A Level OCR Biology

13 Classification and evolution – answers

Question	Answers	Extra information	Marks	AO Spec reference
1(a)	Any four from: grow a lawn / spread / colony of *Pseudomonas* ✓ put a wire loop in a flame to sterilise the tweezers ✓ place antibiotic/flucloxacillin discs at equal distances ✓ leave to incubate for 12-18 hours ✓ at a temperature of 37 °C measure the zone of inhibition ✓	Allow 1 mark for stating aseptic technique Allow a time frame within this range Allow at body temperature	4 max	AO3 1.2.2(i)
1(b)	Any three from: genetic variation / random mutation (in the bacteria) ✓ selection pressure of the antibiotic / selective advantage due to new allele, meaning that the antibiotic does not kill the cell antibiotic resistant bacteria survive against the (action of the) antibiotic ✓ antibiotic resistant bacteria multiply / divide / reproduce ✓ increased population of antibiotic resistant bacteria / allele frequency ✓ more of the population (of bacteria) are resistant (to the antibiotic) ✓	Allow by binary fission	3 max	AO1 4.1.1(n) 4.2.2(h) 4.2.2(i)
1(c)	1.2×10^7 cells min^{-1} ✓ ✓	$\frac{2.3 \times 10^8}{20}$	2	AO2 4.2.2
2(a)	**Indicative content:** • Random mutation for longer legs • Causes intraspecific variation • Selection pressures of getting food and avoiding drowning are involved • Survival of the fittest favours lizards with longer legs, which is a selective advantage • Interbreeding between lizards with longer legs • Advantageous allele for longer legs passed to offspring • Allele frequency for long legs increases in the population • Lizards with shorter legs die out	**Level 3 (5–6 marks):** Full and detailed explanation as to why natural selection may have contributed to lizards with longer legs surviving. *There is a well-developed comparison. The information presented is relevant and clearly explained.*	6	AO2 4.2.2(f) 4.2.2(h) 4.2.2(n) 6.1.2(e) 6.1.2(g)

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Question	Answers	Extra information	Marks	AO Spec reference
		Level 2 (3–4 marks): Response includes an explanation, including at least two points as to why natural selection may have contributed to lizards with longer legs surviving. *There is a reasonable comparison and sequence. The information presented is in the most-part relevant and well-explained.* **Level 1 (1–2 marks):** Response includes a brief explanation, including at least one point as to why natural selection may have contributed to lizards with longer legs surviving. *The information is basic and communicated in an unstructured way. The information is supported by limited method which may be unclear.* **0 marks** No response worthy of credit.		
2(b)	Any two from: competition for food ✓ disease ✓ predation ✓ avoiding drowning ✓		2 max	AO1 4.2.2(g) 4.2.2(h) 6.1.2(e) 6.1.2(g)
2(c)	population is small ✓ alleles could disappear if individuals do not reproduce ✓	Allow a specific allele, such as how long the leg length is	2	AO2 6.1.2(g) 6.1.2(h)

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3(a)	directional ✓ one extreme phenotype is selected for over the other ✓ dark green beetles have the selective advantage over light green ✓	If type of selection is incorrect but the answer is explained correctly, award 2 marks	3	AO2 4.2.2(h) 6.1.2(d)
3(b)	$p = 0.3$ and $q = 0.7$ ✓ 9% AA, 42% Aa **AND** 49% aa ✓		2	AO2 6.1.2(f)
3(c)	Any 3 of the following: random mating ✓ no mutation ✓ large population size ✓ no migration ✓		3 max	AO1 6.1.2(g)
4(a)	Any two from: peer review ✓ (confidence in) repeatability ✓ published in scientific journals/presented at scientific conferences ✓		2 max	AO1 HSW 5c 4.2.2(e)
4(b)	Any 3 of the following: each domain has (at least some) unique characteristics ✓ Eukarya and Archaea share three characteristics ✓ Eukarya and Archaea are more closely related ✓ difference in ribosome size / reproduction ability / variation in cell wall due to evolution after Eukarya and Archaea split ✓	Allow a named example, such as Eukarya have 80S ribosomes Allow: same initial amino acid for protein synthesis, rRNA loop absent and not sensitive to antibiotics Allow that they both have a more recent common ancestor	3 max	AO3 4.2.2(c)

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Question	Answers	Extra information	Marks	AO Spec reference
4(c)	Any four from: Met is the start codon ✓ Met signals the beginning of translation at the ribosome ✓ mRNA binds with the ribosome ✓ tRNA carries the specific amino acids to the ribosome ✓ anticodon and codon form complementary bonds via hydrogen bonding ✓ mRNA is read three bases at a time ✓ peptide bonds form between the amino acids ✓ the number and order of amino acids forms the protein's primary structure ✓		4 max	AO2 2.1.2(m) 2.1.3(g)
5(a)	*Patella* ✓		1	AO1 4.2.2(a)
5(b)	5 m: 3, 6, 36 ✓ 30 m: 4, 0, 0 ✓ 40 m: 9, −7, 49 ✓	1 mark per correct row	3	AO2 4.2.2(f)
5(c)(i)	$6(\Sigma d^2) = 1824$ ✓ $n\ (n^2 - 1) = 990$ ✓ $r_s = -0.84$ ✓	 Allow −0.8	3	AO2 4.2.2(f)
5(c)(ii)	the further away from the lowest water mark, the lower the mean diameter of sea snails ✓ negative correlation ✓		2	AO3 4.2.2(f)

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Question	Answers	Extra information	Marks	AO Spec reference
5(d)	Any two from: increase the number of transects ✓ sample at shorter intervals along the transect ✓ include more (than 10) sea snails in the sample at each interval (along the transect) ✓		2 max	AO3 4.2.1(b) 4.2.2(f)
6(a)	Any two from: chitin cell wall ✓ nucleus ✓ saprotrophic ✓ mycelium present ✓ hyphae present ✓	Allow eukaryotic/multinucleate	2 max	AO1 4.2.2(c)
6(b)	**Level 3 (5–6 marks)** Full and detailed explanation as to why natural selection may have contributed resistant fungi surviving. *There is a well-developed comparison. The information presented is relevant and clearly explained.* **Level 2 (3–4 marks)** Response includes an explanation, including at least two points as to why natural selection may have contributed to resistant fungi surviving. *There is a reasonable comparison and sequence. The information presented is in the most-part relevant and well-explained.* **Level 1 (1–2 marks)** Response includes a brief explanation, including at least one point as to why natural selection may have contributed to resistant fungi surviving.	**Indicative scientific points may include:** • Initial decrease in apple scab shows that the fungicide is effective • (subsequent) increase in apple scab shows that the fungus is becoming resistant to the fungicide • Random mutation for fungus causing resistance • Causes intraspecific variation between resistant and non-resistant fungi • Survival of the fittest favours resistant fungi • Selection pressure and selective advantage for resistant fungi • (asexual) reproduction of resistant fungi • Advantageous allele for resistant fungi passed to offspring	6	AO3 4.2.2(h) 4.2.2(i)

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Question	Answers	Extra information	Marks	AO Spec reference
	The information is basic and communicated in an unstructured way. The information is supported by limited method which may be unclear. **0 marks** No response worthy of credit	• Allele frequency for resistant fungi increases in the population Non-resistant fungi are killed by the fungicide		
6(c)	Any four from: heat DNA strand to 90–98 °C to denature it ✓ annealing at 50–65 °C ✓ extension at 70–75 °C ✓ use of primers ✓ use of nucleotides ✓ repeat cycle ✓	 Allow any temperature within this range Allow any temperatures within these ranges	4 max	AO2 6.1.3(d) 6.1.3(e)

Skills box answers

Question	Answer
1	**A** = 0.03 **B** = 4.5 **C** = 2.3 **D** = 0.07 **E** = 0.6 control = 0.0
2	**B**
3	antibiotic **B** may only be inhibiting growth rather than killing the bacteria; it may be more soluble than the other antibiotics, so it diffused further
4	to check that bacterial growth was not inhibited by a chemical in the paper disc; a suitable control would be a paper disc soaked in sterile, distilled water