

GCSE Biology

Worksheet: Resistant bacteria

TIME 35 min	TOTAL 31 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Resistant bacteria

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

Some strains of bacteria are resistant to antibiotics.

0 1 . 1

Which of these is a strain of bacteria that is resistant to many antibiotics?

Tick (✓) **one** box.

HIV

☐

MRSA

☐

Plasmodium

☐

TMV

☐

[1 mark]

0 1 . 2

Which **two** actions reduce the rate at which antibiotic-resistant strains develop?

Tick (✓) **two** boxes.

Doctors prescribing antibiotics for viral infections

☐

Patients completing their course of antibiotics

☐

Farmers routinely adding antibiotics to animal feed

☐

Restricting the use of antibiotics in agriculture

☐

Patients sharing leftover antibiotics with family members

☐

[2 marks]

0 1 . 3

The development of new antibiotics is unlikely to keep up with the emergence of new resistant strains.
Give **one** reason why.

[1 mark]

0 2

The statements describe how a strain of bacteria that is resistant to an antibiotic can develop and spread. They are in the wrong order.

- A** The resistant bacteria survive and reproduce.
- B** A mutation produces a bacterium that is resistant to the antibiotic.
- C** The antibiotic kills the bacteria that are not resistant.
- D** The population of the resistant strain rises.
- E** The resistant strain spreads, because people are not immune to it and there is no effective treatment.

0 2 . 1

Write the letters in the correct order.

[2 marks]

0 2 . 2

Why can bacteria evolve rapidly?

Tick (✓) **one** box.

They reproduce at a fast rate.

They are larger than viruses.

They contain a nucleus.

They are killed by antibiotics.

☐
☐
☐
☐

[1 mark]

0 2 . 3

Give **one** way in which the use of antibiotics in farming could be changed to reduce the development of resistant strains of bacteria.

.....

.....

[1 mark]

0 3

A scientist tested bacteria from a throat infection with four antibiotics, A, B, C and D. The bacteria were spread on an agar plate, and a paper disc soaked in each antibiotic was placed on the agar. Each paper disc has a diameter of 6 mm. After incubation, the scientist measured the diameter of the clear zone around each disc.

Table 1 shows the results.

Table 1

Antibiotic	Diameter of clear zone in mm
A	30
B	6
C	9
D	16

0 3 . 1

Which antibiotic was most effective against these bacteria? Give a reason for your answer.

.....

.....

[1 mark]

0 3 . 2

Calculate the area of the clear zone around disc A.
Use the equation: $\text{area} = \pi r^2$, where r is the radius of the clear zone.
Give your answer to 3 significant figures.

.....

.....

.....

.....

Area = mm^2
[2 marks]

0 3 . 3

Explain the result for antibiotic B.

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.....

.....

.....

[2 marks]

.....

0 4

A scientist tested bacteria from a skin infection with four antibiotics, A, B, C and D. The bacteria were spread on an agar plate, and a paper disc soaked in each antibiotic was placed on the agar. Each paper disc has a diameter of 6 mm. After incubation, the scientist measured the diameter of the clear zone around each disc.

Table 2 shows the results.

Table 2

Antibiotic	Diameter of clear zone in mm
A	8
B	26
C	7
D	16

0 4 . 1

Which antibiotic was most effective against these bacteria? Give a reason for your answer.

.....

.....

[1 mark]

0 4 . 2

Calculate the area of the clear zone around disc B.
Use the equation: $\text{area} = \pi r^2$, where r is the radius of the clear zone.
Give your answer to 3 significant figures.

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.....

Area = mm²

[2 marks]

0 4 . 3

Suggest what the result for antibiotic C shows about the bacteria.

.....

.....

[1 mark]

0 5

In 2015, doctors in one region wrote 740 000 prescriptions for antibiotics. 45% of these prescriptions were for coughs, colds and sore throats, which are usually caused by viruses. After a campaign to reduce the use of antibiotics, the number of prescriptions in 2021 was 681 000.

0 5 . 1

Calculate the number of prescriptions in 2015 that were for coughs, colds and sore throats.

.....

.....

.....

Number of prescriptions =

[1 mark]

0 5 . 2

Calculate the percentage decrease in the number of prescriptions between 2015 and 2021.

Give your answer to 3 significant figures.

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.....

.....

Percentage decrease = %

[2 marks]

0 5 . 3

Explain how using fewer antibiotics slows down the development of antibiotic-resistant strains of bacteria.

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.....

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[2 marks]

0 5 . 4

Give **one** other way to reduce the rate at which antibiotic-resistant strains develop.

.....

.....

[1 mark]

0 6

Table 3 shows the number of new antibiotics approved for use in one country in different five-year periods.

Table 3

Five-year period	Number of new antibiotics approved
1985–1989	17
1990–1994	12
1995–1999	11
2000–2004	6
2005–2009	4
2010–2014	3

0 6 . 1

Calculate the percentage decrease in the number of new antibiotics approved between 1985–1989 and 2010–2014.

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.....

Percentage decrease = %

[2 marks]

0 6 . 2

Suggest **two** reasons why fewer new antibiotics are being developed.

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[2 marks]

0 6 . 3

Explain why the trend in Table 3 is a problem for treating bacterial infections in the future.

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[2 marks]

0 6 . 4

Explain why doctors should not prescribe antibiotics for viral or non-serious infections.

.....

.....

.....

.....

[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 Biology · Worksheet: Resistant bacteria · 31 marks

Question 1 (4 marks)

01.1 [1 mark]

Correct: MRSA

01.2 [2 marks]

Correct: Patients completing their course of antibiotics; Restricting the use of antibiotics in agriculture

01.3 [1 mark]

- developing new antibiotics is costly / expensive (1)
- developing new antibiotics is slow / takes many years (1)
- bacteria reproduce / evolve quickly (1)

Any 1 of the points above.

Question 2 (4 marks)

02.1 [2 marks]

Answer: B, C, A, D, E

- B first and E last (1)
- C, A, D in that order between them: B, C, A, D, E (1)

Notes: B, C, A, D, E scores 2 marks.

02.2 [1 mark]

Correct: They reproduce at a fast rate.

02.3 [1 mark]

- restrict / reduce the use of antibiotics in agriculture (1)
- stop adding antibiotics to animal feed routinely, e.g. to increase growth (1)
- use antibiotics only to treat animals that are ill (1)

Any 1 of the points above.

Question 3 (5 marks)

03.1 [1 mark]

Answer: A

- A, because it produced the largest clear zone (1)

03.2 [2 marks]

Answer: 707 mm²

- $r = 15$ (mm) (1)
- 707 (mm²) (1)

Notes: An answer of 706.9 (not given to 3 significant figures) scores 1 mark. An answer of 2830 (diameter used as the radius) scores 1 mark.

03.3 [2 marks]

- there is no clear zone (the diameter is the same as the disc) (1)
- so the bacteria are resistant to antibiotic B (1)

Question 4 (4 marks)

04.1 [1 mark]

Answer: B

- B, because it produced the largest clear zone (1)

04.2 [2 marks]

Answer: 531 mm²

- $r = 13$ (mm) (1)
- 531 (mm²) (1)

Notes: An answer of 530.9 (not given to 3 significant figures) scores 1 mark. An answer of 2120 (diameter used as the radius) scores 1 mark.

04.3 [1 mark]

- the bacteria are partly resistant to antibiotic C / it is the least effective antibiotic, so it should not be used (1)
-

Question 5 (6 marks)

05.1 [1 mark]

Answer: 333 000

- $740\,000 \times 0.45 = 333\,000$ (1)

05.2 [2 marks]

Answer: 7.97%

- $(740\,000 - 681\,000) \div 740\,000 \times 100$ (1)
- 7.97 (%) (1)

Notes: An answer of 7.973 (not given to 3 significant figures) scores 1 mark.

05.3 [2 marks]

- fewer bacteria are exposed to antibiotics, so fewer non-resistant bacteria are killed (1)
- so resistant bacteria have less of an advantage: they are less likely to survive and reproduce while the others die, so the resistant strain spreads more slowly (1)

05.4 [1 mark]

- patients should complete their course of antibiotics (1)
- restrict the use of antibiotics in farming / agriculture (1)

Any 1 of the points above.

Question 6 (8 marks)

06.1 [2 marks]

Answer: 82.4%

- $(17 - 3) \div 17 \times 100$ (1)
- 82.4 (%) (1)

Notes: Allow 82 or 82.35.

06.2 [2 marks]

- developing a new antibiotic is costly / expensive (1)
- developing and testing a new antibiotic is slow / takes many years (1)
- drug companies may make little profit (antibiotics are taken for short courses) (1)
- many of the easiest-to-find antibiotics have already been discovered (1)
- bacteria may quickly become resistant to a new antibiotic (1)

Any 2 of the points above.

06.3 [2 marks]

- more strains of bacteria are becoming resistant (to existing antibiotics) (1)
 - (so) new antibiotics will not keep up / some infections may have no effective treatment (1)
-

06.4 [2 marks]

- antibiotics do not kill viruses / non-serious infections get better without antibiotics (1)
 - unnecessary use increases the chance of resistant bacteria surviving / being selected and spreading (1)
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