AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Biology Paper 2F

Friday 9 June 2023 Afternoon Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Information
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Do not write outside the box

0 1 **Figure 1** shows a place where peat is being removed from a peat bog.

Figure 1

0 1 . 1 Why is peat removed from peat bogs?

[1 mark]

Tick (✓) **one** box.

To increase biodiversity ☐

To produce garden compost ☐

To protect rare habitats ☐

Do not write outside the box

0 1 . 2 Peat can decay.

Name **one** type of organism that causes decay.

[1 mark]

_____

0 1 . 3 Complete the sentences.

Choose answers from the box.

[2 marks]

carbon dioxide	**nitrogen**	**oxygen**	**sulfur dioxide**

The organisms that cause decay respire.

The gas used for respiration is _____ .

The gas produced by respiration is _____ .

Question 1 continues on the next page

Do not write outside the box

0 1 . 4 Peat bogs cover a total area of 3 700 000 km^2.

In 2020, 46% of peat bogs were frozen.

How can the area of peat bogs that were frozen be calculated?

[1 mark]

Tick (✓) **one** box.

$3\,700\,000 \times \frac{46}{100}$ ☐

$\frac{46}{3\,700\,000} \times 100$ ☐

$\frac{3\,700\,000}{46} \times 100$ ☐

0 1 . 5 The percentage of peat bogs that are frozen decreases each year.

Suggest why the **percentage** of peat bogs that are frozen is decreasing.

[1 mark]

Do not write outside the box

0 1 . 6 Which **two** human activities **decrease** the area of land available for other animals and plants?

[2 marks]

Tick (✓) **two** boxes.

- Building factories ☐
- Recycling plastics ☐
- Replanting hedgerows ☐
- Reusing glass bottles ☐
- Quarrying rocks ☐

8

Turn over for the next question

Do not write outside the box

0 2 A student investigated the effect of either **seeing** a stimulus or **hearing** a stimulus on reaction time.

First, the student measured their reaction time to **seeing** a colour change.

This is the method used.

1. Sit in front of a computer with a reaction timer program open.
2. Press a key on the keyboard as quickly as possible when the computer screen changes colour.
3. Record the reaction time.
4. Repeat steps 1 to 3 four more times and calculate the mean reaction time.

Next, the student measured their reaction time to **hearing** a sound.

This is the method used.

5. Sit in front of a computer with a reaction timer program open.
6. Press a key on the keyboard as quickly as possible when the computer produces a sound.
7. Record the reaction time.
8. Repeat steps 5 to 7 four more times and calculate the mean reaction time.

Do not write outside the box

0 2 . 1 **Table 1** shows some variables in this investigation.

Table 1

Variable	Independent variable	Dependent variable	Control variable
Distractions from background sounds			
Reaction time			
Type of stimulus			

Identify each variable as an independent variable, a dependent variable or a control variable.

Tick (✓) **one** box in each row on **Table 1**.

[3 marks]

0 2 . 2 How could the method be improved?

[1 mark]

Tick (✓) **one** box.

Measure the reaction time with a stopwatch. ☐

Only test reaction time to seeing a colour change. ☐

Repeat both methods 10 times. ☐

Question 2 continues on the next page

Turn over ►

Do not write outside the box

0 2 . 3 A shorter reaction time means the student reacted faster.

The student reacted faster as each test was repeated.

Suggest **one** reason why the student's reactions got faster.

[1 mark]

Table 2 shows the results.

Table 2

Method	**Mean reaction time in milliseconds**
Seeing the stimulus	350
Hearing the stimulus	220

Do not write outside the box

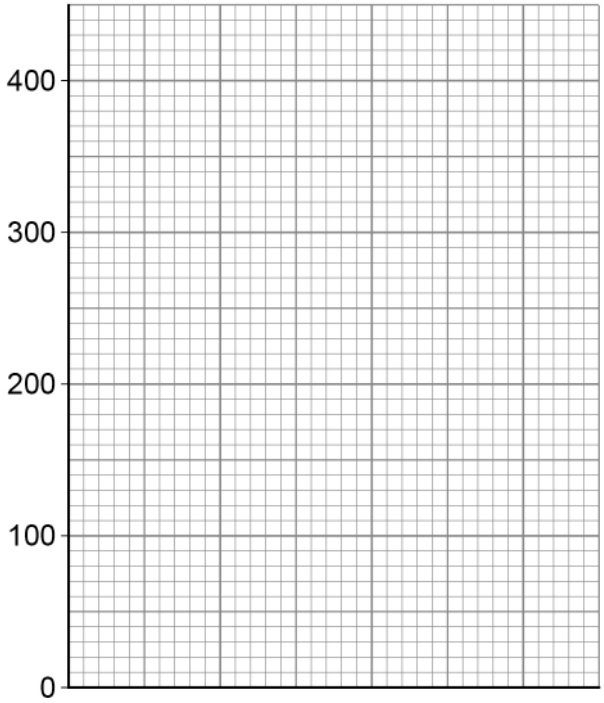
0 2 . 4 Complete **Figure 2**.

You should:

- plot the data from **Table 2** as a bar chart
- label each bar
- label the y-axis.

[2 marks]

Figure 2



Method

0 2 . 5 Compare the reaction time when seeing the stimulus with the reaction time when hearing the stimulus.

[1 mark]

8

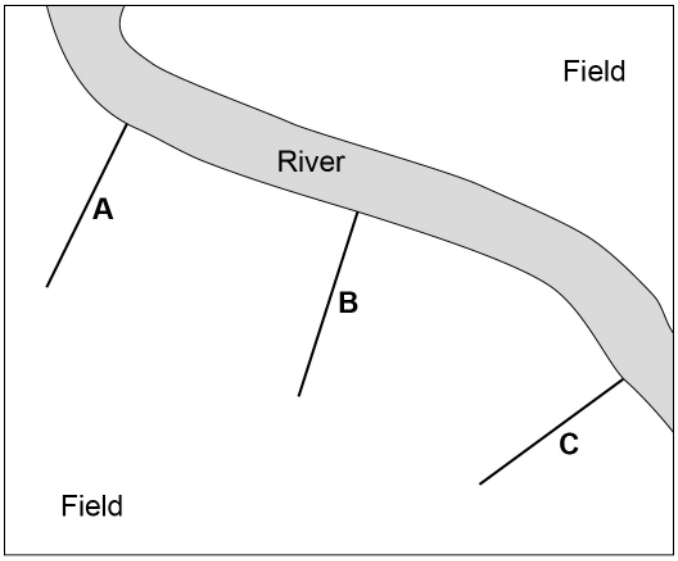
Turn over ►

Do not write outside the box

0 3 A student investigated how the distance from a river affects the number of different plant species.

Figure 3 shows a river between two fields.

Figure 3



0 3 . 1 **A**, **B** and **C** show the positions of three transects.

Where should the student position another transect for this investigation?

Draw the extra transect line on **Figure 3**.

[1 mark]

Do not write outside the box

0 3 . 2 The student recorded the number of different plant species at 1 m intervals along each transect.

Which piece of equipment should be used at 1 m intervals along the transect?

[1 mark]

Tick (✓) **one** box.

Microscope ☐

Quadrat ☐

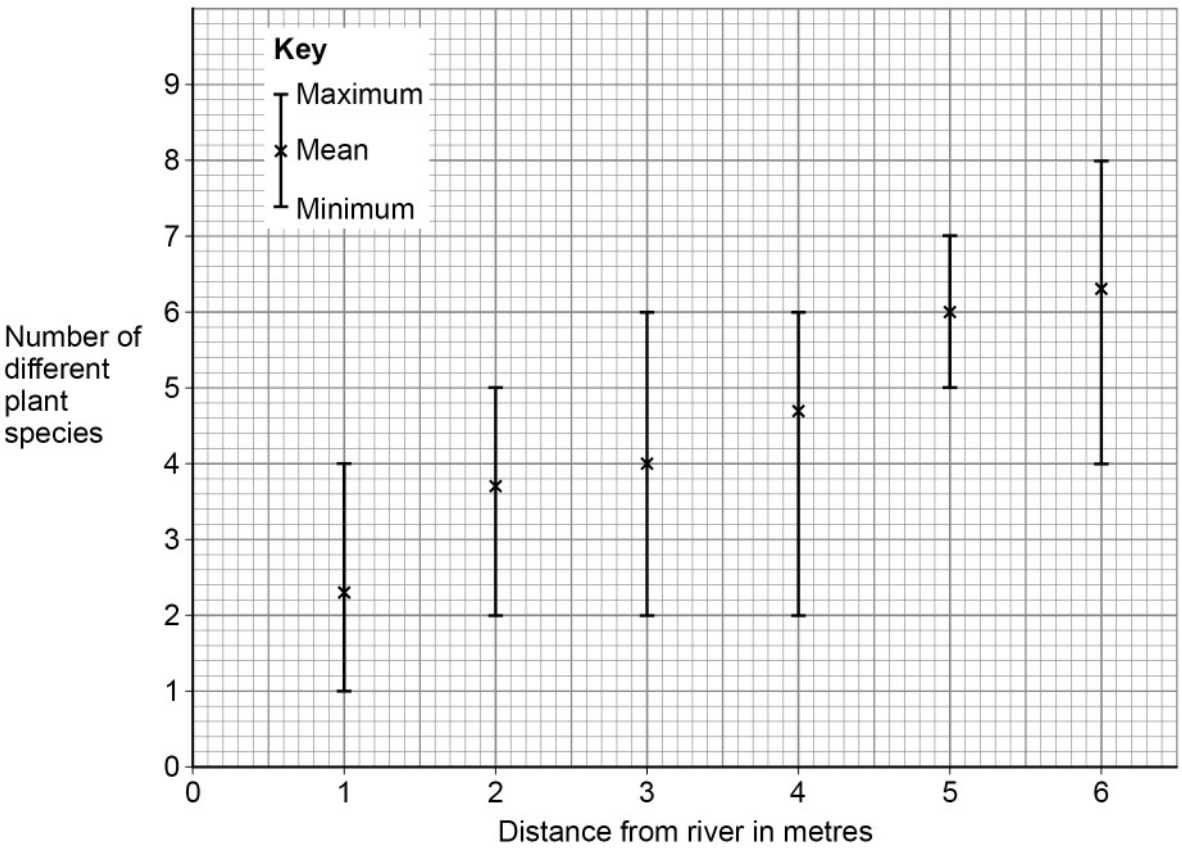
Timer ☐

Question 3 continues on the next page

Do not write outside the box

Figure 4 shows the results.

Figure 4



0 3 . 3 What was the mean number of different plant species 5 m from the river?

[1 mark]

Mean = _____

0 3 . 4 What is the effect of increasing distance from the river on the mean number of different plant species?

[1 mark]

_____

_____

Do not write outside the box

0 3 . 5 The minimum and maximum values on **Figure 4** show the range of results at each distance from the river.

Why is it useful to know the range of results?

[1 mark]

Tick (✓) **one** box.

To calculate the mean result ☐

To know the uncertainty of the mean ☐

To show the mode of the results ☐

0 3 . 6 Cows are kept in the fields.

Fewer plants are found where the cows often walk on the ground.

The number of cows is one **biotic** factor that affects the number of plants.

Which **two** factors are **abiotic** factors?

[2 marks]

Tick (✓) **two** boxes.

Consumers ☐

Light intensity ☐

Moisture levels ☐

Pathogens ☐

Predators ☐

Question 3 continues on the next page

Do not write outside the box

0 3 . 7 Explain why a decrease in the number of plants across the world increases global warming.

[2 marks]

9

Do not write outside the box

0 4 Salmon are fish.

A species of salmon has the binomial name *Oncorhynchus keta*.

0 4 . 1 **Table 3** shows the classification for this species of salmon.

Complete **Table 3**.

Choose answers from the box.

[3 marks]

Class	Domain	Genus	Kingdom	Species

Table 3

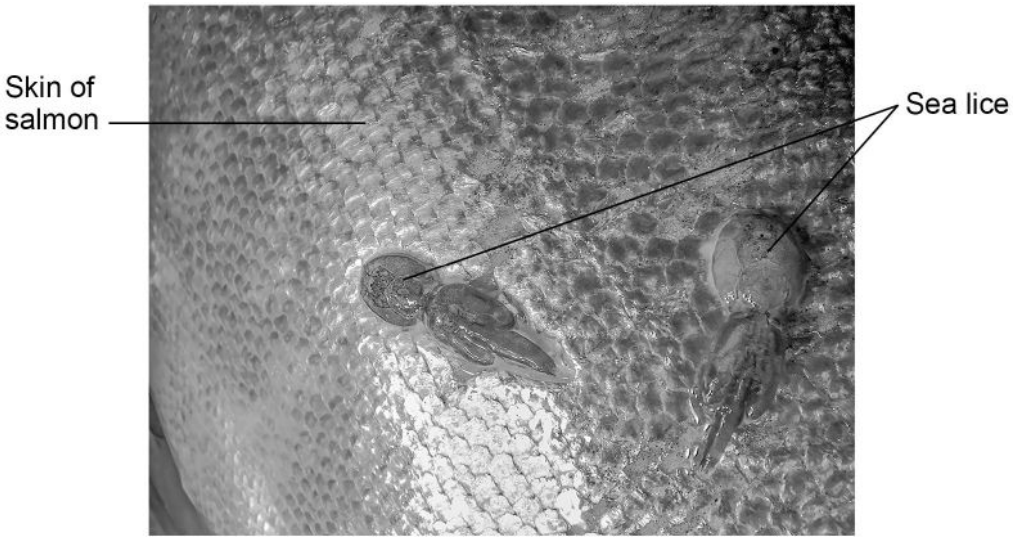
Group	Classification for salmon
	Animalia
Phylum	Chordata
Family	Salmonidae
	Oncorhynchus
	keta

Question 4 continues on the next page

Do not write outside the box

Figure 5 shows sea lice attached to the skin of a salmon.

Figure 5



Sea lice are small animals that feed on the skin and blood of salmon.

On a salmon farm, the salmon are fed with food made from soya plants.

0 4 . 2 Which food chain represents the salmon, sea lice and soya plants?

[1 mark]

Tick (✓) **one** box.

salmon → sea lice → soya plants ☐

sea lice → soya plants → salmon ☐

soya plants → salmon → sea lice ☐

Do not write outside the box

0 4 . 3 What do the arrows in a food chain represent?

[1 mark]

Tick (✓) **one** box.

The different numbers in the food chain ☐

The predators in the food chain ☐

The producers in the food chain ☐

The transfer of energy in the food chain ☐

Question 4 continues on the next page

Do not write outside the box

Some salmon are more resistant than other salmon to sea lice infections.

Salmon farmers selectively breed salmon.

0 4 . 4 Salmon farmers select salmon that are most resistant to sea lice and breed these salmon together.

What is the next stage in selectively breeding salmon that are resistant to sea lice?

[1 mark]

Tick (✓) **one** box.

Breed together the offspring that are most resistant to sea lice. ☐

Kill any offspring that are resistant to sea lice before the lice can attach. ☐

Remove the gene for resistance to sea lice from the selected salmon. ☐

0 4 . 5 When is the process of selective breeding finished?

[1 mark]

Tick (✓) **one** box.

After one generation have produced offspring ☐

When all offspring are resistant to sea lice ☐

When sea lice are living on all salmon ☐

Do not write outside the box

0 4 . 6 Salmon that do **not** have sea lice are more profitable for the salmon farmer.

Suggest **one** reason why.

[1 mark]

0 4 . 7 What is a **disadvantage** of selectively breeding salmon?

[1 mark]

Tick (✓) **one** box.

All the salmon may suffer from the same diseases. ☐

Fewer sea lice will infect the salmon. ☐

The salmon will have a large variety of genes. ☐

Question 4 continues on the next page

Do not write outside the box

Other fish farmers have produced genetically modified (GM) salmon.

GM salmon grow large enough to sell in 18 months.

Non-GM salmon grow large enough to sell in 3 years.

GM salmon need 25% less food than non-GM salmon to get to the same size.

0 4 . 8 Suggest **two** advantages of farming GM salmon instead of farming non-GM salmon.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 9 GM salmon are often farmed a long distance from where wild, non-GM salmon live.

What is an advantage of farming GM salmon a long distance from where wild salmon live?

[1 mark]

Tick (✓) **one** box.

To give the GM salmon different conditions to wild salmon ☐

To increase the genetic differences between GM salmon and wild salmon ☐

To reduce the risk of GM salmon breeding with wild salmon ☐

12

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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0 5 Homeostasis is the control of internal body conditions.

Control of body temperature is an example of homeostasis.

0 5 . 1 Draw **one** line from each part involved in temperature control to the function of that part.

[3 marks]

Part involved in temperature control	**Function**
	Changes air temperature outside the body
Brain	
	Contracts to increase body temperature
Muscle	
	Coordinates information about body temperature
Receptor	
	Detects changes in skin temperature

Do not write outside the box

0 5 . 2 Why is homeostasis important?

[2 marks]

Tick (✓) **two** boxes.

To allow cells to function properly ☐

To change body temperature to match air temperature ☐

To decrease water levels in the body throughout the day ☐

To maintain the optimum conditions for enzymes ☐

To prevent reactions inside cells ☐

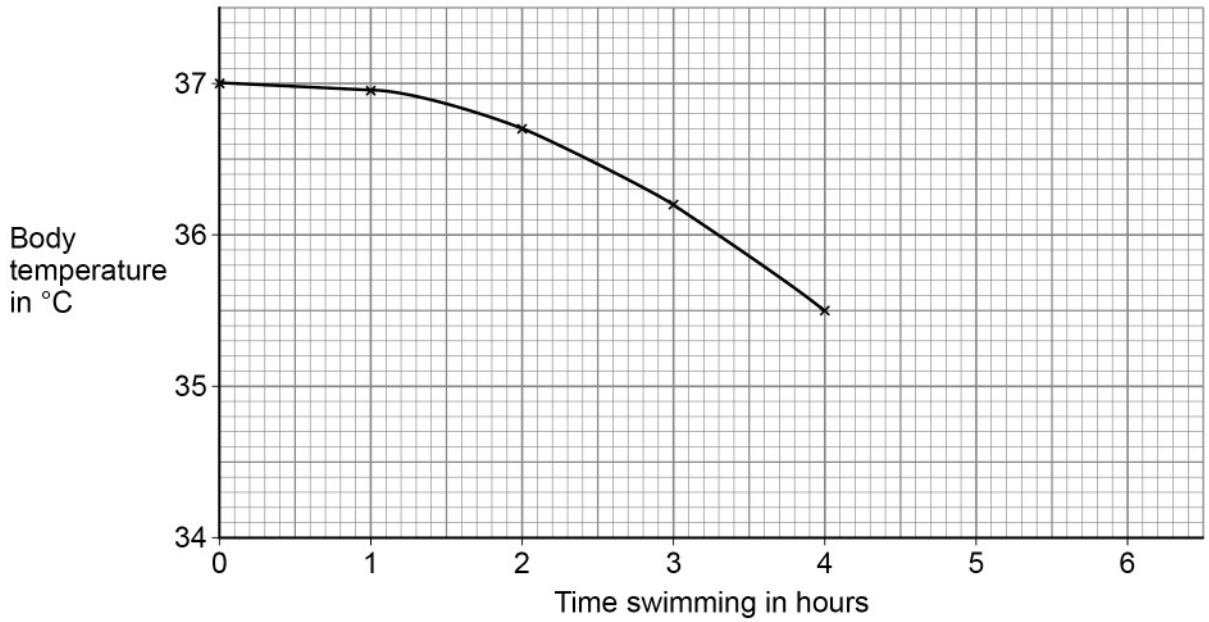
Question 5 continues on the next page

Do not write outside the box

The body temperature of a long-distance swimmer can change with the length of time swimming in cold water.

Figure 6 shows how the body temperature of one swimmer changed in the first 4 hours of a 6-hour swim.

Figure 6



0 5 . 3 Describe the trend shown in **Figure 6**.

[1 mark]

Do not write outside the box

0 5 . 4 Determine the change in body temperature in the first 4 hours of the swim.

[2 marks]

Change in body temperature = _____ °C

0 5 . 5 Hypothermia is a dangerously low body temperature of 35 °C or colder.

Predict when the swimmer was **first** at risk of hypothermia.

You should extend the line on **Figure 6**.

[2 marks]

Prediction = _____ hours

Question 5 continues on the next page

Do not write outside the box

Swimming in cold water decreases the insulin concentration in the blood.

0 5 . 6 Complete the sentence.

Choose the answer from the box.

[1 mark]

heart	**pancreas**	**stomach**

Insulin is produced by the _____ .

0 5 . 7 Insulin is a hormone.

Which organ system produces hormones?

[1 mark]

_____

0 5 . 8 Complete the sentence.

Choose the answer from the box.

[1 mark]

decrease	**stay the same**	**increase**

When insulin concentration in the blood increases, blood glucose concentration will _____ .

0 5 . 9 Give **one** risk factor for Type 2 diabetes.

[1 mark]

_____

14

Do not write outside the box

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

Do not write outside the box

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]

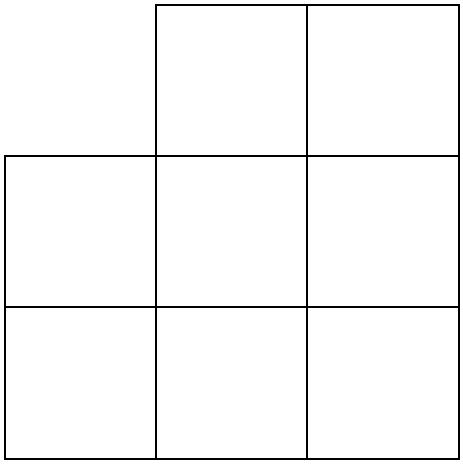
0 6 . 4 A person with the genotype **Dd** and a person with the genotype **dd** plan to have a child.

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 = _____

Do not write outside the box

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

Do not write outside the box

0 7 It is estimated that 99.9% of all species that have ever existed are now extinct.

0 7 . 1 Why is the percentage of species that are extinct only an estimate?

[1 mark]

Tick (✓) **one** box.

All individuals of one species have the same genes. ☐

Extinction is always caused by humans. ☐

Humans have not found evidence of every species. ☐

0 7 . 2 What evidence is used to study species that have become extinct?

[1 mark]

Do not write outside the box

0 7 . 3 A bacterium called *Clostridioides difficile* (*C. difficile*) can infect the human digestive system.

C. difficile can multiply and produce toxins. The toxins cause diarrhoea.

Doctors are concerned that new strains of *C. difficile* may evolve. Antibiotics may **not** be able to kill these new strains.

Explain how the evolution of antibiotic resistant *C. difficile* can be slowed down.

[6 marks]

8

END OF QUESTIONS

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