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NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2020
FORMERLY MAY/JUNE

LIFE SCIENCES: PAPER II

MARKING GUIDELINES

Time: 2 hours

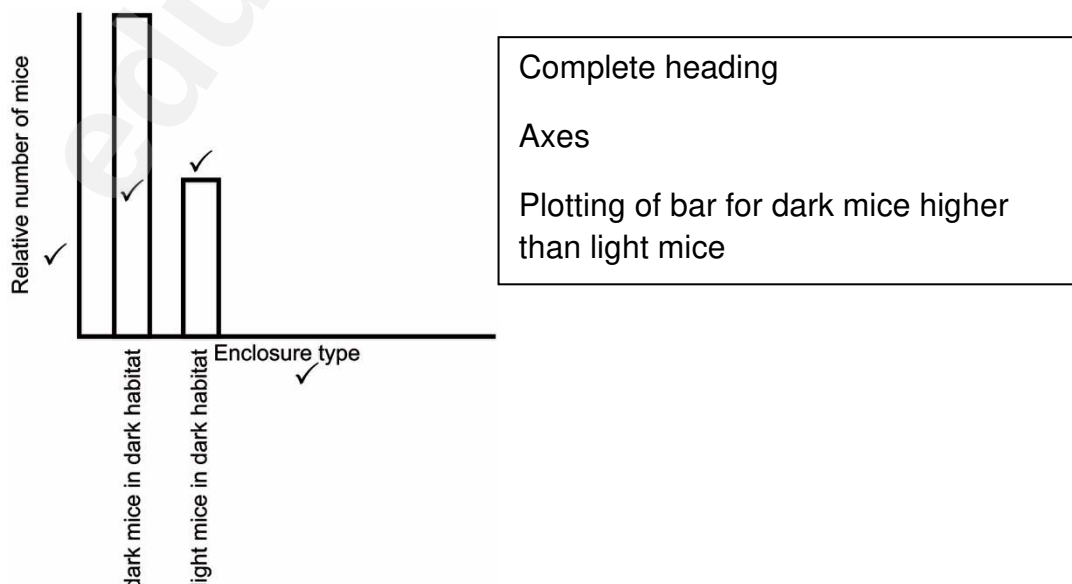
100 marks

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 C
1.1.2 A
1.1.3 B
1.1.4 E
1.1.5 D
- 1.2 1.2.1 Mutations in mice gave rise to pale coat colour. Mice with pale coats are better able to survive as they are not eaten, they are able to interbreed and their offspring will have a chance of inheriting this pale coat characteristic and dark mice die more often without leaving offspring that survive.
- 1.2.2 Mice became pale/acquired pale coats to blend into the environment, mice passed on paleness to offspring each generation the paleness increased.
- 1.3 1.3.1 T
1.3.2 T
1.3.3 F
- 1.4 1.4.1 This enables peer review of the information in order to check reliability. It also allows other people in the field (peers) to access information on new discoveries.
- 1.4.2 Camouflage/predation pressure (of owls)
- 1.4.3 To determine what mutations are present and whether changes in frequency of alleles occur according to which enclosure the mice are in.
- 1.5 Graph showing the relative numbers of each type of mouse in the enclosure on dark soil.



- 1.6 No. Natural selection results in the best characteristics that are suited to that particular environment persisting. This can change as the environment changes; there is no perfect solution to characteristics. It is a result of particular environmental changes.

QUESTION 2

- 2.1 2.1.1 Cave and surface fish are able to produce fertile offspring/they both have the same species' name.
- 2.1.2 DNA evidence also shows that blindness evolved separately in each of the three populations of cave fish./Each population seems to have evolved blindness in different ways/evidence from three investigations.
- 2.1.3 Anything from evidence of investigations in populations 1 and 2, e.g. fish with more taste buds/bigger regions of brain detecting smell were favoured in caves/fish without eyes were favoured as lower parasite infection rate.
- 2.1.4 Cave fish populations all descended from small surface populations that entered caves and became isolated from one another/evidence from population 3 (e.g. characteristic is present due to being present in surface population).
- 2.1.5 Parts of their eyes are present but are simply non-functional.
- 2.1.6 Tetras have been selectively bred.
- 2.2 2.2.1 Absence of water/land separating rivers/found in caves in different mountains.
- 2.2.2 Smaller populations have less genetic variation – there is more chance of inbreeding – an increase in homozygosity in individuals as parents tend to have the same alleles for different genes, therefore any unfavourable characteristics can increase in frequency.
- 2.2.3 Any suitable example (e.g. hypocholesterolemia in Afrikaans populations, Gauchers/Tay Sachs in Ashkenazi Jews)
- 2.3 Darwin's finches evolved by finches from South America being isolated on islands and natural selection occurring to select for different characteristics on each island in the same way as surface fish populations being isolated in caves and evolving (answer to include comparison of isolation and evolution of divergent characteristics)
- 2.4 DNA determines phenotype. Therefore, studying the DNA of different organisms and determining how similar the DNA is/where DNA diverged/ mutations occurred will show relationships between them.
- 2.5 $84-89 \text{ mm} / 13 \text{ mm} \times 10 \text{ km} = (64-68) \text{ km}$

2.6

Population	Hypothesis	Justification
1	II	Gene mutation causes more sense of smell, but this also results in loss of vision.
2	I	Advantage to lose sight as less chance of parasite infection.
3	III	Founder effect – chance that some of the fish with the blindness allele reached the caves and population was established from them.

2.7

Learning how the genetics of sight is controlled could be of benefit to understanding how human eyesight is controlled, useful in determining how genes function in other body systems (i.e. pleiotropy), determining what different genes do.

SECTION B**QUESTION 3**

<i>Homo sapiens</i> is responsible for the extinction of Neanderthals	
Yes	No
Source A	Source A Overlap was for a long time therefore would have died out earlier if humans were responsible for extinction.
Source B Humans have better cognitive development to plan strategies to outcompete Neanderthals could communicate better, had a higher degree of social cooperation, memory, learning, movement, balance and vision, more of brain given over to sight in Neanderthals therefore human had more of frontal lobe development.	Source B
Source C Humans interbred with Neanderthals – 2,6% DNA in humans, merged with them. Various fossils of hybrids exist.	Source C Not a lot of DNA in humans from Neanderthals therefore not a lot of interbreeding.
Source D Conflict over resources, violence including warfare evidence from marks on bones.	Source D
Source E Pathogens/parasites due to limited immunity of Neanderthals to disease not exposed to.	Source E
Source F Division of labour in Neanderthals less developed than in humans – less use of resources. Social groupings bigger in humans, humans grew slower therefore more opportunity to learn. Less cooperation between Neanderthal groups, therefore less help from other groups. Neanderthal pelvises less adapted to running and walking long distances.	Source F Domestication of dog allowed easier hunting by humans. Humans have bowl-shaped hips – therefore easier to run upright. Humans have arched feet – better able to stand upright.

<i>Homo sapiens</i> is responsible for the extinction of Neanderthals	
Yes	No
Source G Humans outcompeted Neanderthals in colder climates due to a more varied diet.	Source G Volcanic eruption – ash blocked sun and killed vegetation – lack of food, drop in temperature, gases released. Climate change resulted in lower temperatures – frozen ground, loss of game, no signs of habitation, tools or bones found. Humans had a more varied diet so could survive. Neanderthals had less access to protein.
Source H	Source H Neanderthals battled to survive harsh environment. Forced to live on a restricted diet, by-products (proteins) are toxic. If prey animals died then they would not have food. Did not have technology to make needles to make clothes or weapons. Poor artwork meant poor hand-eye coordination, therefore difficult to hunt for scarce prey. Less ability to plan future hunts.
OWN INFO Humans have bigger cerebrum. Poor speech development in Neanderthals. Lack of communication between Neanderthals.	OWN INFO Small populations – bottleneck, low genetic variation – difficult to adapt to new situations in Neanderthals. Difficult to organise defence in Neanderthals.

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	- Decision given - Key points present for and against the argument	- Decision given - Key points developed for and against the argument	- Decision given - Key points developed for and against the argument - Source references identified (e.g. Source A/ own information)		6
Decision	- Vague - Changed position within essay	Clear decision made			2
Use of knowledge from sources × 2	Up to ¼ of potential detail in sources used to support argument	Up to ½ of potential detail in sources used to support argument	Up to ¾ of potential detail in sources used to support argument	Source detail – very close to full potential used to support argument	8
Use of own knowledge	Some facts given beyond the source to support argument	Many facts given beyond the source to support argument	- Some facts given beyond the source to support argument - Facts integrated into the argument	- Many facts given beyond the source to support argument - Facts integrated into the argument	4
Content Relevance	- Repetition mostly avoided - Some minor digression - Supporting argument relevant	- Repetition mostly avoided - Some minor digression - Supporting argument relevant - Quality of source extracts acknowledged			2

	1 mark	2 marks	3 marks	4 marks	Possible mark (40)
Quality of argument supporting decision × 2	- Writing consists of facts with little linkage or reasoning - Reasoning incorrect	Maximum if no clear decision in support - Reasoning correct, but hard to follow - Ordinary: some linkage evident	- Supports the position - Reasoning is clear - Minor errors in flow - Linkage sometimes missed	- 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	One to two counter opinions given from the sources	Three to four counter opinions given from the sources	Integration of one to two counter opinions from the sources into argument	Integration of three to four counter opinions from the sources into argument	4
Presentation	- Writing is almost unintelligible - Tone, language, terminology unscientific and very weak - Introduction and/or conclusion not present	- Tone, language, terminology weak - Introduction and conclusion present	- Tone is consistent and suited to scientific language - Good and appropriate language and terminology - Mostly appropriate paragraphing - Introduction and conclusion have merit	- 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