

GCSE Combined Science: Trilogy

Worksheet: Evolution

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Evolution

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

A population of rabbits lives in a cold area. The sentences below describe how natural selection could make thick fur more common in the population, but they are in the wrong order.

- A Rabbits with thicker fur are more likely to survive a cold winter.
 B There is variation in fur thickness in the population.
 C The allele for thick fur becomes more common over many generations.
 D The surviving rabbits breed and pass on the allele for thick fur.

0 1 . 1 Write the letters in the correct order.

[2 marks]

0 1 . 2 What is the original source of the variation in fur thickness?

Tick (✓) **one** box.

Mutations in genes

☐

Rabbits eating more food in winter

☐

Rabbits growing thicker fur because they feel cold

☐

Rabbits choosing a mate with thick fur

☐

[1 mark]

0 1 . 3

Complete the sentence.

Two populations of rabbits have become separate species if they can no longer interbreed to produce offspring.

.....

.....

.....

[1 mark]

0 2

Natural selection is the process that drives evolution.

0 2 . 1

Which condition is needed for natural selection to act on a population?

Tick (✓) **one** box.

All individuals must be genetically identical

☐

Individuals must be able to move to a new habitat

☐

There must be variation between individuals

☐

The environment must never change

☐

[1 mark]

0 2 . 2

Owls hunt mice that live on dark soil.

Which mice are most likely to survive and breed?

Tick (✓) **one** box.

Mice with dark fur

☐

Mice with pale fur

☐

Mice with white fur

☐

All the mice have the same chance

☐

[1 mark]

0 2 . 3

Which statement about a new, useful mutation is correct?

Tick (✓) **one** box.

It always spreads through the whole population within one generation

☐

It cannot be passed on to offspring

☐

It gives individuals with it a better chance of surviving and reproducing

☐

It makes the individual unable to reproduce

☐

[1 mark]

0 3

The theory of evolution by natural selection explains how living things have changed over time.

0 3 . 1

What is evolution?

Tick (✓) **one** box.

A change in the inherited characteristics of a population over time through natural selection

☐

The changes that happen to an individual during its lifetime

☐

The process by which a species becomes extinct

☐

The production of offspring from one parent

☐

[1 mark]

0 3 . 2

All species of living things have evolved from simple life forms.

When did these simple life forms first develop?

Tick (✓) **one** box.

More than three thousand years ago

☐

More than three million years ago

☐

More than three billion years ago

☐

More than three trillion years ago

☐

[1 mark]

0 3 . 3

Complete the sentence.

Individuals with the characteristics best suited to their environment are more likely to and

.....

.....

.....

.....

[2 marks]

0 3 . 4

Two populations of one species can become so different in phenotype that they form two new species.

How can you tell when this has happened?

.....

.....

.....

.....

[2 marks]

.....

0 4

Warfarin is a poison that was widely used to kill rats. Some rats have an allele that makes them resistant to warfarin. Table 1 shows the percentage of rats in one town that were resistant, in the years after warfarin was first used there.

Table 1

Years after warfarin was first used	0	5	10	15
Resistant rats in %	1	8	35	70

0 4 . 1

Explain how the population of rats became resistant to warfarin.

.....

.....

.....

.....

.....

.....

.....

[4 marks]

0 4 . 2

Suggest why the percentage of resistant rats increased so quickly.

.....

.....

[1 mark]

0 4 . 3

Suggest what the town council should do to control the rats.

.....

.....

[1 mark]

.....

0 5

An insecticide was used every year to control aphids on a farm. Table 2 shows the percentage of the aphids that were resistant to the insecticide.

Table 2

Years since the insecticide was first used	0	6	10
Resistant aphids in %	3	17	57

0 5 . 1

In year 10, a sample of 200 aphids was tested.
Calculate the number that would be expected to be resistant.

.....

.....

.....

.....

Number resistant =

[2 marks]

0 5 . 2

Explain how the percentage of resistant aphids increased while the insecticide was being used.

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

0 6

In a population of moths, dark-coloured moths were rare until industrial pollution blackened the tree trunks the moths rest on, after which dark moths became common because they were better camouflaged from birds. Decades later, pollution controls cleaned the air, and the tree trunks became pale again. Table 3 shows the percentage of dark moths before, during and after the period of heavy pollution.

Table 3

Period	Before pollution	During heavy pollution	After pollution controls
Dark moths in %	5	90	12

0 6 . 1

Explain the change in the percentage of dark moths between ‘before pollution’ and ‘during heavy pollution’.

.....

.....

.....

.....

.....

.....

[3 marks]

0 6 . 2

Explain the change in the percentage of dark moths between ‘during heavy pollution’ and ‘after pollution controls’.

.....

.....

.....

.....

[2 marks]

0 6 . 3

Suggest why the percentage of dark moths after pollution controls (12%) is still higher than before pollution began (5%).

.....

.....

.....

.....

[2 marks]

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: Evolution · 32 marks

Question 1 (4 marks)

01.1 [2 marks]

Answer: B, A, D, C

- B first and C last (1)
 - A before D (1)
-

01.2 [1 mark]

Correct: Mutations in genes

01.3 [1 mark]

Answer: fertile

- fertile (1)
-

Question 2 (3 marks)

02.1 [1 mark]

Correct: There must be variation between individuals

02.2 [1 mark]

Correct: Mice with dark fur

02.3 [1 mark]

Correct: It gives individuals with it a better chance of surviving and reproducing

Question 3 (6 marks)

03.1 [1 mark]

Correct: A change in the inherited characteristics of a population over time through natural selection

03.2 [1 mark]

Correct: More than three billion years ago

03.3 [2 marks]

Answer: survive and reproduce (breed)

- survive (1)
 - reproduce / breed (1)
-

03.4 [2 marks]

Answer: They can no longer interbreed to produce fertile offspring

- they can no longer interbreed (1)
 - to produce fertile offspring (1)
-

Question 4 (6 marks)

04.1 [4 marks]

Answer: A few rats already had the resistance allele (from a mutation); warfarin killed non-resistant rats; resistant rats survived and reproduced, passing on the allele; over many generations the percentage of resistant rats increased

- some rats already had the allele for resistance / it arose by mutation (1)
- warfarin killed the rats that were not resistant (1)
- resistant rats survived and reproduced (1)
- passing on the allele to their offspring, so over generations the percentage of resistant rats increased (1)

Notes: Do not accept 'rats became resistant because they were exposed to warfarin' or 'rats developed immunity'.

04.2 [1 mark]

Answer: Rats breed quickly and produce many offspring, so there are many generations in a short time

- rats reproduce quickly / short generation time / produce many offspring (1)
-

04.3 [1 mark]

Answer: Use a different poison or another method, such as traps

- use a different poison / traps / another control method (1)
-

Question 5 (6 marks)

05.1 [2 marks]

Answer: 114

- $200 \times 57 \div 100$ (1)
- 114 (1)

Notes: Correct answer with no working scores 2 marks.

05.2 [4 marks]

Answer: A few aphids already had an allele giving resistance; the insecticide killed the ones that were not resistant; the resistant ones survived and reproduced, passing on the allele, so the percentage of resistant aphids increased

- a few aphids already had a mutation / allele giving resistance before the insecticide was first used (1)
 - The insecticide killed the aphids that were not resistant (1)
 - resistant aphids survived and reproduced (1)
 - passing on the allele for resistance to their offspring, so the percentage of resistant aphids increased (over many generations) (1)
-

Question 6 (7 marks)

06.1 [3 marks]

Answer: Dark moths were already present because of a mutation; on the dark bark they were camouflaged from birds, so they survived and reproduced more, passing on the allele for dark colour, which became more common

- variation in colour was already present (caused by mutation) (1)
- dark moths were camouflaged on the (now dark) polluted bark, so were less likely to be eaten by birds (1)
- dark moths survived and reproduced more, passing on the allele for dark colour, so its frequency increased (1)

06.2 [2 marks]

Answer: Once the tree trunks became pale again, dark moths were no longer camouflaged but pale moths were, so pale moths were more likely to survive and reproduce, and the percentage of dark moths fell

- once tree trunks became pale again, dark moths were no longer camouflaged (more visible to birds) while pale moths were (1)
- pale moths became more likely to survive and reproduce, so the percentage of dark moths fell again (1)

06.3 [2 marks]

Answer: There may not have been enough generations since the pollution controls for the percentage to fall back fully, and some trunks may still be darker than before, or dark moths may arrive from more polluted areas

- there may not have been enough time (generations) since the pollution controls for the percentage to fall back fully (1)
- some tree trunks may still be darker than before / dark moths may fly in from areas that are still polluted (1)

Notes: Allow: the allele for dark colour is still carried by many moths, so it takes many generations to become rare again.
