AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.6.3.4

Resistant bacteria

Past-paper questions

Tier	**Higher**
Question groups	**4**
Available paper years	**2018–2023**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.6.3.4 Resistant bacteria

Question 01

June 2018 | 8464/B/2H | Original Q2

0 2 *Pseudomonas* bacteria cause infections in hospital patients.

A new strain of *Pseudomonas* bacteria has evolved. This new strain can only be killed by one antibiotic called fluroquinolone.

Scientists want to prevent the new strain of *Pseudomonas* from spreading in the human population.

Explain the advice doctors should be given to prevent the spread of the new strain.

[6 marks]

6

4.6.3.4 Resistant bacteria

Question 02

November 2020 | 8464/B/2H | Original Q3

0 3 There is a need to grow enough food for all the people in the world.

Growing enough food affects habitats and biodiversity.

0 3 . 1 What is meant by the term biodiversity?

[1 mark]

Peat bogs are being destroyed because peat is used by humans.

Destroying peat bogs also reduces biodiversity.

0 3 . 2 Give **one** use of peat taken from peat bogs.

[1 mark]

0 3 . 3 Explain why the use of peat is harmful to the environment.

Do **not** refer to biodiversity in your answer.

[2 marks]

4.6.3.4 Resistant bacteria

Question 02 · continued

0 3 . 4 Intensive farming, where a single crop is grown on a large area of land year after year, is more cost effective for farmers.

It is efficient to use fertilisers and to burn the waste so the land is ready to use the next year.

Planting a single crop reduces biodiversity.

Suggest **two** ways that this type of farming can damage the environment.

Do **not** refer to biodiversity in your answer.

[2 marks]

1 _____

_____

2 _____

_____

0 3 . 5 Most of the world's production of antibiotics is used in farming.

Antibiotics are given to animals to prevent the spread of disease.

Explain how the widespread use of antibiotics in farming is a threat to human life.

[4 marks]

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10

4.6.3.4 Resistant bacteria

Question 03

June 2023 | 8464/B/1H | Original Q7

0 7 Antibiotics are drugs used to treat bacterial infections.

Mutations in bacteria produce new strains.

Some strains of bacteria are resistant to antibiotics.

0 7 . 1 Where do mutations happen in a **bacterial** cell?

[1 mark]

A scientist investigated which antibiotics (**A**, **B**, **C**, **D** and **E**) killed *Staphylococcus aureus* (*S. aureus*) bacteria.

This is the method used.

1. Grow *S. aureus* bacteria in a Petri dish.

2. Cut five small discs of paper.

3. Soak each paper disc in a different antibiotic solution.

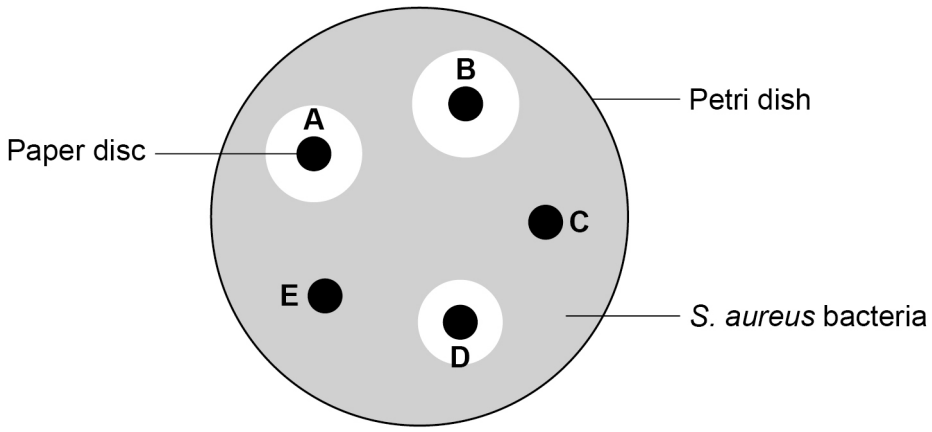
4. Put the five paper discs into the Petri dish.

5. Keep the Petri dish at 37 °C for 24 hours.

Figure 9 shows the results.

A clear area around a disc shows where the bacteria have been killed.

Figure 9



4.6.3.4 Resistant bacteria

Question 03 · continued

0 7 . 2 The scientist concluded:

'*S. aureus* is resistant to antibiotics **C** and **E**'.

Explain the evidence for this conclusion.

Use **Figure 9**.

[2 marks]

0 7 . 3 The scientist later discovered that *S. aureus* is **not** resistant to antibiotic **E**.

Suggest how the method was developed and showed that *S. aureus* is **not** resistant to antibiotic **E**.

[2 marks]

Question 7 continues on the next page

4.6.3.4 Resistant bacteria

Question 03 · continued

Broken bones are sometimes repaired using a metal implant.

The area around an implant can become infected with *S. aureus* bacteria.
The infection is usually treated with a long-term course of antibiotics.

Long-term use of antibiotics has led to the development of antibiotic resistant bacteria.
Research is being carried out into alternative treatments.

Stem cells from bone marrow and from fat tissue have antimicrobial properties.

A scientist investigated the effect of four treatments on the area of infection around metal implants. Each treatment was injected into the area around the implant.

The four treatments were:

- unreactive solution
- antibiotic solution
- stem cells from fat tissue
- stem cells from fat tissue containing antibiotic.

Each treatment was tested on 5 patients where an infection had developed around their metal implant.

After 7 days of treatment, the scientist calculated the ratio:

area of infection : total tissue area

0 7 . 4 What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

- The ratio of area of infection : total tissue area ☐
- The treatment injected around the implant ☐
- The type of antibiotic used ☐
- The type of bacterial infection ☐

4.6.3.4 Resistant bacteria

Question 03 · continued

0 7 . 5 Suggest **one** advantage of using stem cells from fat tissue, rather than using stem cells from bone marrow.

[1 mark]

0 7 . 6 Stem cells containing antibiotic were produced by growing the cells for 24 hours in a solution containing the antibiotic.

How did the antibiotic enter the stem cells from the solution?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

By active transport ☐

By diffusion ☐

By osmosis ☐

By translocation ☐

Reason

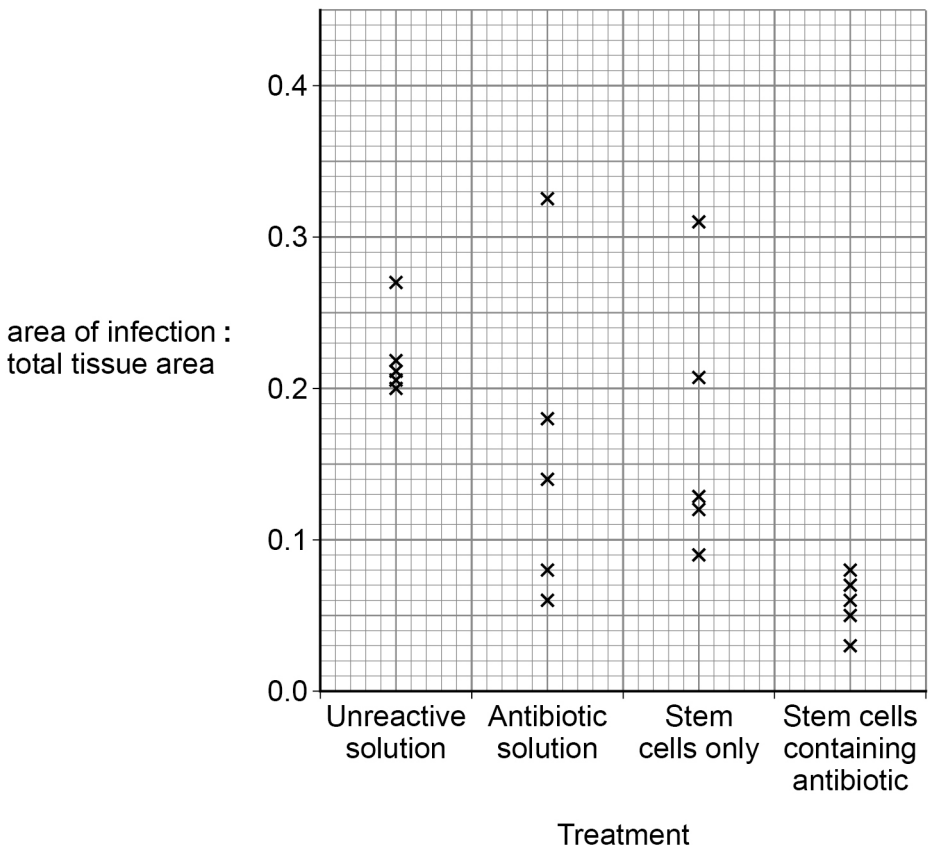
Question 7 continues on the next page

4.6.3.4 Resistant bacteria

Question 03 · continued

Figure 10 shows the results.

Figure 10



0 7 . 7 What is the range of results for the treatment with stem cells only?

[1 mark]

From _____ to _____

4.6.3.4 Resistant bacteria

Question 03 · continued

0 7 . 8 A student looked at the results and concluded:

‘Injections of stem cells containing antibiotic should be used to treat **all** implant-related infections’.

Evaluate the student’s conclusion.

Use **Figure 10**.

[4 marks]

14

4.6.3.4 Resistant bacteria

Question 04

0 2 It is estimated that 99.9% of all species that have ever existed are now extinct.

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

[1 mark]

_____

_____

4.6.3.4 Resistant bacteria

Question 04 · continued

0 2 . 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