1.8 Meiosis and the Causes of Variation: Test Pack

Total Marks

EDEXCEL 4BI1 · Calculator allowed · about 15 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Define meiosis, as used in the production of gametes in animals and plants, naming the number of cells produced and whether they are genetically identical or different.

(Total for Question 1 is 2 marks)

2 State the haploid and diploid chromosome numbers relationship that meiosis establishes for sexual reproduction, as required for fertilisation to restore chromosome number.

(Total for Question 2 is 1 mark)

3 In a species, body cells have 24 chromosomes. Meiosis produces gametes, and fertilisation joins one gamete from each parent. State the chromosome number in the zygote.

(Total for Question 3 is 1 mark)

4 Distinguish between continuous and discontinuous variation, giving one clear example of each within the context of organisms of the same species.

(Total for Question 4 is 2 marks)

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5 In an illustrative investigation, a class records leaf lengths for two plant groups. Group A: 18, 20, 20, 22 mm. Group B: 16, 18, 24, 26 mm. Calculate the mean leaf length for each group.

(Total for Question 5 is 2 marks)

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6 Explain two ways in which genetic variation arises between gametes and therefore between offspring of the same species, naming meiosis and another source.

(Total for Question 6 is 2 marks)

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7 An illustrative survey records wing lengths in two groups of the same insect species. Group X: 21, 22, 22, 23 mm. Group Y: 18, 21, 24, 25 mm. Calculate the range for each group. Explain why these measurements alone cannot show whether the differences in wing length are genetic or environmental.

(Total for Question 7 is 3 marks)

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Mark scheme · 1.8 Meiosis and the Causes of Variation: Test Pack

Question 1

a type of cell division that produces gametes **B1**

produces four haploid cells that are genetically different from each other and from the parent cell **B1**

Answer: Meiosis is a cell division that produces four haploid gametes which are genetically different

Question 2

meiosis halves the diploid number to make haploid gametes so fertilisation restores the diploid number **B1**

Answer: Meiosis halves the diploid number to haploid so fertilisation restores the diploid number

Question 3

24 chromosomes **B1**

Answer: 24 chromosomes

Question 4

continuous variation: shows a range of values, e.g. height **B1**

discontinuous variation: distinct categories, e.g. blood group **B1**

Answer: Continuous variation shows a range of values such as height; discontinuous variation falls into distinct categories such as blood group

Question 5

Group A mean = 20 mm **B1**

Group B mean = 21 mm **B1**

Answer: Group A mean: 20 mm; Group B mean: 21 mm.

Question 6

variation arises in meiosis because the four gametes are genetically different (award phrasing that meiosis produces different combinations) **B1**

variation also arises from random fertilisation or mutation named as a second source **B1**

Answer: Meiosis produces genetically different gametes, and additional variation arises from random fertilisation or from mutations in DNA

Question 7

Group X range = 2 mm **B1**

Group Y range = 7 mm **B1**

The measurements provide no information about genes or environmental conditions, so they cannot distinguish genetic from environmental causes **B1**

Answer: Group X range = 23 - 21 = 2 mm. Group Y range = 25 - 18 = 7 mm. The measurements alone cannot show whether the differences are genetic or environmental because neither genes nor growing conditions were recorded.

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