each mass extinction (C) Many new species of reptiles evolved after Permian mass extinction (F) Even though Permian and Triassic extinctions were caused by climate change not every species became extinct and recovery occurred (C) Bramble Cay melomys were rare before climate change occurred (C)	Extinctions Bramble Cay melomys first mammal extinct by climate change (C) Green sea turtle affected due to too few males being born (C) Extinction rate of certain animal groups much higher than normal background extinction rate (C) Extinction rate increasing sharply over last 100–150 years (C) Mass extinctions occurred over long periods of time (C) Permian and Triassic extinctions caused by climate change (C) Too many species to be able to save them all (B)
	Keystone species Loss of some species could result in loss of many others (E)
Natural selection 60% of amphibian species affected by chytridiomycosis shows signs of evolving resistance (D) e.g. <i>Xenopus laevis</i> (D) Gulf killifish evolved resistance to pollutants (D). Resistance is genetic (D) Corals, tawny owls adapted to rising temperatures (D) Natural selection can operate quickly (D) The more variation exists the more chance evolution will occur (F) – Up to 4 times faster than previously thought (F) Polyploidy allows for increase in variation meaning more chance of natural selection to occur (D) Up to 80% of plants are polyploid (D) London Underground mosquito through human-induced habitat change (H) Humans facilitate allopatric speciation (H) by introducing species into new areas (H) or habitat fragmentation (H), e.g. helicopter dragonfly (H). New ecosystems produced, such as subway tunnels and light-drenched cities (H). More new plant species in Britain alone than are known to have gone extinct in all of Europe (H). –	Natural selection 40% of amphibians still not resistant to chytridiomycosis /18% went extinct (D) Evolution usually very slow process (D), especially for those species with a long generation time (D) Few animals or other organisms besides plants are polyploid (D)

<p>mostly hybrids produced by two separate species interbreeding with one another (H). Current rate of plant speciation could be thousands of times higher than the natural background rate (H) We could be creating so many new species that they equal the number of extinctions that we're seeing (H)</p>	
<p>Artificial selection Successfully selected for coral individuals that can withstand hotter more acidic water (G) Some varieties of corals have been produced that are resistant to increased temperatures (G) Humans have been driving evolution (H)</p>	<p>Artificial selection Artificial selection expensive (G) Only one species worked on at a time (G)</p>
<p>Own info Peppered moths Apple maggot fly – new species evolving Punctuated equilibrium Antibiotic resistance evolves quickly in bacteria/ evolution of new viral strains</p>	<p>Own info Lack of genetic diversity in rare populations</p>

Total: 100 marks

Note: Essay should be 2½ to 3 pages long.

Time allocation suggestion: Reading of sources 10 min.; Planning 10 min.; Writing essay 40 min.

	1 mark	2 marks	3 marks	4 marks	Possible mark (40)
Planning × 2	<ul style="list-style-type: none"> Decision given Key points present for and against the argument 	<ul style="list-style-type: none"> Decision given Key points developed for and against the argument 	<ul style="list-style-type: none"> Decision given Key points developed for and against the argument Sources identified (e.g., Source A/ own information) 		6
Decision	<ul style="list-style-type: none"> Vague Changed position within essay 	<ul style="list-style-type: none"> Clear decision made 			2
Use of knowledge from sources × 2	<ul style="list-style-type: none"> Up to ¼ of potential detail in sources used to support argument 	<ul style="list-style-type: none"> Up to ½ of potential detail in sources used to support argument 	<ul style="list-style-type: none"> Up to ¾ of potential detail in sources used to support argument 	<ul style="list-style-type: none"> Source detail – very close to full potential used to support argument 	8
Use of own knowledge	<ul style="list-style-type: none"> Some facts given beyond the source to support argument 	<ul style="list-style-type: none"> Many facts beyond the source given to support argument 	<ul style="list-style-type: none"> Some facts beyond the source given to support argument Facts integrated into the argument 	<ul style="list-style-type: none"> Many facts beyond the source given to support argument Facts integrated into the argument 	4

	1 mark	2 marks	3 marks	4 marks	Possible mark (40)
Content relevance	<ul style="list-style-type: none"> • Repetition mostly avoided • Some minor digression • Supporting argument relevant 	<ul style="list-style-type: none"> • Repetition mostly avoided • Some minor digression • Supporting argument relevant • Quality of source extracts acknowledged 			2
Quality of argument supporting decision × 2	<ul style="list-style-type: none"> • Writing consists of facts with little linkage or reasoning • Reasoning incorrect 	<ul style="list-style-type: none"> • Maximum if no clear stand taken • Reasoning correct, but hard to follow • Ordinary: some linkage evident 	<ul style="list-style-type: none"> • Supports the position • Reasoning is clear • Minor errors in flow • Linkage sometimes missed 	<ul style="list-style-type: none"> • Strongly supports a clear position • Reasoning is very clear and succinct • Flow is logical • Compelling with regular linkage • Well-integrated argument 	8
Fairness – counter opinions to decision	<ul style="list-style-type: none"> • One to two counter opinions given from the sources 	<ul style="list-style-type: none"> • Three to four counter opinions given from the sources 	<ul style="list-style-type: none"> • Integration into argument of one to two counter opinions from the sources 	<ul style="list-style-type: none"> • Integration into argument of three to four counter opinions from the sources 	4
Presentation	<ul style="list-style-type: none"> • Writing is almost unintelligible • Tone, language, terminology unscientific and very weak • Introduction and/or conclusion not present 	<ul style="list-style-type: none"> • Tone, language, terminology weak • Introduction and conclusion present 	<ul style="list-style-type: none"> • Tone is consistent and suited to scientific language • Good and appropriate language and terminology • Mostly appropriate paragraphing • Introduction and conclusion have merit 	<ul style="list-style-type: none"> • Tone is mature and suited to scientific language • Excellent and appropriate language and terminology • Correct paragraphing with good transitions • Interesting introduction, satisfying conclusion 	4
Scientific merit	Essay shows academic rigour, accurate reasoning, insight and cohesiveness.				2