

GCSE Combined Science: Trilogy

Worksheet: Variation

TIME 30 min	TOTAL 27 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Variation

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Differences in the characteristics of individuals in a population are called variation.

0 1 . 1

Which characteristic is caused only by genetic factors?

Tick (✓) **one** box.

Blood group

☐

Body mass

☐

Language spoken

☐

A scar on the knee

☐

[1 mark]

0 1 . 2

Which characteristic is caused only by the environment?

Tick (✓) **one** box.

Blood group

☐

Eye colour

☐

Height

☐

A tattoo

☐

[1 mark]

0 1 . 3

Body mass is affected by both genes and the environment.
Give **one** environmental factor that affects body mass.

.....

.....

[1 mark]

0 1 . 4

All genetic variants arise in the same way.
What causes genetic variants?

.....

.....

.....

.....

[1 mark]

0 1 . 5

Which statement about genetic variants is correct?
Tick (✓) **one** box.

Most genetic variants determine the phenotype

☐

Most genetic variants have no effect on the phenotype

☐

Most genetic variants are harmful

☐

Most genetic variants are useful

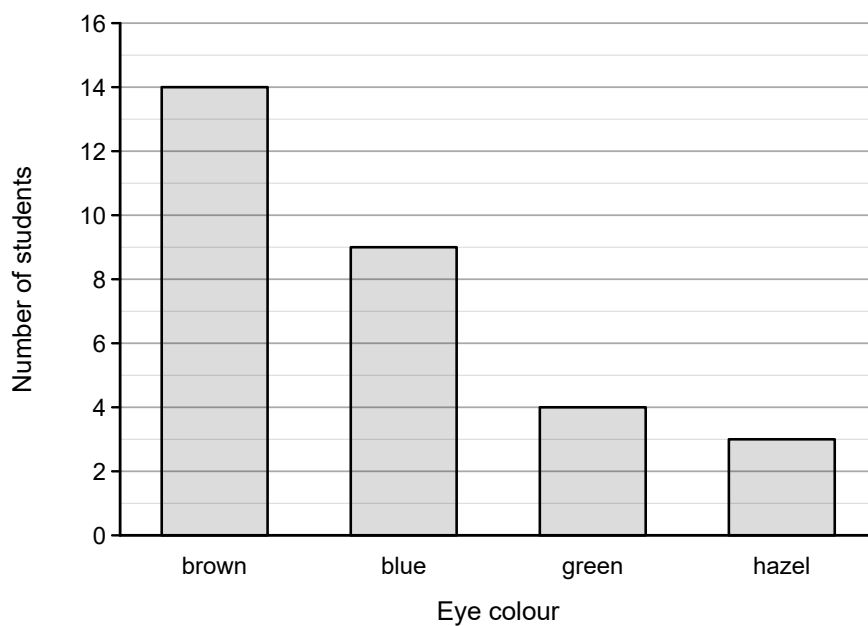
☐

[1 mark]

0 2

A student recorded the eye colour of the 30 students in a class. Figure 1 shows the results.

Figure 1



0 2 . 1

Which eye colour was the most common?

.....

.....

.....

[1 mark]

0 2 . 2

Calculate the percentage of the students who had blue eyes.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 2 . 3

What name is given to differences in the characteristics of individuals in a population?

.....

.....

.....

[1 mark]

0 2 . 4

Eye colour is controlled by genes. Two sisters have the same parents but different eye colours.
Suggest why.

.....

.....

[1 mark]

0 3

Variation between individuals can be caused by genes, by the environment, or by a combination of both.

0 3 . 1

Classify each characteristic as caused mainly by genes, mainly by the environment, or by a combination of both.

Natural hair colour

The language a person speaks

Height

[3 marks]

0 3 . 2

Two plants were grown from seeds produced by the same two parent plants. They were grown in the same greenhouse, but one plant grew much taller than the other.
Suggest **two** reasons for this difference.

.....

.....

.....

.....

[2 marks]

0 4

A student took 30 cuttings from one plant. The student grew 10 cuttings in each of three different light intensities for 6 weeks and then measured their mean dry mass. Table 1 shows the results.

Table 1

Light intensity	Mean dry mass in g
low	2.1
medium	4.8
high	6.3

0 4 . 1

Explain why the student used cuttings from the same plant.

.....

.....

.....

.....

[2 marks]

0 4 . 2

Calculate the percentage increase in mean dry mass between low and high light intensity.

.....

.....

.....

.....

Percentage increase = %

[2 marks]

0 4 . 3

Explain why the plants grown in high light intensity had the greatest mass.

.....

.....

.....

.....

[2 marks]

0 5

A class of 30 students investigated variation in hand span (the distance from the tip of the thumb to the tip of the little finger with the hand stretched out). Each student measured their own hand span with a ruler. Table 2 shows the results, grouped into classes.

Table 2

Hand span in cm	16.0–17.9	18.0–19.9	20.0–21.9	22.0–23.9	24.0–25.9
Number of students	2	8	12	6	2

0 5 . 1

Suggest **two** ways the students could make their measurements more accurate or more consistent.

.....

.....

.....

.....

[2 marks]

0 5 . 2

The students want to show their results in a chart.

Which type of chart is most suitable?

Tick (✓) **one** box.

Bar chart with gaps between the bars

☐

Histogram (bars touching each other)

☐

Line graph

☐

Scatter graph

☐

[1 mark]

0 5 . 3

Calculate the percentage of the students with a hand span of 20.0 cm or more.
Give your answer to 3 significant figures.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 5 . 4

Suggest **one** environmental factor that might affect a person’s hand span.

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Variation · 27 marks

Question 1 (5 marks)

01.1 [1 mark]

Correct: Blood group

01.2 [1 mark]

Correct: A tattoo

01.3 [1 mark]

Answer: Diet / amount of exercise

- diet / amount of food eaten / exercise (1)
-

01.4 [1 mark]

Answer: Mutations

- mutation(s) (1)
-

01.5 [1 mark]

Correct: Most genetic variants have no effect on the phenotype

Question 2 (5 marks)

02.1 [1 mark]

Answer: Brown

- brown (1)

02.2 [2 marks]

Answer: 30%

- $9 \div 30 \times 100$ (1)
- 30 (%) (1)

Notes: Correct answer with no working scores 2 marks.

02.3 [1 mark]

Answer: Variation

- variation (1)

02.4 [1 mark]

Answer: They inherited different combinations of alleles from their parents

- they inherited different alleles / different combinations of alleles from their parents (each gamete is genetically different) (1)

Question 3 (5 marks)

03.1 [3 marks]

Answer: Genes; environment; a combination of both

- natural hair colour: genes (1)
- the language a person speaks: environment (1)
- height: a combination of both (1)

03.2 [2 marks]

Answer: The seeds were produced by sexual reproduction, so the plants inherited different alleles; and one plant may have had more light, water or mineral ions than the other

- genetic: the seeds were produced by sexual reproduction, so the plants inherited different alleles / different combinations of genes for height (1)
 - environmental: one plant may have received more light / water / mineral ions (e.g. because of its position in the greenhouse) (1)
-

Question 4 (6 marks)

04.1 [2 marks]

Answer: The cuttings are genetically identical (clones), so any differences in mass must be caused by the environment (light intensity)

- cuttings are genetically identical / clones (1)
- so differences in mass are due to the environment / light intensity only (1)

04.2 [2 marks]

Answer: 200%

- $(6.3 - 2.1) \div 2.1 \times 100$ (1)
- 200 (%) (1)

Notes: Correct answer with no working scores 2 marks.

04.3 [2 marks]

Answer: More light means a faster rate of photosynthesis, so more glucose is made and used for growth

- faster (rate of) photosynthesis (1)
 - more glucose made / used to make new cells, e.g. cellulose, protein (for growth) (1)
-

Question 5 (6 marks)

05.1 [2 marks]

Answer: One person measures every hand in the same way, with the fingers fully stretched, to the nearest millimetre; repeat each measurement and calculate a mean

- measure every hand in the same way, with the fingers stretched as wide as possible (1)
- measure to the nearest millimetre (1)
- the same person measures every hand / use a measuring board or fixed ruler (1)
- repeat each measurement and calculate a mean (1)

Any 2 of the points above.

05.2 [1 mark]

Correct: Histogram (bars touching each other)

05.3 [2 marks]

Answer: 66.7%

- $(12 + 6 + 2) \div 30 \times 100$ (1)
- 66.7 (%) (1)

Notes: Correct answer with no working scores 2 marks. 66.67 or 67 (not given to 3 significant figures) scores 1 mark.

05.4 [1 mark]

Answer: Diet (nutrition) during childhood

- nutrition / diet (during childhood growth) / illness during development (1)
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