



Mark schemes

Q1.

(a)

Classification group
Kingdom
Phylum
Class
Order
Family
Genus
Species

all 4 correct = 2 marks
2 or 3 correct = 1 mark
0 or 1 correct = 0 marks

2

 (b) *Geospiza fortis*

ignore underlining or attempted italics or upper and lower case letters

1

(c) offspring have similar beak depths to parents

ignore same beak depths
ignore positive correlation / described

1

(d) parents of a given beak depth produce offspring with several beak depths

allow spread of results for a given parental beak depth about line of best fit
allow range of phenotypes for a given parental beak depth

1

(e) colonisers of Isabela have a range of beak depths

allow colonisers of Daphne have a range of beak depths

1

due to different combinations of alleles of several genes
 or
 due to different alleles of one gene
 or

due to mutation	1
large range of (sizes / species of) seeds / food (on Isabela) or large(r) seeds (on Isabela) <i>allow small range of (sizes / species of) seeds / food on Daphne</i> or <i>allow small(er) seeds on Daphne</i>	1
more competition for seeds / food (on Isabela) <i>allow less competition for seeds / food on Daphne</i> <i>ignore competition unqualified</i>	1
birds with larger beaks get enough food to (survive and) reproduce (on Isabela) <i>allow birds with smaller / medium beak sizes get enough food to (survive and) reproduce on Daphne</i>	1
(survivors) pass on (beneficial) alleles to offspring <i>allow pass on genes / mutation ignore pass on chromosomes / characteristics</i>	1
(f) Isabela is a large island with more species of plants or Isabela is a large island with more variety in seed / food sizes or Isabela is a large island with more plants / seeds / food	1
less competition for seeds / food or enough seeds / food for both bird species	1
	[13]
Q2.	
(a) 3.7	1
(b) 2	1
(c) (different combinations of alleles cause) many / 22 values <i>allow continuous variation</i> or	

- in-between values
 or
 large range of values
 or
 there are not only two values
allow there are not only 3 values if 3 is given in part (b)
- 1
- (d) different protein made
allow change in shape (of enzyme) or change in 3-D structure
ignore denature
- 1
- active site changed
- 1
- so substrate does not fit / bind
allow description of substrate
allow cannot form E-S complex
ignore lock and key description
- 1
- (e) produces (some) offspring with high-fat milk or not all offspring have low-fat milk *ignore*
reference to alleles
- 1
- (f) takes less time (to obtain results) or more offspring at the same time
allow other sensible suggestion – e.g. allows screening or allow cow 7 to continue to produce eggs or avoid injury to cow 7 during mating or giving birth
- 1
- (g) male gametes correct: d (and d)
- 1
- female gametes correct: D and d
- 1
- allow 1 mark if gametes are correct but gender not identified*
- correct derivation of offspring genotypes from given gametes
allow 2 × 2 or 2 × 1 derivation
- 1
- Dd identified as low-fat and dd identified as high-fat in offspring
if DD offspring are produced, must also identify as low-fat
- 1

- (h) find female with low(est) fat in milk and high(est) milk yield
allow choose from 7, 9, 12, 13 which has the highest yield 1
- find male whose female offspring have high(est) milk yield and low(est) fat in milk
allow choose from 16 or 18 whose female offspring has the highest yield 1
- or
- find female with lowest fat in milk
 or cow 13 (1)*
**or allow female with high(est) milk yield*
- find male whose female offspring have high(est) milk yield (1)*
**or allow male whose female offspring have lowest fat in milk / male 16*
- cross the best (for both features) female with the best male 1
- select best offspring (for both features) from each generation and repeat for several generations 1
- [16]

Q3.

(a)

Classification group	Name
Class	<i>Mammalia</i>
Order	<i>Primates</i>
Family	<i>Lemuroidea</i>
Species	<i>catta</i>

*all 4 correct = 2 marks
 2 or 3 correct = 1 mark
 0 or 1 correct = 0 marks*

2

(b) Lemur catta

ignore capitalisation / non-capitalisation of initial letters

ignore italics / non-italics

ignore underlining / non-underlining

	1	
(c) carried by (favourable) currents on masses of vegetation <i>allow description of currents from Figure 2</i> <i>ignore swimming</i>	1	
(d) isolation of different populations	1	
habitat variation between lemur populations <i>allow examples – biotic (e.g. food / predators) or abiotic (e.g. temperature)</i>	1	
genetic variation or mutation (in each population)	1	
better adapted survive (reproduce) and pass on (favourable) allele(s) to offspring <i>allow natural selection or survival of the fittest and pass on (favourable) allele(s) to offspring</i> <i>allow gene(s) / mutation as an alternative to allele(s)</i>	1	
(eventually) cannot produce fertile offspring with other populations <i>allow cannot reproduce 'successfully' with other populations</i> <i>ignore cannot reproduce unqualified</i>	1	
		[9]
Q4.		
(a) less sweating so less water loss	1	
(as) no / little water available in desert	1	
(b) (fat store) can be metabolised / respired to water	1	
(little urine...) conserve water	1	
(hard mouth) not damaged by spines on plants / on food or not damaged by hard / dry food	1	
(c) dromedary / <i>C.dromedarius</i> and bactrian / <i>C. bactrianus</i>		

- no mark for the names, but must be identified*
- because
same genus
ignore 'both are Camelus' 1
- (d) any two from:
- the fossil record
 - oldest fossils in N. America or
 - newer fossils in S. America / in Asia / in Africa
allow numbers for ages (45 Mya and 3 Mya / 6 Mya)
 - chemical / DNA analysis of living species
allow radioactive dating of fossils 2
- (e) isolation of separate camel populations by sea or by mountains 1
- habitat variation / described between populations
allow examples – biotic (e.g. food / predators) or abiotic 1
- genetic variation / mutation in each population 1
- 45 million years is sufficient time to accumulate enough mutations 1
- natural selection
or
better adapted survive to reproduce 1
- pass on favourable allele(s)
allow gene(s) 1
- [14]
- Q5.
- (a) white blood cells have the same DNA / genes / chromosomes or have the gene for GH
allow have all the genes
allow all body cells (except RBCs) have all of the genes 1
- (b) enzyme has specifically-shaped active site

1

the 2 antibiotic resistance genes have different (sequence of) bases

1

only Tetracycline-resistance gene fits (active site of) enzyme or
 only Tetracycline-resistance gene is complementary to (active site of)
 enzyme

1

(c)

Ampicillin	Tetracycline
✓	✗
✗	✗
✓	✓

1 mark for each correct row

if no other mark, allow 1 mark for one correct
 column

1

1

1

(d) clone produced by asexual reproduction

allow by 'mitosis'

1

all DNA / all genes are copied

allow GH gene copied

allow plasmid copied

1

every cell receives a copy

or

receives every gene

or

receives GH gene

or

receives plasmid

or

genetically-identical cells

1

[10]

Q6.

(a) any two from:

- so that they do not have specific genetic defects
- to produce docile cats or so they are not aggressive
 allow descriptions of aggression such as biting and
 scratching
- for aesthetic reasons

	<i>allow descriptions of suitable aesthetic reasons</i>	2	
(b)	(cats) are more likely to pass on (recessive) disorders or more likely to be susceptible to diseases	1	
(c)	<p>Level 2 (3–4 marks): A detailed and coherent explanation is given, which logically links the process of selective breeding with explanations of how this produces cats that do not cause allergic reactions.</p> <p>Level 1 (1–2 marks): Simple statements are made relating to process of selective breeding, but no attempt to link to explanations.</p> <p>0 marks: No relevant content.</p> <p>Indicative content</p> <p>process:</p> <ul style="list-style-type: none"> • parents with the desired characteristic are selected • the parents are bred together to produce offspring • offspring with the desired characteristics are selected and bred • this is repeated over many generations. <p>explanations:</p> <ul style="list-style-type: none"> • parents who produce the least Fel D1 are initially selected • in their offspring there will be individuals with differing amounts of Fel D1 produced • care is taken to ensure cats are healthy and avoid possible problems associated with selective breeding • over time the population of (selectively bred) cats will produce less Fel D1 	4	[7]
Q7.			
(a)	three billion	1	
(b)	mutation(s)	1	
	<p>breed / reproduce</p> <p><i>in this order only</i></p> <p><i>allow pass on their genes</i></p>	1	[3]

Q8.

- (a) any two from:
- larger / longer / thicker
allow examples eg fewer toes or bones fused
 - fewer (bones in total)
allow smaller surface area touching the ground
 - fewer bones touching the ground
- 2
- (b) (i) large(r) surface / area in contact with the ground or
low / less pressure on ground
- 1
- (so) less likely to sink into mud / ground
- or
- (so) could run fast(er)
allow easy / easier to escape predators
- 1
- (ii) variation (in size / number / arrangement of bones)
allow mutation(s) (in size / number / arrangement of bones)
- 1
- (and) those with large(r) / few(er) bones more suited to running or run faster (on harder / drier ground)
- 1
- these survive and breed
allow ref to offspring for breed
- 1
- (so) genes / DNA (for larger / fewer bones) passed on
allow alleles passed on
- 1
- [8]