



QUESTION WORKBOOK

Continuous and discontinuous variation

Evolution and speciation · Unit B19

OCR A 4.2.2 · Edexcel A 3.14, 3.15, 8.19 · CAIE 17.1

13 questions · 40 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 State what is meant by discontinuous variation, and give one named example of a human characteristic that shows it. [2]
VCD-Q4

A2 A student measures the shell height of 90 snails from one wood, and separately compares the shell height of two different snail species. Identify which set of data shows intraspecific variation and which shows interspecific variation, and justify each choice. [2]
VCD-Q5

A3 State how many different genotypes are possible for the ABO blood group gene in a population, and state how many phenotypes these genotypes give rise to. [2]
VCD-Q15

SECTION B · Standard, 3 to 5 marks

B1

VCD-Q6

Studies of variation in human characteristics often compare identical twins reared apart with identical twins reared together. Evaluate this design as a way of separating the genetic contribution to a characteristic from the environmental one.

[5]

B2

VCD-Q1

Compare continuous variation with discontinuous variation, referring to the genes involved, the effect of the environment and the graph used to display each.

[4]

B3

VCD-Q9

A characteristic is controlled by several genes, each with two alleles of equal and additive effect. With one such gene there are 3 phenotype classes, and with two such genes there are 5. Calculate the number of phenotype classes with three such genes, and calculate the number with six such genes.

[4]

B4 A characteristic controlled by four genes, each with two alleles of equal and additive effect, gives nine phenotype classes. Explain why adding more such genes makes the variation appear continuous. [3]

VCD-Q2

B5 Cuttings taken from one hydrangea plant are grown in acid soil and in alkaline soil, and they produce flowers of different colours. Explain what this shows about variation. [3]

VCD-Q3

B6 Himalayan rabbits carry an allele for a fur-pigment enzyme that works at low temperature but not at high temperature, giving black fur on the cool extremities and white fur on the warmer trunk. A patch of white fur is shaved from a rabbit's back and an ice pack is bound over the area while the fur regrows. Explain the colour of the fur that regrows under the ice pack. [3]

VCD-Q10

B7

VCD-Q11

Two wheat plants of identical genotype are grown, one in soil given plenty of nitrogen fertiliser and one in poor soil with little nitrogen, and the well-fertilised plant grows much taller. Suggest why the two plants differ in height despite being genetically identical, and suggest what would happen to the height difference if seed from each plant were grown together in the same, well-fertilised soil. [3]

B8

VCD-Q12

A student claims that height shows continuous variation only because of differences in diet and exercise, and has no genetic basis at all. Explain why this claim is incorrect. [3]

B9

VCD-Q13

Two genetically identical (cloned) strawberry plants are grown, one in a greenhouse and one outdoors, and the outdoor plant produces smaller fruit. Separately, the height of 50 unrelated strawberry plants of different genotypes, grown together in the same greenhouse, is found to vary continuously. Identify which difference is environmental variation and which is at least partly genetic variation, justifying each choice. [3]

B10

VCD-Q14

Seed coat colour in a crop plant is controlled by a single gene and falls into two sharply distinct classes regardless of growing conditions, whereas seed mass varies smoothly across a wide range and is heavier in plants grown with more water. Explain, with reference to the number of genes involved, why environmental conditions affect seed mass but not seed coat colour. [3]

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