1.7 Genetics, Populations, Evolution and Ecosystems: 10-minute Pack

AQA 7402 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The Roman snail (Helix pomatia) is found on chalk grassland in parts of southern England. Shell colour in this species is controlled by a single gene with two alleles. The allele for brown shell (B) is dominant to the allele for pale shell (b).

(a) State the genotype of a snail with a pale shell. **(1)**

(b) A brown-shelled snail was crossed with a pale-shelled snail (bb). Of the 100 offspring produced, 48 were brown-shelled and 52 were pale-shelled. Use a genetic diagram to determine the genotype of the brown-shelled parent. **(3)**

(c) Explain why crossing an organism showing the dominant phenotype with a homozygous recessive individual (a test cross) allows its genotype to be determined. **(2)**

(Total for Question 1 is 6 marks)

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Mark scheme · 1.7 Genetics, Populations, Evolution and Ecosystems: 10-minute Pack

Question 1

(a) bb (homozygous recessive) oe **B1**

(a) Answer: bb

(b) correct genetic diagram/Punnett square set up for a cross of Bb x bb (or equivalent gamete diagram) **M1**

(b) gametes B and b from the unknown parent combine with b from the pale parent to give offspring genotypes Bb, Bb, bb, bb (1 Bb : 1 bb) **M1**

(b) genotype of brown parent = Bb (heterozygous); the predicted 1:1 ratio matches the observed 48:52 ratio cao **A1**

(b) Answer: Bb (heterozygous)

(c) the homozygous recessive parent can only contribute a recessive allele, so the phenotypes of the offspring reveal the alleles carried by the unknown parent oe **B1**

(c) if all offspring show the dominant phenotype the unknown parent is homozygous dominant; if approximately half the offspring show the recessive phenotype the unknown parent is heterozygous oe **B1**

(c) Answer: A homozygous recessive test-cross partner only contributes recessive alleles, so the offspring ratio (all dominant, or 1:1 dominant:recessive) reveals whether the unknown parent is homozygous dominant or heterozygous.

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