

Mark schemes

Q1.

- (a) Alfred Russel Wallace 1
- Charles Darwin 1
- (b) remains of an organism 1
allow remains of an animal / plant
- from a long time ago 1
allow from thousands / millions of years ago
- (c) the animal walked on mud 1
- (d) any **two** from:
- flooding
 - drought
 - ice age
 - global warming
if none of these, allow climate change for 1 mark
ignore weather
 - volcanic activity
 - asteroid collision
if neither of these, allow catastrophic event
or *natural disaster for 1 mark*
 - (new) predators
 - (new) disease / pathogen
 - competition for food
 - competition for mates
allow hunters / poachers
allow named example
allow lack of food
allow lack of mates
ignore competition unqualified
ignore environment change
 - lack of habitat **or** habitat change
ignore isolation

- ignore pollution* 2
- (e) bacteria can become resistant to an antibiotic 1
- older fossils are simpler than more recent ones 1
- [9]

Q2.

- (a) *Elasmotherium* 1
- (b) eukaryota 1
- (c) Carl Woese 1
- (d) any **one** from:
 • fighting / competing for mates / food / territory
 • to kill predators / prey
allow for defence / protection 1
- (e) (bones **or** hard tissues) did not decay
*allow soft tissues decayed **or** were eaten*
allow other parts decayed or were eaten
allow horn could be damaged / lost in fighting 1
- (f) any **one** from:
 • compare to other fossils of known age
allow compare with the fossil record
 • by the age of the rocks (where fossil was found)
allow depth underground (where fossil was found)
allow (radio)carbon / isotope dating
allow DNA analysis 1
- (g) 0.05 (million years ago) 1
- (h) 0.2 – 0.05
allow 0.05 × 3
allow ecf from question (g) 1
- 0.15 1

150 000 (years)
allow 0.15 million (years)

1

(i) any **two** from:

- *ignore pollution*
- drought
- ice age / global warming
- volcanic activity
- *allow earthquakes / tsunami*
- asteroid / meteor collision
- (new) predators
- *allow hunters / poachers / eaten*
- (new) disease
- *allow named pathogen*
- competition for food
- *allow lack of food*
- competition for mates
- *allow isolation or lack of mates*
- lack of habitat **or** habitat change
- *if no other marks awarded allow natural disaster or climate change or catastrophic event for 1 mark*

2

[12]

Q3.

(a) 38 500 000 – 36 000 000
allow 500 000 x 5

1

2 500 000 (years)
or
 2.5 million (years)
if no other mark awarded, allow
 $38.5 - 36 = 2.5$ **or**
 $0.5 \times 5 = 2.5$ **for 1 mark**

1

(b) (extinction of Andrewsarchus) led to population increase / evolution of another predator

allow idea of a new predator

1

because Andrewsarchus no longer competing for food / resources

allow because Andrewsarchus no longer eating another predator

1

other predator (population) hunted more Brontotherium

or

(extinction of Andrewsarchus) led to population increase / evolution of another herbivore (previously eaten by Andrewsarchus) (1)

because Andrewsarchus no longer predating (other) herbivore (1)

more competition with other herbivores (1)

or

(extinction of Andrewsarchus so)

Brontotherium are not eaten so therefore the population increases (1)

so much that the food source decreases (1)

Brontotherium compete with each other so much that they all die (1)

max 2 marks if reference to hunted by humans or still killed by Andrewsarchus or reference to climate change or factors relating to climate change

1

(c) any **three** from:

- fossils buried deep(er) so hard(er) to find
- fossils smaller so harder to find
- more likely to be destroyed by geological activity / earthquakes / erosion
- oldest organisms were soft-bodied so most of the tissue decayed
allow oldest organisms were soft-bodied so there were very few fossils
- dating older fossils is hard
- older eras less researched by scientists because less to find
- (usually) unclear when one species evolves into another species (because not enough fossils found)

3

(d) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5-6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3-4

Level 1: Relevant points are made. They are not logically linked.

1-2

No relevant content

0

Indicative content**Supporting the statement**

- decrease (in large mammals) is large(r) in some areas
- decrease (in large mammals) occurs when humans enter areas
- decrease occurs at different times in the areas, so not suggestive of worldwide climate change or meteor impact or volcanic activity
- decrease is not (always) immediate, suggesting human population grew, then had impact **or** decrease accelerates as human population grows

Not supporting the statement

- only shows large mammals **or** does not show other species
- correlation does not mean causation
- there were always some left so it wasn't a 'mass extinction'
- decrease could have been due to other factors / named
- no information about climate change / abiotic factors
- no information about predators / pathogens / food sources / other biotic factors
- decrease (in mammal population) in Africa (after humans present) is small
- decrease (in mammal population) in Madagascar (after humans present) was gradual / slow
- only shows data for four areas of the world **or** no data shown for other areas of the world

Answers in level 3 must refer to evidence supporting **and** not supporting the statement

(e) (disadvantage)

any **one** from:

- loss of potential, future biodiversity
allow loss of biodiversity
- reduction in range of alleles
allow reduction in gene pool

1

(advantage)

allows evolution of new species / varieties

allow opportunity for speciation

1

[16]

Q4.

(a) Raphus

1

(b) any **two** from:

- humans hunted / killed / ate the dodo **or** dodo easy to catch
- humans ate / collected eggs
- humans ate the dodo's food
- animals brought by humans ate dodo / eggs

- allow examples – eg cats / dogs / pigs / rats*
- diseases introduced by humans **or** by imported animals
 - humans destroyed dodo's habitat / nests
- allow deforestation*
- 2
- (c) any **one** from:
- growing crops / biofuels
allow farming / agriculture
 - grazing animals
 - building houses
allow other correct examples – eg building roads
 - quarrying / mining
 - dumping waste
- 1
- (d) there is less photosynthesis
- the trees are burned
- 1
1
- (e) increase
- 1
- (f)
- an answer of 270 scores 2 marks*
- 9 × 30
- 1
- 270
- 1
- (g) **Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.
- 3-4
- Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.
- 1-2
- No relevant content**
- 0
- Indicative content**
- displaced animals can move to adjacent areas
 - where suitable habitat is found **or** where the trees have not been cut down
 - seeds return to deforested area
 - from other (forested) areas
 - plants / trees begin to grow back

- so provide food / shelter / nest sites / suitable habitat for animals
- animals return to re-growing area
- from other (forested) areas
- sufficient time for regeneration
- old growth area is a source of recolonising organisms

[13]

Q5.

(a) (organism) soft-bodied

*allow lack hard parts / skeleton / shell**allow (organism) eaten / decayed***or**

(fossil) destroyed

*allow buried (very) deep**allow they are (very) small*

1

(b) any **two** from:

- the fish (dies) buried in sediment / sand / mud

*allow other examples of sediments**do **not** accept rock(s)*

- (only) the soft parts decayed / eaten **or** the hard parts / bones did not decay or were not eaten

- mineralisation occurred

*allow description of mineralisation e.g.**bones turned to stone**allow imprinted (in the sediment)*

2

(c) any **two** from:*ignore pollution*

- drought
- ice age / global warming
- volcanic activity

allow earthquakes / tsunami

- asteroid / meteor collision
- (new) predators

*allow hunters / poachers**allow eaten*

- (new) disease / named pathogen
- competition for food

allow lack of food

- competition for mates
allow isolation or lack of mates
 - lack of habitat or habitat change
if no other marks awarded allow natural disaster / climate change / weather change / catastrophic event / environmental change for 1 mark
- 2
- (d) a change in a gene 1
- (e) there is variation (between members of a species)
allow mutation 1
- better adapted survive
allow 'survival of the fittest' 1
- (reproduce and) pass on (favourable) allele(s) / gene(s) / mutation(s)
/ DNA / genetic material
ignore pass on characteristic(s) 1
- allow in terms of an example*
- [9]**

Q6.

- (a) any **one** from:
- animal / plant (dies and) body covered in sediment / mud
 - bones / shells / hard parts do not decay
 - minerals enter bones / parts are replaced by other materials / mineralisation
 - preserved traces / footprints / burrows / rootlet traces / impressions / casts
- allow covered in tar / ice* 1
- (b) (diameter **P** =) 60
and
(diameter **Q** =) 75
allow ± 1 mm 1
- (c) 150
allow ecf from (b) 1
- (d) 2.5 1
- (e) any **two** from:

- Q has fewer spirals
 - Q has more (radial) ridges
allow stripes / etc
 - Q's ridges are more pronounced
 - Q has more elongated shape
accept Q is less circular / round
allow other correct descriptions
- 2
- (f) Q was found in newer rocks than P
- 1
- (g) 100 million years
- 1
- (h) any **three** from:
- flooding
 - drought
 - ice age
- ignore pollution*
if none of these points given allow climate change / global warming / weather change / environmental change for 1 mark
- volcanic activity
 - asteroid collision
- ignore pollution*
if none of these points given allow natural disaster / catastrophic event for 1 mark
- (new) predators (allow hunters / poachers)
 - (new) disease / named pathogen
 - competition for food
 - competition for mates
 - isolation
- lack of habitat
or
habitat change
- 3
- (i) lack of evidence
or
cannot perform experiment to find out
*do **not** accept no evidence*
allow no proof
allow no one was there to observe
- 1

[12]

Q7.

- (a) (Jean Baptiste) Lamarck
allow phonetic spelling 1
- (b) (snake is) covered in sediment / mud
or
sinks into the mud 1
- (then) the soft parts decay / are eaten
or
bones / hard parts do not decay 1
- (so) minerals enter bones
or
bones are replaced by minerals 1

- (c) **Level 3 (3–4 marks):**
A detailed and coherent explanation is provided. Logical links between clearly identified, relevant points explain how the rat snake evolved through the process of natural selection.

Level 2 (1–2 marks):

Simple statements made, but not precisely. The logic is unclear.

0 marks:

No relevant content.

Indicative content**statements:**

- there are lots of different colours of snakes
- some shades of green are closer to the colour of the environment (in Japan) than others
- survivors (in each generation) will breed and produce offspring

explanations:

- different colours are controlled by different genes / alleles / are caused by mutations
- being green means they are best suited to grassy / green environments
- being green means they are camouflaged
- those that are camouflaged best will be able to catch more food
- those that are camouflaged best will be able to avoid being eaten
- survivors' offspring will inherit the genes / alleles / mutation for the shade of green colouration

additional examiner guidance:

- allow converse points relating to the Texas rat snake if they clearly identify the reasons why this snake was at an evolutionary disadvantage, ie

- more likely to be caught and eaten by a predator
- a good level 2 answer will clearly link survival and breeding to the passing on of the advantageous genes / alleles / mutations and link the idea of colour (AO2) to a correct explanation of its significance for survival

4

(d) any **one** from:

- changes to the environment
- new predators
- new diseases
- new (more successful) competitors
- catastrophic event / described event

1

[9]

Q8.

(a) three billion

1

(b) mutation(s)

1

breed / reproduce

in this order only

allow pass on their genes

1

[3]

Q9.

(a) (i) reduced photosynthesis

ignore growth

*do **not** allow need light for respiration*

1

(ii) less food (for animals) **or** less oxygen (for animals)

allow loss of habitat

1

(iii) any **two** from:

accept 2 physical factors or 2 biological factors or one of each for full marks

examples of physical factors, eg

- flooding
- drought
- ice age / temperature change
- ignore pollution*
- volcanic activity

examples of biological factors, eg

- (new) predators (allow hunters / poachers)

- (new) disease / named pathogen
 - competition for food
 - competition for mates
 - cyclical nature of speciation
 - isolation
 - lack of habitat or habitat change
- If no other answers given allow natural disaster / climate change / weather change / catastrophic event / environmental change for 1 mark*
- 2
- (b) (i) 3 1
- (ii) fossils 1
ignore bones, remains, fossil fuels
- (c) (i) 65 million years ago 1
- (ii) 17 1
allow ecf
- (iii) fossil record incomplete 1
or
 some fossils destroyed
accept not enough evidence
or
cannot perform experiment to test
- [9]**

Q10.

- (a) reference to interbreeding 1
 successfully between Island types
allow ref. to production of fertile offspring
allow ref. to DNA analysis / comparison for 1 mark
ignore ref. to grey fox 1
- (b) (i) (two ancestral populations) separated / isolated (by geographical barrier / sea) 1
 and genetic variation (in each population) **or** different / new alleles **or** mutations occur 1
 under different environment / conditions 1
allow abiotic or biotic example
allow different selection pressures 1

natural selection occurs **or** better adapted survived to reproduce
so (favourable) alleles / genes / mutations passed on (in each population) 1

ignore they adapt to their environment 1

- (ii) any **one** from:
- continued to mate with one another
 - few beneficial mutations (between island varieties)
 - similar conditions on each island so similar adaptations/features fit
- 1

[8]