

Q1. (June 2018)

C

Q2. (June 2018)

B

Q3. (June 2019)

C

Q4. (June 2019)

19	(a)	<p>all organisms show variation / mutation causes variation ✓</p> <p>Any three from: the blue tits with the longer beaks get more food / ORA ✓ they are more likely to survive / ORA ✓ they reproduce and pass on the alleles for longer beaks / ORA ✓ over many generations beak length increases in the blue tit population / ORA ✓</p>	4	<p>1.1 ALLOW description of variation in beak length in the original population</p> <p>2.1 x3 ALLOW the blue tits with the longer beaks get access bird feeders</p> <p>IGNORE pass on genes</p> <p>ALLOW idea of many repeats of cycle</p>
	(b)	<p>shows that over the years the birds are laying eggs earlier (in May) ✓</p> <p>this could be because temperatures are increasing (year on year) ✓</p> <p>however, the data shows a lot of variation ✓</p> <p>there could be other factors involved ✓</p>	4	<p>3.1a ALLOW shows downward trend</p> <p>3.2b ALLOW because Earth is getting warmer</p> <p>3.1a ALLOW examples of variation in data from the graph ALLOW data shows lots of fluctuations / erratic data / spikes in the data</p> <p>3.2b ALLOW examples of factors such as predator/prey relationship may be different</p>

Q5. (June 2019)

23	(a)	platelets are needed for blood clotting ✓ the rat would keep bleeding/bleed to death ✓	2	2.1	
	(b)	parents are Rr and Rr ✓ offspring are RR, Rr, Rr, rr ✓ rr identified as being non-resistant ✓	3	2.2	ALLOW all marks from a Punnett square ALLOW ECF on offspring
	(c)	Rr/heterozygous rats more likely to survive than RR/homozygous rats as they need less vit K / ORA ✓ therefore, when two Rr rats mate rr rats will be born ✓	2	2.2	ALLOW rats that need less vit K are more likely to survive
	(d) (i)	(DNA) ligase ✓	1	1.1	
	(ii)	males are XY ✓ so only male rats will be born / ORA ✓ the population will contain an imbalance of sexes / (too many males and) not enough females/no females to mate/reproduce with ✓	3	1.1 2.1 x2	ALLOW female is XX DO NOT ALLOW males are YY ALLOW genetic diagram for 2 marks <div style="text-align: center;"> male X Y female X -- XY X -- XY Male only </div>

Q6. (June 2022)

B

Q7. (June 2022)

D

Q8. (June 2023)

B

Q9. (June 2023)

21	(a)	<p>Any three from: (Chemical first produced) by a mutation ✓</p> <p>(Idea these seeds/plants) less likely/not eaten by birds/people / ORA ✓</p> <p>These seeds are more likely to survive and reproduce / ORA ✓</p> <p>Pass on allele/gene (for making the chemical) / ORA ✓</p>	3	<p>1.1 If selective breeding described award no marks</p> <p>2 x 2.1 ALLOW these seeds/plants are better adapted (by less being eaten) ORA</p> <p>AW produce offspring for reproduction</p> <p>ALLOW pass on advantageous allele/gene ORA IGNORE pass on traits/characteristics</p>
	(b)	<p>Any two from: (Select/choose plants/organisms) with less bitter chemical/show desired characteristics ✓</p> <p>Breed these (plants/organisms together) ✓</p> <p>Select/choose (offspring) with less bitter chemical/desired characteristic and repeat the process ✓</p>	2	<p>2 x 1.1 If genetic engineering/cloning described award no marks</p> <p>DO NOT ALLOW (select) seeds/sorghum with no bitter chemical</p> <p>ALLOW cross breed/pollinated (together)</p>
	(c)	<p>In areas where there are many birds there are higher levels of the bitter chemical / ORA ✓</p> <p>(More bitter chemical) less likely to be eaten by the birds / ORA ✓</p>	2	<p>3.1a</p> <p>3.1b IGNORE sorghum evolves to not be eaten</p> <p>If no worthy answer allow birds have evolved to no longer taste the bitter chemical</p>

Q10. (June 2024)

B

Q11. (June 2024)

C

Q12. (June 2024)

(d)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Detailed explanation why the number of tuskless elephants is rapidly increasing in East Africa using ideas of both inheritance and natural selection. AND Explains why the spread of this allele may have negative effects on the elephant population <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Explanation why the number of tuskless elephants is rapidly increasing in East Africa using ideas from either inheritance or natural selection. AND Explains why the spread of this allele may have negative effects on the elephant population <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Explanation why the number of tuskless elephants is rapidly increasing in East Africa using ideas from either inheritance or natural selection. OR Explains why the spread of this allele may have negative effects on the elephant population</p>	6	<p>2 x 1.1</p> <p>2 x 2.1</p> <p>2 x 3.2a</p> <p>AO1.1 Demonstrates knowledge and understanding of scientific ideas to explain the significance of the allele being dominant. Inheritance:</p> <ul style="list-style-type: none"> Dominant allele is always expressed if present Only one tuskless allele needed to give phenotype/for elephant to be tuskless <p>AO2.1 Applies knowledge and understanding to explain why the proportion of tuskless elephants are increasing. Inheritance:</p> <ul style="list-style-type: none"> 50% chance of offspring inheriting this allele (if mother is tuskless) 50% chance of female elephants born with tusks (if mother is tuskless) only females born tuskless 100% of male elephants born with tusks / 0% male elephants born with no tusks (if inherit dominant allele) Males can only survive as homozygous recessive Accept correct Punnett square showing heterozygous x homozygous recessive <p>Natural selection:</p> <ul style="list-style-type: none"> Tuskless elephants are less likely to be hunted ORA The tuskless elephants are more likely to survive and breed ORA The allele for tuskless is more likely to be passed on ORA The frequency of the tuskless allele will increase in the population over time No males born without tusks
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There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.

0 marks

No response or no response worthy of credit.

AO3.2a Analyses information to explain why the spread of the allele may have negative effects.

- (The allele is lethal to male embryos) so fewer male elephants will be born/male population will fall
- This will cause the number of males to females in the population to be unbalanced
- Female elephants may find it harder to find a mate
- More males hunted with tusks so less males
- (Female) elephants will not be able to defend themselves without tusks.
- Idea tusks are used to access food

Q13. (Nov 2020)

C

Q14. (Nov 2020)

B

Q15. (Nov 2020)

C

Q16. (Nov 2020)

C

Q17. (Nov 2020)

17	(a)	(i)	Yes (no marks) cooler than black/grey skin OR Yes (no marks) lighter skin is cooler OR No (no marks) zebra skin was similar temperature to the other barrels OR No (no marks) idea it is warmer than the barrel covered by the white skin / ORA ✓	1	3.2a	argument must support decision
		(ii)	paint the barrels different colours rather than using the skins / use the same type of skin painted different colours OR idea to make sure that thicknesses/SA/V /volume/temperature of water in barrel need to be controlled ✓	1	3.3a	ALLOW use painted towels to cover barrels ALLOW for same type of skin e.g. hair-free skin
	(b)	(i)	Any two from: zebras with stripes attracts less/fewer insects / ORA ✓ narrower stripes attract less insects / ORA ✓ stripe width for least number of insects/optimum protection is about 8cm / stripe width for most number of insects is about 25cm ✓	2	2 x 3.1a	ALLOW insect bites for insects IGNORE length of stripe ALLOW width range between 5-10cm for least number of insects / most number of insects is 22- 27cm

(ii)	stripe width of 8cm because it is the lowest point on the graph/fewest number of insects ✓	1	3.2a	ALLOW width tolerance between 7-9cm and least number of insects (on tape)
(iii)	Any three from: stripes developed as a mutation / variation for skin stripes ✓ (animals with stripes) less likely to be bitten by insects / more healthy / spread less pathogens / ORA ✓ (striped animals) more likely to survive ✓ (striped animals) more likely to reproduce ✓ pass on allele/gene for stripes / ORA ✓ process occurs over many generations ✓	3	3 x 2.1	ALLOW some more striped than others ALLOW offspring produced / breed together IGNORE selective breeding ALLOW pass on advantageous gene IGNORE trait is passed on / genes are passed on IGNORE over time

Q18. (Nov 2021)

B

Q19. (Nov 2021)

23	(a)	Any two from: Change in the (inherited) characteristics of a population over time ✓ By natural selection ✓ (May) result in a new species ✓	2	2 x 1.1	AW genotype/phenotype/features for characteristics
	(b)	Travelled on a voyage / studies were on islands ✓ Studied many species ✓ Animals in some areas had become better suited/adapted to their environment ✓ Documented his observations / described his theory in a book ✓	4	4 x 1.2	ALLOW Galapagos Islands/HMS Beagle/expeditions ALLOW named examples of plants and animals e.g. finches ALLOW struggle for existence within species/survival of the fittest ALLOW described adaptation e.g. finches beaks adapted to food source ALLOW Origin of the Species

(c)*	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Identifies the production of oxygen in photosynthesis and its use in aerobic respiration. AND Provides an explanation why larger primary consumers were able to live AND Provides an explanation how secondary consumers could exist.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Identifies the production of oxygen in photosynthesis or its use in aerobic respiration. AND Provides an explanation why larger primary consumers were able to live OR Provides an explanation how secondary consumers could exist.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Identifies the production of oxygen in photosynthesis or its use in aerobic respiration. OR</p>	6	2 x 1.1 2 x 2.1 2 x 3.2b	<p>AO1.1: Demonstrate scientific knowledge and understanding of photosynthesis and respiration.</p> <ul style="list-style-type: none"> photosynthesis will produce oxygen (rather than sulfur) aerobic respiration needs oxygen <p>AO2.1 Apply knowledge and understanding of respiration.</p> <ul style="list-style-type: none"> animals will be able to respire more / use more oxygen to respire (to increase their growth/biomass) aerobic respiration makes more energy/ATP available to primary consumers less production of lactic acid <p>AO3.2b Analyse information and ideas to draw conclusions about the evolution of consumers.</p> <ul style="list-style-type: none"> therefore, there was more energy/ATP available for growth of primary consumers so more energy is available to be transferred to secondary consumers, allowing them to survive
	<p>Provides an explanation why larger primary consumers were able to live OR Provides an explanation how secondary consumers could exist.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>			
(d)	<p>Any two from: (Presence of secondary consumers) the primary consumers were more likely to be eaten ✓</p> <p>(Primary consumer) best adapted more likely to survive ✓</p> <p>(Those best adapted) reproduce and pass on advantageous allele/gene ✓</p>	2	2 x 3.1b	<p>ALLOW higher level answer referring to selection pressure</p> <p>ALLOW only those with best adaptations e.g., run faster/camouflage to survive</p>