1.9 Monohybrid Inheritance and Genetic Diagrams: Test Pack

Total Marks

EDEXCEL 4BI1 · Calculator allowed · about 15 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Define the term genotype in the context of inheritance of a single gene in humans.

(Total for Question 1 is 1 mark)

2 In a type of bean, allele S for smooth seeds is dominant to s for wrinkled seeds. State the genotype of a homozygous wrinkled-seed plant.

(Total for Question 2 is 1 mark)

3 State what is meant by a recessive allele when discussing a single gene trait in humans.

(Total for Question 3 is 1 mark)

4 In a bird species, allele L for long tail is dominant to l for short tail. A long-tailed bird has genotype Ll and is crossed with a short-tailed bird ll. Calculate the expected number of short-tailed chicks in 80 offspring.

(Total for Question 4 is 2 marks)

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5 Explain briefly why two parents who are both carriers of a recessive allele can be unaffected themselves but have an offspring with the recessive disorder. Refer to genotypes in your explanation.

(Total for Question 5 is 2 marks)

6 In a dog breed, allele E for erect ears is dominant to e for floppy ears. Two erect-eared dogs have a puppy with floppy ears. Deduce both parental genotypes and calculate the probability that their next puppy has erect ears.

(Total for Question 6 is 3 marks)

7 Construct a fully labelled genetic diagram (Punnett square) for cystic fibrosis showing the cross between two carrier parents, each genotype Cc. Label gametes, fill the four offspring boxes, and state the genotype ratio.

(Total for Question 7 is 4 marks)

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Mark scheme · 1.9 Monohybrid Inheritance and Genetic Diagrams: Test Pack

Question 1

the genetic constitution of an organism for a particular gene, the alleles an organism has — **B1**

Answer: The genetic constitution for a particular gene; the alleles an organism has

Question 2

ss — **B1**

Answer: ss.

Question 3

an allele that is only expressed in the phenotype when two copies are present (homozygous recessive) — **B1**

Answer: An allele expressed only when two copies are present, i.e. homozygous recessive

Question 4

probability of ll is 1/2 from Ll x ll — **M1**

80 x 1/2 = 40 short-tailed chicks — **A1**

Answer: Ll produces L and l gametes; ll produces l only, so half the offspring are ll. Expected number = 80 x 1/2 = 40 short-tailed chicks.

Question 5

states that carriers have one dominant and one recessive allele (heterozygous, e.g. Cc) so they show the dominant phenotype — **B1**

explains that if both parents pass the recessive allele the child is homozygous recessive (cc) and shows the disorder — **B1**

Answer: Carriers are Cc so show the normal dominant phenotype. If both pass c the child is cc and affected

Question 6

floppy puppy is ee, so each erect parent passed e — **M1**

both parents are Ee; outcomes Ee, Ee, EE, ee — **M1**

three of four outcomes have erect ears, giving 3/4 or 75% — **A1**

Answer: The floppy puppy is ee, so both erect parents passed e. Each parent must therefore be Ee. Ee x Ee gives EE, Ee, Ee and ee. Three outcomes have erect ears, so the probability is 3/4 = 75%.

Question 7

correct gametes shown for each parent: C and c on both sides — **M1**

Punnett square completed correctly with genotypes in boxes: CC, Cc, Cc, cc — **M1**

states genotype ratio as 1 CC : 2 Cc : 1 cc — **A1**

labels one of the offspring boxes as homozygous recessive (cc) and identifies it as affected by cystic fibrosis — **B1**

Answer: Gametes C and c vs C and c. Offspring CC, Cc, Cc, cc. Genotype ratio 1:2:1 with cc affected

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