

GCSE Combined Science: Trilogy

Worksheet: Selective breeding

TIME 30 min	TOTAL 29 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Selective breeding

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

Humans have changed many plants and animals by choosing which individuals are allowed to breed.

0 1 . 1 Give the name of the process in which humans choose organisms with desired characteristics and breed them together over many generations.

.....

.....

.....

.....

[1 mark]

0 1 . 2 Which characteristic is a farmer most likely to choose when breeding a food crop?

Tick (✓) **one** box.

Disease resistance

Low yield

Poor flavour

Slow growth

☐
☐
☐
☐

[1 mark]

0 1 . 3

Give **one** problem that can happen when closely related animals are bred together for many generations.

.....

.....

[1 mark]

0 2

Humans have used selective breeding for thousands of years.

0 2 . 1

What is selective breeding?

Tick (✓) **one** box.

Changing an organism's genome by adding a gene from another organism

☐

Growing new plants from small groups of cells

☐

Humans choosing parents with desired characteristics and breeding them together

☐

The survival of the organisms best suited to their environment in the wild

☐

[1 mark]

0 2 . 2

Give **two** characteristics that farmers might choose when selectively breeding food crops or farm animals.

.....

.....

.....

.....

[2 marks]

0 2 . 3

The steps in selective breeding are given below, but they are in the wrong order.

- A Breed together the offspring that show the desired characteristic.
- B Choose parents with the desired characteristic from a mixed population.
- C Repeat over many generations until all the offspring show the characteristic.
- D Breed the chosen parents together.

Write the letters in the correct order.

.....

.....

[2 marks]

0 3

In a breed of dog, 1 in 10 dogs is a carrier of a recessive allele that causes an inherited eye disorder. Carriers do not have the disorder.

0 3 . 1

Calculate the percentage of dogs in the breed that are carriers.

.....

.....

.....

Percentage = %

[1 mark]

0 3 . 2

There are 560 dogs of this breed in one country.
Estimate how many of them are carriers.

.....

.....

.....

.....

Number of carriers =

[2 marks]

0 3 . 3

Explain why the disorder can stay in the breed for many generations, even if dogs with the disorder are never used for breeding.

.....

.....

.....

.....

[2 marks]

0 4

A farmer selectively bred a herd of dairy cows for high milk yield. Table 1 shows the mean yield of milk per cow per year in each generation.

Table 1

Generation	0	1	2	3	4
Mean milk yield per cow in dm ³ per year	4800	5100	5500	5800	6000

0 4 . 1

Calculate the percentage increase in mean milk yield between generation 0 and generation 4.

.....

.....

.....

.....

Percentage increase = %

[2 marks]

0 4 . 2

Describe how the farmer would have selectively bred the cows to increase milk yield.

.....

.....

.....

.....

.....

[3 marks]

0 4 . 3

Suggest why the increase in milk yield became smaller in the later generations.

.....

.....

[1 mark]

0 5

Cabbage, broccoli, cauliflower, kale and Brussels sprouts have all been produced by selective breeding from the same species of wild plant.

0 5 . 1

Broccoli has very large flower heads.
Describe how farmers produced broccoli from the wild plant.

.....

.....

.....

.....

.....

.....

[3 marks]

0 5 . 2

All of these vegetables still belong to the same species.
What does this tell you about them?

.....

.....

[1 mark]

0 5 . 3

Plant breeders also select crops for disease resistance.
Give **two** benefits of growing disease-resistant crops.

.....

.....

.....

.....

[2 marks]

0 6

A vegetable breeder wants a variety of lettuce that grows well in slightly salty soil. Some wild lettuce plants already show slight natural tolerance to salty soil.

0 6 . 1

Explain how the breeder could use selective breeding, making use of the natural variation already present, to produce a salt-tolerant lettuce variety.

.....

.....

.....

.....

.....

.....

[3 marks]

0 6 . 2

Suggest **one** advantage of this approach over genetic engineering in this case.

.....

.....

[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: Selective breeding · 29 marks

Question 1 (3 marks)

01.1 [1 mark]

Answer: Selective breeding

- selective breeding / artificial selection (1)
-

01.2 [1 mark]

Correct: Disease resistance

01.3 [1 mark]

Answer: The animals are more likely to have inherited diseases or defects (inbreeding)

- the offspring are more likely to have (inherited) diseases or defects / there is less genetic variation (inbreeding) (1)
-

Question 2 (5 marks)

02.1 [1 mark]

Correct: Humans choosing parents with desired characteristics and breeding them together

02.2 [2 marks]

Answer: E.g. disease resistance in crops; high yield; animals that produce more meat or milk

- disease resistance (in food crops) (1)
- animals that produce more meat (1)
- animals that produce more milk (1)
- higher yield / bigger fruit or grain (1)

Any 2 of the points above.

02.3 [2 marks]

Answer: B, D, A, C

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

Question 3 (5 marks)

03.1 [1 mark]

Answer: 10%

- $1 \div 10 \times 100 = 10 \text{ (\%)} (1)$

03.2 [2 marks]

Answer: 56

- $560 \div 10 (1)$
- 56 (1)

Notes: Correct answer with no working scores 2 marks.

03.3 [2 marks]

Answer: Carriers do not have the disorder, so they cannot be recognised and are still used for breeding; they pass the recessive allele on to about half of their puppies

- carriers do not have the disorder, so they cannot be recognised by their appearance and are still used for breeding (1)
 - they pass the recessive allele on to (about half of) their puppies (1)
-

Question 4 (6 marks)

04.1 [2 marks]

Answer: 25%

- $(6000 - 4800) \div 4800 \times 100$ (1)
- 25 (%) (1)

Notes: Correct answer with no working scores 2 marks.

04.2 [3 marks]

Answer: Choose the cows with the highest milk yield and breed them (with bulls whose mothers had a high yield); choose the offspring with the highest yield and breed them; repeat over many generations

- choose the cows with the highest milk yield (and a bull from a high-yielding family) (1)
- breed them together (1)
- select the offspring with the highest milk yield and breed them together (1)
- repeat over many generations (1)

Any 3 of the points above.

04.3 [1 mark]

Answer: There is less genetic variation left, as most cows now have the alleles for high yield

- less (genetic) variation left / most cows already have the alleles for high yield / there is a physical limit to milk production (1)
-

Question 5 (6 marks)

05.1 [3 marks]

Answer: Chose wild plants with the largest flower heads and bred them together; chose the offspring with the largest flower heads and bred them; repeated this for many generations

- choose plants with the largest flower heads (1)
- breed them together and select offspring with the largest flower heads (to breed) (1)
- repeat over many generations (1)

05.2 [1 mark]

Answer: They can interbreed to produce fertile offspring

- they can interbreed to produce fertile offspring (1)

05.3 [2 marks]

Answer: Higher yields; less need for pesticides / fungicides, which saves money and harms the environment less

- higher yield / less crop lost (1)
- less need to spray pesticides / fungicides (1)
- lower costs for the farmer (1)
- more reliable food supply / food security (1)

Any 2 of the points above.

Question 6 (4 marks)

06.1 [3 marks]

Answer: Choose the most salt-tolerant lettuce plants and breed them together; grow the offspring in salty soil and select the most tolerant to breed from; repeat over several generations

- choose the most salt-tolerant lettuce plants available and breed them together (1)
- grow the offspring in salty soil and select the most tolerant offspring to breed from (1)
- repeat this process over several generations (1)

06.2 [1 mark]

Answer: Some natural tolerance already exists, so no gene needs to be inserted from another species; this may be cheaper and face fewer regulations and less consumer resistance

- it does not need a gene to be inserted from another species, so it may be simpler / cheaper / face fewer regulations or less consumer resistance than a GM approach (1)