AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.6.2.1

Variation

Past-paper questions

Tier	**Foundation**
Question groups	**5**
Available paper years	**2018–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.6.2.1 Variation

Question 01

June 2018 | 8464/B/2F | Original Q5

0 5 Variation in individual organisms can be caused by:

- genes
- the environment
- a combination of both genes and the environment.

Figure 7 shows variations in a woman.

Figure 7



0 5 . 1 What is the cause of each variation in **Table 5**?

Tick only **one** box in each row.

[3 marks]

Table 5

Variation	Cause of variation		
	Genes only	Environment only	Both genes and the environment
Brown eyes			
Light brown skin colour			
Short hair			

4.6.2.1 Variation

Question 01 · continued

0 5 . 2 The allele for blue eyes is recessive (**b**).

The allele for brown eyes is dominant (**B**).

A woman has blue eyes.

What are the woman's alleles?

[1 mark]

Tick **one** box.

BB ☐ **Bb** ☐ **bb** ☐

0 5 . 3 The woman marries a man with the alleles **Bb** for eye colour.

What colour eyes does the man have?

[1 mark]

0 5 . 4 Complete the Punnett square diagram in **Figure 8** for this man and woman.

[1 mark]

Figure 8

		Woman	
Man	**B**		
	b		

0 5 . 5 What is the probability that a child of this man and woman will have brown eyes?

[1 mark]

Question 5 continues on the next page

4.6.2.1 Variation

Question 01 · continued

0 5 . 6 What is the scientific term used for the child's eye colour?

[1 mark]

Tick **one** box.

- Chromosome ☐
- Condition ☐
- Genotype ☐
- Phenotype ☐

0 5 . 7 What effect will a mutation have?

[1 mark]

Tick **one** box.

- Almost certainly have no effect ☐
- Definitely change appearance ☐
- Definitely be passed on to all children ☐
- Probably cause a disease ☐

9

4.6.2.1 Variation

Question 02

November 2021 | 8464/B/2F | Original Q3

0 3 **Figure 2** shows one species of bird on a bird feeder.

Figure 2



The birds use their beaks to reach nuts inside the bird feeder.

Cats sometimes eat the birds.

0 3 . 1 Give the food chain for the birds, cats and nuts.

[2 marks]

0 3 . 2 Which organism in the food chain you gave in Question **03.1** is the primary consumer?

[1 mark]

4.6.2.1 Variation

Question 02 · continued

0 3 . 3 Cats are one biotic factor that affects the size of the bird population.

Which **two** of the following are **biotic** factors?

[2 marks]

Tick (✓) **two** boxes.

- Food ☐
- Pathogens ☐
- Sunlight ☐
- Temperature ☐
- Water ☐

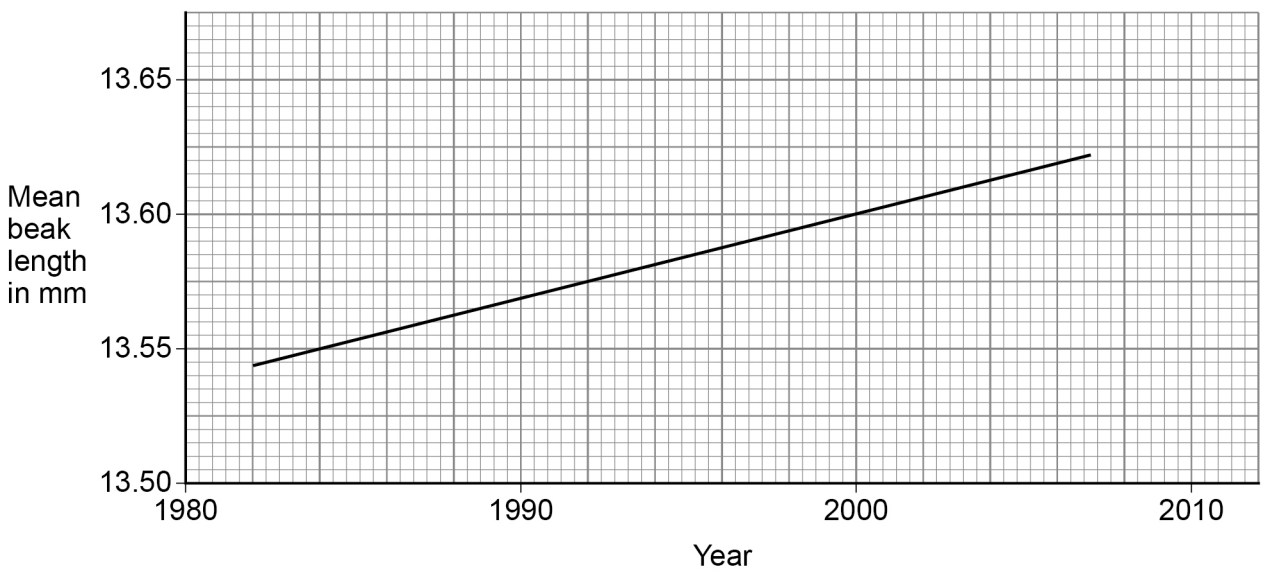
Question 3 continues on the next page

4.6.2.1 Variation

Question 02 · continued

Figure 3 shows the mean beak length of this species of bird from 1982 to 2007.

Figure 3



0 3 . 4 What was the mean beak length in 2000?

[1 mark]

Mean beak length = _____ mm

0 3 . 5 What type of adaptation is beak length?

[1 mark]

Tick (✓) **one** box.

Behavioural ☐

Chemical ☐

Structural ☐

4.6.2.1 Variation

Question 02 · continued

Figure 3 shows evidence of evolution in this species of bird.

0 3 . 6 Scientists have concluded that beak length in this species of bird is increasing.

Complete the sentences about the evolution of this species of bird.

Choose answers from the box.

[4 marks]

excretion	**generation**	**mutation**
reproduction	**respiration**	**variation**

The difference in beak length in the bird population

is called _____ .

A change in a gene affects the beak length.

Change in a gene is called _____ .

The birds with the longest beaks get more food.

Getting more food improves a bird's chances of

survival and _____ .

This process of evolution takes place over more

than one _____ .

Question 3 continues on the next page

4.6.2.1 Variation

Question 02 · continued

0 3 . 7 Birds of this species:

- live for about 3 years
- produce up to 24 eggs every year.

Why is evolution easier to study in birds than in humans?

[1 mark]

Tick (✓) **one** box.

Birds breed less frequently than humans. ☐

Birds have a shorter life cycle than humans. ☐

Birds have fewer offspring than humans. ☐

0 3 . 8 Bacteria also provide evidence for evolution.

Which statement describes evidence for evolution?

[1 mark]

Tick (✓) **one** box.

Bacteria can become resistant to antibiotics. ☐

Decomposition can be caused by bacteria. ☐

Some bacteria are pathogens. ☐

13

4.6.2.1 Variation

Question 03

June 2023 | 8464/B/2F | Original Q6

0 6 Sexual reproduction in humans involves the production of egg cells and sperm cells.

0 6 . 1 Name the type of cell division that produces egg cells and sperm cells.

[1 mark]

_____

0 6 . 2 Sexual reproduction produces offspring that are genetically different from each other.

Give **two** reasons why sexual reproduction causes variation in the offspring.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

4.6.2.1 Variation

Question 03 · continued

Polydactyly is an inherited disorder.

The allele for polydactyly is dominant, **D**.

A person with two copies of the allele **d** will **not** have polydactyly.

0 6 . 3 A person with the genotype **DD** is homozygous.

What word describes the genotype **Dd**?

[1 mark]

_____

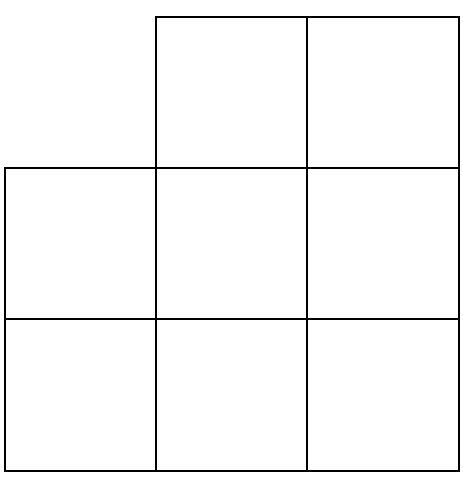
0 6 . 4 A person with the genotype **Dd** and a person with the genotype **dd** plan to have a child.

Determine the probability that the child will have polydactyly.

You should:

- complete the Punnett square diagram
- identify any offspring genotype that would have polydactyly.

[5 marks]



Probability that the child will have polydactyly = _____

4.6.2.1 Variation

Question 03 · continued

0 6 . 5 Embryos can be screened for the alleles that cause inherited disorders.

Give **two** advantages of embryo screening.

[2 marks]

1 _____

_____

2 _____

_____

11

Turn over for the next question

4.6.2.1 Variation

Question 04

June 2024 | 8464/B/2F | Original Q1

0 1 Cystic fibrosis is a genetic disorder.

0 1 . 1 Cystic fibrosis affects the movement of substances into and out of cells.

Which part of a cell controls the movement of substances into and out of the cell?

[1 mark]

Tick (✓) **one** box.

- Cell membrane ☐
- Cytoplasm ☐
- Mitochondria ☐

Cystic fibrosis is caused by a recessive allele, **b**.

0 1 . 2 What name is given to the allele **B**?

[1 mark]

Tick (✓) **one** box.

- DNA ☐
- Dominant ☐
- Gene ☐

0 1 . 3 Which term describes the genotype **Bb**?

[1 mark]

Tick (✓) **one** box.

- Chromosome ☐
- Heterozygous ☐
- Phenotype ☐

4.6.2.1 Variation

Question 04 · continued

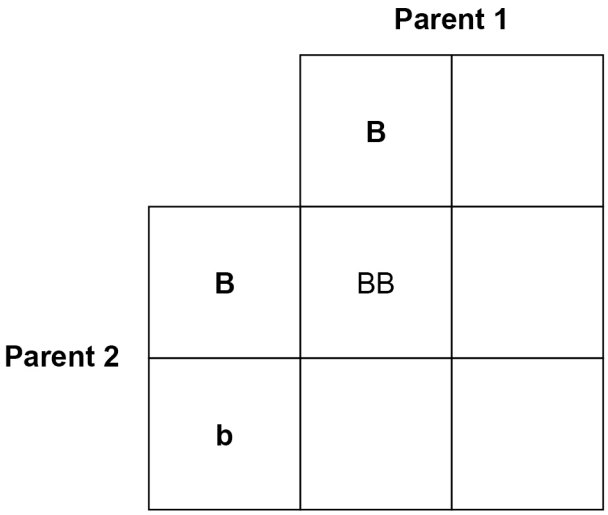
0 1 . 4 Two people plan to have a child.

Both people have the genotype **Bb**.

Complete **Figure 1** to show the possible genotypes of the child.

[3 marks]

Figure 1



0 1 . 5 What is the chance that a child of these parents will have cystic fibrosis?

Use **Figure 1**.

[1 mark]

Tick (✓) **one** box.

0% ☐ 25% ☐ 50% ☐ 75% ☐

Question 1 continues on the next page

Question 04 · continued

0 1 . 6 An embryo can be tested to find out its genotype.

What is the name of the testing process?

[1 mark]

Tick (✓) **one** box.

Genetic engineering ☐

Screening ☐

Selective breeding ☐

0 1 . 7 Inherited disorders can be caused by changes in DNA.

What is the name of a change in DNA?

[1 mark]

Tick (✓) **one** box.

Genome ☐

Helix ☐

Mutation ☐

0 1 . 8 Inheritance is one cause of variation in a population.

Environmental factors also cause variation in a population.

Suggest **one** environmental cause of variation in a human population.

Do **not** refer to inheritance or to changes in DNA in your answer.

[1 mark]

_____

_____

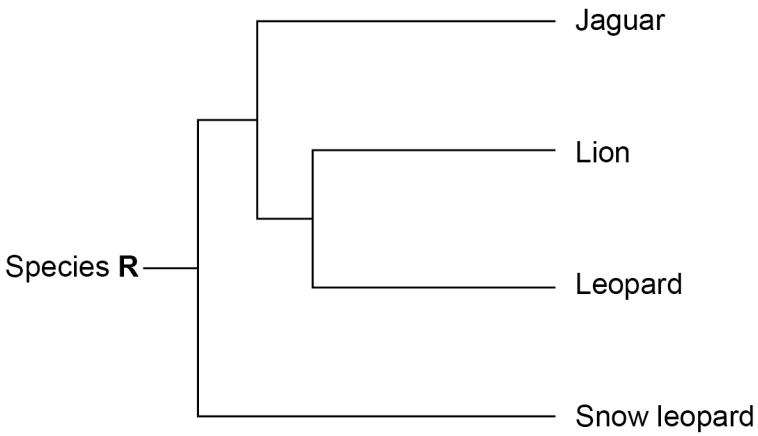
10

4.6.2.1 Variation

Question 05

0 4 **Figure 8** shows an evolutionary tree.

Figure 8



0 4 . 1 Which species in **Figure 8** is most closely related to lions?

[1 mark]

Tick (✓) **one** box.

Jaguar ☐

Leopard ☐

Snow leopard ☐

0 4 . 2 Tigers are more closely related to snow leopards than to jaguars.

Draw a line on **Figure 8** to show the evolution of tigers.

Label the line 'Tiger'.

[1 mark]

4.6.2.1 Variation

Question 05 · continued

0 4 . 3 What is represented by species **R** on **Figure 8**?

[1 mark]

Tick (✓) **one** box.

A species recently evolved from jaguars. ☐

A species that may evolve in the future. ☐

A species that the other species evolved from. ☐

0 4 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

classification	**homeostasis**	**natural selection**

Evolution occurs by the process of _____.

0 4 . 5 Species can become extinct.

Give **two** possible causes of extinction.

[2 marks]

1 _____

_____

2 _____

_____

Question 4 continues on the next page

Question 05 · continued

0 4 . 6 Fossils are used to study the evolution of some species.

Suggest **one** reason why fossils are used to study evolution.

[1 mark]

Some bacteria have evolved to be resistant to penicillin.

Penicillin is an antibiotic.

0 4 . 7 How has the process of evolution produced bacteria that are resistant to penicillin?

Write the stages, **A**, **B**, **C**, **D** and **E** in the correct order.

The first stage has been completed for you.

[3 marks]

A The bacteria with mutations are more likely to survive.

B The population of bacteria is exposed to penicillin.

C The mutation for resistance to penicillin is passed on to offspring.

D Variation in the population of bacteria is caused by mutation.

E The surviving bacteria reproduce.

D → _____ → _____ → _____ → _____

4.6.2.1 Variation

Question 05 · continued

0 4 . 8 New antibiotics are **not** likely to control the spread of bacteria that are resistant to antibiotics.

What are **two** reasons why?

[2 marks]

Tick (✓) **two** boxes.

- Antibiotics kill all types of bacteria. ☐
- Antibiotic resistant bacteria will continue to evolve. ☐
- Bacteria reproduce very rapidly. ☐
- New antibiotics are cheap to produce. ☐
- Testing new antibiotics is quick. ☐

12

Turn over for the next question