18. Variation and selection

18.3 Selection

Paper 3 and 4

Question Paper

Paper 3

Questions are applicable for both core and extended candidates

1 **(d)** Coral groupers developed over time from a species of fish with very few spots on their bodies.

Complete the sentences to explain how coral groupers developed.

The fish species with few spots had genetic variation in their population.

When these fish ....., some of the offspring were born with more spots than others.

Fish with more spots were better adapted to the .....

because predators were less likely to see them.

Fish with more spots had a greater chance of passing on the .....

for more spots to the next generation.

This process is called ..... selection.

[4]

2 **(c)** Complete the flowchart to describe how egg production in chickens is increased by selective breeding.

identify the chickens that .....

↓

use these chickens to .....

↓

observe the offspring for improvement in egg production

↓

repeat this process over many .....

[3]

(d) Selective breeding is also used to increase crop plant production.

State **two other** ways to increase crop plant production.

1 .....

2 .....

[2]

3 **(a)** A farmer wanted to use selective breeding to produce goats with a high milk yield.

Fig. 7.1 shows a goat being milked.

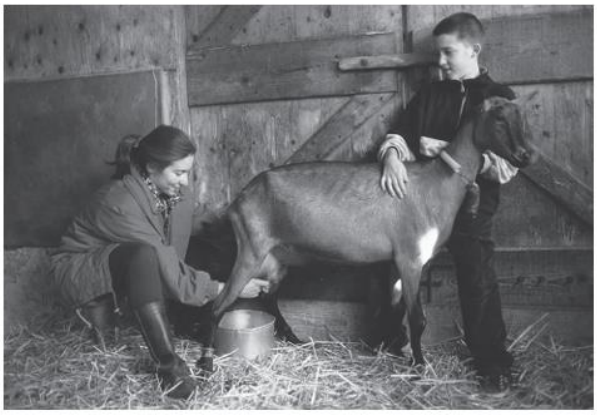

Fig. 7.1

Describe the stages in selective breeding to develop goats with a high milk yield.

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..... [3]

4 **(b)** Crops such as apples can be selectively bred.

The box on the left contains a sentence beginning.

The boxes on the right contain some sentence endings.

Draw **two** lines to make two correct sentences about selective breeding.

	involves one parent only.
	is carried out over many generations.
Selective breeding	is caused by mutation.
	is caused by the environment.
	requires human involvement.

[2]

(c) Some of the statements shown correctly describe events that happen during the process of natural selection.

Two of the statements are incorrect.

1	There is no variation within populations.
2	Many offspring are produced so there is more competition for resources.
3	Individuals that are not suited to the environment die.
4	Individuals that are better suited to the environment survive and breed.
5	Offspring pass their alleles to their parents.

State the numbers of the **two** incorrect statements.

..... and .....

[2]

5 **(c)** Selective breeding can be used to improve the yield of meat from livestock.

Sentences **A** to **E** in Table 7.2 describe the selective breeding of chickens to improve meat quantity.

The sentences are **not** in the correct order.

Table 7.2

Breed the chickens together.	**A**
Observe the chickens to identify those that will yield the most meat.	**B**
Observe the offspring and select the offspring that will yield the most meat.	**C**
Repeat the process over many generations.	**D**
Select one male and one female chicken.	**E**

Put the letters from Table 7.2 into the correct order.

One has been done for you.

		A		

[2]

6 **(b)** Some crop plants have been selectively bred to be drought resistant.

The sentences show stages in the process of selective breeding.

They are not in the correct order.

1 A farmer identifies crop plants that survive in drought conditions.

2 Offspring that survive drought conditions are selected and bred again.

3 The drought resistant plants are bred together and seeds collected.

4 The farmer repeats the process over many generations.

5 The seeds are germinated and grown in drought conditions.

Write the statement numbers in the boxes to show the correct order of the stages in selective breeding.

[3]

7 **(d)** Describe the process a farmer could use to breed a herd of white goats.

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.....[3]

8 Selective breeding of animals is very important to farmers.

Many different breeds of sheep have been produced by selective breeding.

Fig. 10.1 shows a flock of Merino sheep. This breed of sheep was produced by selective breeding.

Fig. 10.1

(a) Sheep are important animals in many parts of the world as they produce meat, wool and milk.

Table 10.1 describes some characteristics of five different breeds of sheep.

Table 10.1

breed of sheep	wool yield	wool quality	meat yield	milk yield
Arapawa	average	good	poor	average
Awassi	average	poor	average	very good
Blackbelly	poor	poor	very good	average
Merino	good	very good	good	poor
Tsurcana	average	good	average	average

A farmer wants to sell both meat and wool.

Suggest which breed of sheep in Table 10.1 is the most suitable for this farmer.

Give a reason for your choice.

breed of sheep .....

reason .....

.....

.....
[2]

(b) Another farmer wants to produce a new breed of sheep with both a very good milk yield and a very good quality of wool.

The farmer is able to buy any of the breeds of sheep shown in Table 10.1.

Describe the process this farmer would use to produce the new breed of sheep on her farm.

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..... [4]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

9 **(c)** Complete the sentences about drug resistance and genetic variation by writing a suitable word or phrase in the spaces provided. **(extended only)**

Bacteria can be killed by drugs called ..... . The development of strains of bacteria that are resistant to these drugs is an example of ..... selection.

Resistant strains of bacteria have gene mutations that enable them to survive drug treatment. Gene mutations are caused by random changes in the ..... of bases in DNA and result in the formation of new ..... in the bacteria. Mutation rates can be increased by ..... radiation and some chemicals.

In animals and plants, another source of genetic variation is a type of nuclear division called ..... .

[6]

10 **(d)** Describe how artificial selection differs from natural selection. **(extended only)**

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11 **(b)** **(i)** Outline how antibiotic resistance develops in a population of bacteria. **(extended only)**

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..... [3]

(ii) Scientists use differences in antibiotic-resistance genes to distinguish between different strains of the bacterium, methicillin-resistant *S. aureus* (MRSA).

Suggest why scientists use differences in base sequences to classify the strains of MRSA rather than using other methods. **(extended only)**

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..... [1]

(iii) Explain why scientists are concerned that some strains of bacteria, such as *S. aureus*, have become resistant to antibiotics. **(extended only)**

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..... [2]

12 **(b)** The fruits of maize are produced on structures called cobs. Each cob has many fruits.

Fig. 6.2 shows how the maize cobs have changed over thousands of years as a result of selective breeding.

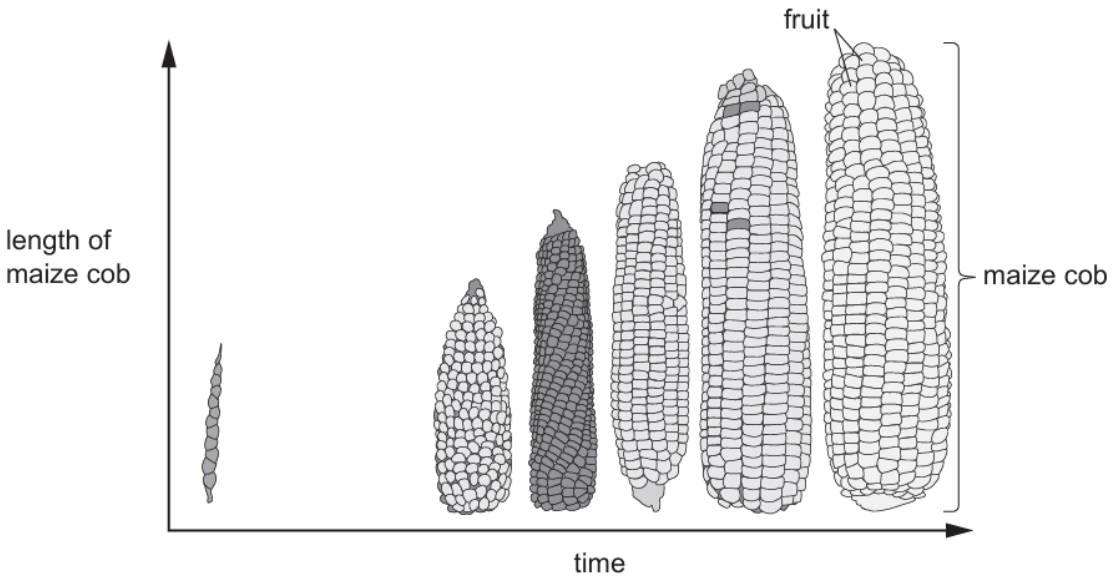

Fig. 6.2

State **two** desirable features, visible in Fig. 6.2, that have been selected from the more ancient varieties of maize.

1 .....

2 .....

[2]

13 **(b)** Galápagos finches share a common ancestor.

Suggest how Galápagos finches have evolved different shaped beaks.

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..... [5]

14 **(c)** Merino sheep in South Africa have high quality wool with very thin hairs.

Breeders in New Zealand have used selective breeding programmes to improve the wool of their sheep to match the quality of South African wool.

Describe the steps that breeders would take to breed sheep that have wool with very thin hairs.

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..... [5]

(d) Explain how natural selection differs from selective breeding. **(extended only)**

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..... [3]

15 **(d)** Black stem rust is a disease of wheat that is caused by a fungus.

Plant breeders used two varieties of wheat to produce a variety of wheat that is both rust-resistant and has a high yield.

Fig. 5.2 shows the breeding programme that was used.

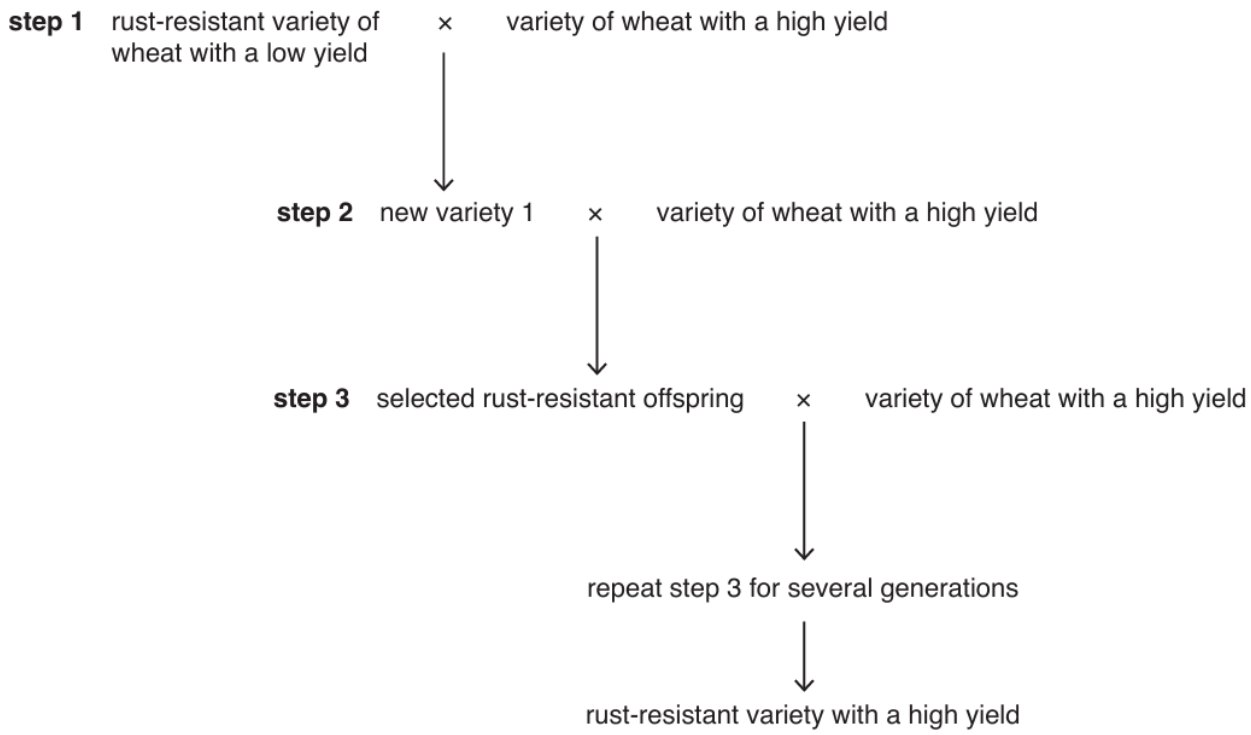

Fig. 5.2

(i) Suggest how plant breeders make sure that the plants that they use for step 3 are rust-resistant.

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..... [2]

(ii) Suggest why step 3 is repeated for many generations before the new rust-resistant variety is made available for farmers to grow.

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..... [1]