AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.3.7

Resistant bacteria

Past-paper questions

Tier	**Higher**
Question groups	**16**
Available paper years	**2007–2024**

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.

4.6.3.7 Resistant bacteria

Question 01

March 2007 | BLY1A | Original Q1 | Legacy

QUESTION ONE

Avian influenza (bird flu) is caused by a virus which was first identified in 1900. Recently there have been concerns that new strains of the virus may be able to infect humans.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A antibiotics

B natural selection

C pandemic

D resistance

Avian influenza cannot be treated with . . . **1** . . . .

The influenza virus may develop . . . **2** . . . to the drugs used as a result of . . . **3** . . . .

This may cause a . . . **4** . . . of the disease.

4.6.3.7 Resistant bacteria

Question 02

June 2007 | BLY1H | Original Q4 | Legacy

4 Some diseases can be tackled by using antibiotics and vaccination.

(a) (i) Explain fully why antibiotics cannot be used to cure viral diseases.

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(2 marks)

(ii) A recent study found that babies in 90 % of hospitals are infected with the MRSA bacterium.

Explain how the MRSA bacterium has developed resistance to antibiotics.

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(2 marks)

(b) A person can be immunised against a disease by injecting them with an inactive form of a pathogen.

Explain how this makes the person immune to the disease.

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(3 marks)

7

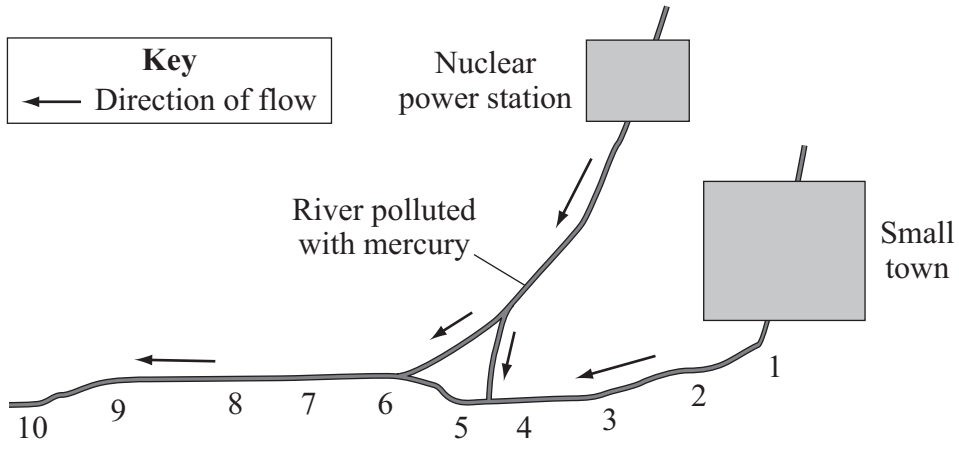
4.6.3.7 Resistant bacteria

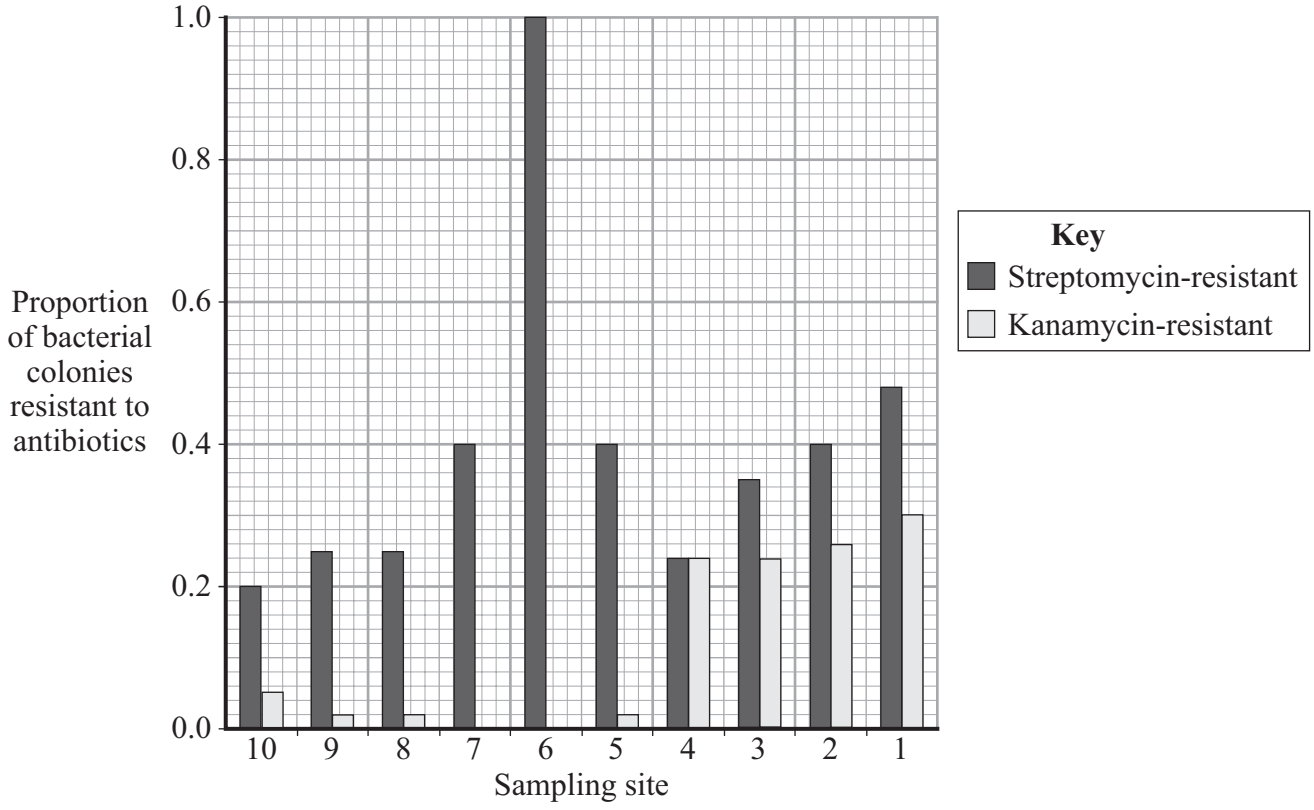
Question 03

November 2007 | BLY1A | Original Q9 | Legacy

QUESTION NINE

An investigation was carried out to survey populations of antibiotic-resistant bacteria in a river.
Human sewage enters the river upstream of site 1. Mercury, which is poisonous to some organisms, enters the river from the power station.
Bacterial colonies were cultivated from samples taken at the sites 1 – 10 shown on the diagram.
The bar chart shows the proportions of bacterial colonies that were streptomycin-resistant and kanamycin-resistant in the samples from each site.





4.6.3.7 Resistant bacteria

Question 03 · continued

9A 60 bacterial colonies grew from the sample taken at sampling site 5.

How many of these colonies were resistant to streptomycin?

1 0.4

2 15

3 24

4 40

9B The ratio of the proportion of streptomycin-resistant colonies to the proportion of kanamycin-resistant colonies is different at each sampling site.

These differences are affected most by . . .

1 the volume of water in the river.

2 the mercury concentration in the water.

3 the antibiotic concentration in the water.

4 the distance downstream from sampling site 1.

9C One possible explanation for the data from sampling sites 5–10 is that . . .

1 streptomycin-resistant bacteria are also resistant to mercury.

2 mercury increases antibiotic resistance in bacteria.

3 kanamycin-resistant bacteria can survive only in water polluted by human sewage.

4 kanamycin-resistant bacteria cannot survive in water containing mercury.

9D An antibiotic-resistant strain of a bacterium is produced by . . .

1 over-prescription of antibiotics.

2 toxins.

3 natural selection.

4 vaccination.

END OF TEST

4.6.3.7 Resistant bacteria

Question 04

June 2008 | BLY1H | Original Q4 | Legacy

4 Pathogenic bacteria and viruses may make us feel ill if they enter our bodies.

4 (a) Why do bacteria and viruses make us feel ill?

Bacteria .....

.....

Viruses .....

.....

(2 marks)

4 (b) Most drugs that kill bacteria cannot be used to treat viral infections.

Explain why.

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(2 marks)

4.6.3.7 Resistant bacteria

Question 04 · continued

for mark

4 (c) Antibiotic-resistant strains of bacteria are causing problems in most hospitals.

Explain, as fully as you can, why there has been a large increase in the number of antibiotic-resistant strains of bacteria.

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(4 marks)

8

4.6.3.7 Resistant bacteria

Question 05

November 2008 | BLY1AP | Original Q4 | Legacy

QUESTION FOUR

In the 1840s, many women died from infections after giving birth in hospitals.
The table shows data for two maternity wards in the same hospital over a two-year period.

	Ward P	**Ward Q**
Number of women who gave birth	296	308
Number of these women who died from infections	109	42

4A The number of women who survived in ward **Q** was . . .

1 42

2 187

3 266

4 350

4B A doctor called Semmelweiss noticed that medical students were delivering babies in ward **P** just after they had been dissecting corpses as part of their studies.
Only midwives delivered babies in ward **Q**.

Which is the best hypothesis to explain the higher death rate in ward **P**?

1 Students were carrying infections from corpses to women.

2 Midwives are better at delivering babies than students.

3 The higher number of deaths occurred by chance.

4 The women who gave birth in ward **P** were poorer than those in ward **Q**.

4.6.3.7 Resistant bacteria

Question 05 · continued

4C Semmelweiss instructed all medical students in the hospital to wash their hands thoroughly before treating patients.

Which row in the table shows the effect that this might have had on the death rate in the two wards?

	Death rate in ward P			Death rate in ward Q		
	Increase	**No change**	**Decrease**	**Increase**	**No change**	**Decrease**
1	✓				✓	
2		✓				✓
3			✓		✓	
4			✓	✓		

4D In the 1980s, antibiotics were often used to kill pathogens to prevent infections from spreading. However, antibiotics are now less effective than in the 1980s.

This is because . . .

1 medical staff do not wash their hands as often.

2 antibiotics have become useless against viruses.

3 mutations in bacteria have made them resistant to antibiotics.

4 people have become immune to antibiotics.

4.6.3.7 Resistant bacteria

Question 06

March 2009 | BLY1AP | Original Q3 | Legacy

QUESTION THREE

Some infections are caused by bacteria.

3A Bacteria can change into strains that are resistant to a particular antibiotic.

What causes this change in a bacterium?

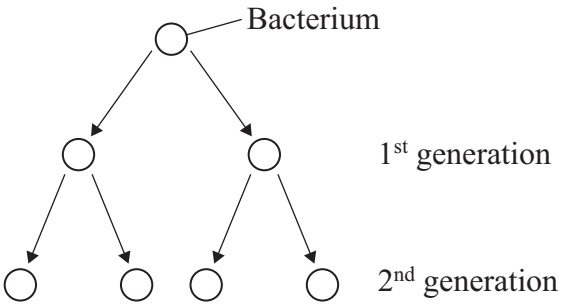
1 immunity

2 mutation

3 natural selection

4 reproduction

The diagram shows how the number of bacteria in the body changes after infection.



3B In ideal conditions, the population of bacteria doubles every 20 minutes.

In ideal conditions, how many bacteria will there be in the body 2 hours after infection with a single bacterium?

1 4

2 8

3 64

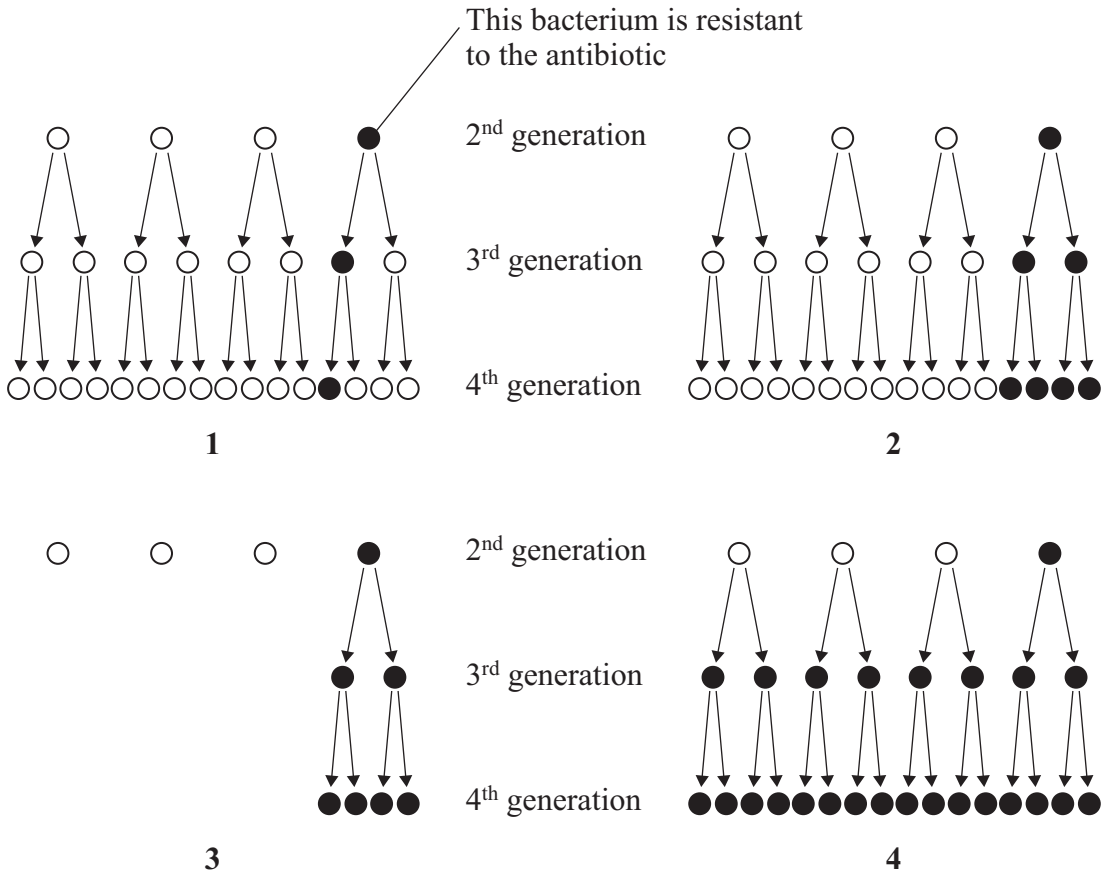
4 128

4.6.3.7 Resistant bacteria

Question 06 · continued March 2009 | BLY1AP | Original Q3 | Legacy

3C One of the second generation of bacteria changes so that it is resistant to an antibiotic.

Which diagram shows the way in which the population of bacteria changes when this generation is treated with the antibiotic?



3D The change in the proportions of non-resistant and resistant bacteria by the fourth generation is due to . . .

1 genetic engineering.

2 mutation.

3 natural selection.

4 reproduction.

4.6.3.7 Resistant bacteria

Question 07

June 2009 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

Antibiotics are used to treat many types of infection.

6A Antibiotics kill . . .

1 bacteria only.

2 viruses only.

3 both bacteria and viruses.

4 all types of pathogens.

In recent years there has been a rapid increase in the number of infections in hospitals caused by antibiotic-resistant bacteria such as MRSA.

6B Bacteria such as MRSA have become resistant to antibiotics mainly because of . . .

1 overcrowding in hospitals.

2 lack of hand-hygiene amongst medical staff.

3 use of infected surgical instruments.

4 overuse of antibiotics.

6C Pathogens can be removed from hands by just washing them with soap and water.

The main advantage of this method, in terms of long-term infection control, is that . . .

1 it does not increase the proportion of antibiotic-resistant bacteria.

2 it is cheap.

3 it selectively kills the most dangerous types of bacteria.

4 soap has been used for many years with no resulting side effects.

4.6.3.7 Resistant bacteria

6D An antibiotic-resistant strain of a bacterium develops as a result of natural selection.

Natural selection means that . . .

1 doctors select which antibiotic to use against the bacterium.

2 only a selection of bacteria can infect the human body.

3 bacteria select the most suitable person to infect.

4 only successful bacteria survive to reproduce.

Turn over for the next question

4.6.3.7 Resistant bacteria

Question 08

March 2010 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

Antibiotic-resistant bacteria are causing severe problems in many hospitals.

6A What is the main cause of the increase in the numbers of antibiotic-resistant bacteria in hospitals?

1 Antibiotics cause mutations.

2 Antibodies are released into the environment.

3 Toxins from bacteria are no longer effective.

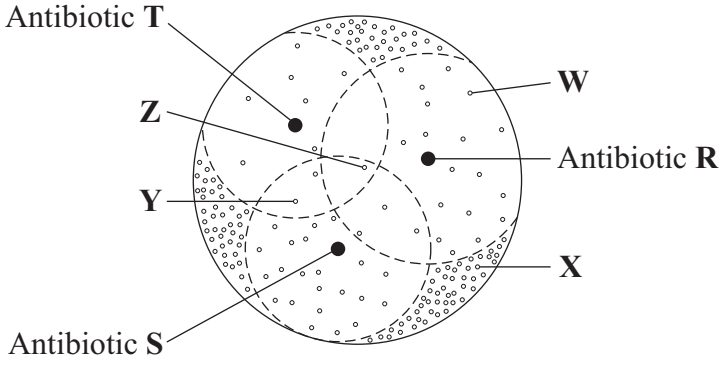
4 Antibiotics are overused.

A group of students investigated the effects of different antibiotics on one type of bacterium.

- A solution of one type of bacterium was spread across sterile nutrient jelly in a dish.
- Discs of absorbent paper containing three different antibiotics, **R**, **S** and **T**, were placed on the dish and were left for two days.

The diagram shows the appearance of the dish after two days. Four colonies of bacteria are labelled **W**, **X**, **Y** and **Z**.

The dotted circles indicate the distance to which each antibiotic diffused.



6B Which row in the table shows the effectiveness of the antibiotics?

	Most effective →		Least effective
1	**R**	**S**	**T**
2	**T**	**S**	**R**
3	**T**	**R**	**S**
4	**R**	**T**	**S**

4.6.3.7 Resistant bacteria

Question 08 · continued

6C Which of the four colonies of bacteria is resistant to all three antibiotics?

1 **W**

2 **X**

3 **Y**

4 **Z**

6D An individual antibiotic-resistant bacterium is originally produced by . . .

1 vaccination.

2 natural selection.

3 antibiotics.

4 mutation.

Turn over for the next question

4.6.3.7 Resistant bacteria

Question 09

March 2011 | BLY1AP | Original Q7 | Legacy

QUESTION SEVEN

Some infections can be treated using antibiotics.

7A Antibiotics can . . .

1 relieve the symptoms of infectious diseases by acting as painkillers.

2 kill viruses inside body cells.

3 cause white blood cells to produce antibodies.

4 kill some strains of bacteria.

Often, a doctor will prescribe antibiotics for an ear infection the first time a child goes to the doctor with earache.

Scientists investigated 240 young children with earache to see if the antibiotic was really needed. Some of the children were given the antibiotic. Other children were given a placebo.

The results are shown in the table.

	Children given an antibiotic	Children given a placebo
Average time for which the child had a fever	2 days	3 days
Average time for which the child had severe pain	3 days	3 days
Average amount of painkilling medicine given in the first 10 days	2.3 doses	4.1 doses
Difference in the redness of the infected eardrum after 4 days	No difference between the two groups	
Difference in the redness of the infected eardrum after 11 days	No difference between the two groups	

7B Compared with the children given the placebo, the children given the antibiotic had . . .

1 fever and severe pain for a shorter time.

2 severe pain and painkilling medicine for a longer time.

3 less redness of the eardrum after 11 days.

4 no difference in the redness of the eardrum after 4 days and the period of severe pain.

4.6.3.7 Resistant bacteria

Question 09 · continued

7C The best conclusion that can be drawn from these results is that children with ear infections . . .

1 should always be prescribed antibiotics.

2 recover from all symptoms more quickly if given antibiotics.

3 should be given a placebo on the first visit to a doctor.

4 do **not** really need to be prescribed an antibiotic on the first visit to a doctor.

7D Doctors are concerned that antibiotic resistance is increasing in some bacteria.

The increase is because . . .

1 antibiotics cause bacteria to mutate into resistant forms of bacteria.

2 bacteria mutate spontaneously, then antibiotics do not kill the resistant forms of the bacteria.

3 the strongest bacteria mutate into resistant forms of bacteria.

4 after being in contact with antibiotics, bacteria decide to mutate.

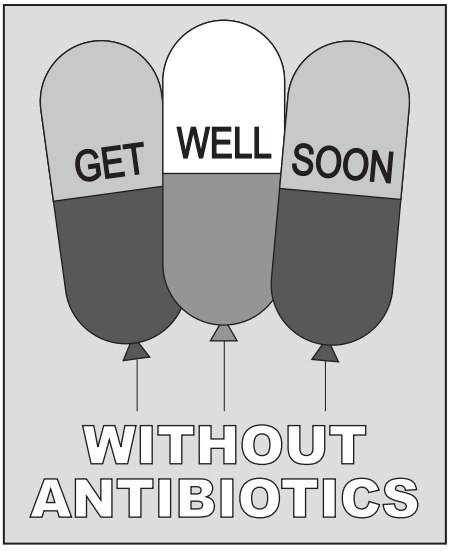
4.6.3.7 Resistant bacteria

Question 10

June 2011 | BLY1AP | Original Q5 | Legacy

QUESTION FIVE

The poster is part of a campaign to reduce the amount of antibiotics used.



5A Antibiotics kill . . .

1 bacteria only.

2 viruses only.

3 both bacteria and viruses.

4 all types of pathogen.

5B Overuse of antibiotics . . .

1 causes bacteria to mutate.

2 causes bacteria to become resistant to antibiotics.

3 increases the rate of development of antibiotic-resistant strains of bacteria.

4 decreases the risk of epidemics and pandemics occurring.

5C A new strain of bacterium might not be recognised by . . .

1 antibodies.

2 antitoxins.

3 painkillers.

4 vaccines.

4.6.3.7 Resistant bacteria

Question 10 · continued

5D The proportion of antibiotic-resistant bacteria in a population increases because of . . .

1 addiction.

2 immunity.

3 mutation.

4 natural selection.

Turn over for the next question

4.6.3.7 Resistant bacteria

Question 11

November 2011 | BLY1AP | Original Q4 | Legacy

QUESTION FOUR

Some infections can be treated with antibiotics.

4A Virus infections cannot be treated with antibiotics because . . .

1 viruses live inside body cells.

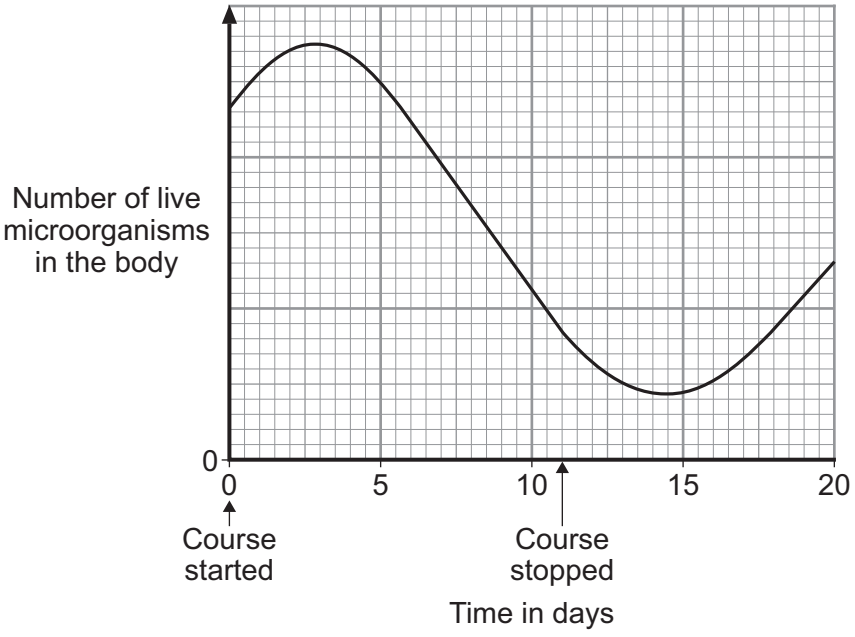
2 viruses are too small.

3 viruses have thick coats.

4 viruses are resistant.

Antibiotic tablets may be prescribed by a doctor. Patients are always told to finish the course of tablets, even though they may be feeling better.

The graph shows what happens to the number of live microorganisms in the body when someone does not finish a course of antibiotic tablets.



4B How many more days would the patient have needed to take the antibiotics to kill all the microorganisms in the body?

1 3

2 11

3 14

4 20

4.6.3.7 Resistant bacteria

Question 11 · continued November 2011 | BLY1AP | Original Q4 | Legacy

4C After starting a course of antibiotics, a patient might feel more ill for a few days.

Why?

1 Microorganisms are still multiplying in the body.

2 Antibiotics always cause side effects which make patients feel unwell.

3 Antibiotics do not kill microorganisms, antibiotics only relieve the symptoms.

4 The course of antibiotics was not completed.

4D Some microorganisms have become resistant to antibiotics.

An antibiotic-resistant population of a microorganism results from . . .

1 patients not completing their course of antibiotics.

2 toxins.

3 natural selection.

4 not enough people being vaccinated.

4.6.3.7 Resistant bacteria

Question 12

June 2012 | BL1HP | Original Q5 | Legacy

5 People may be immunised against diseases using vaccines.

5 (a) (i) Which part of the vaccine stimulates the body's defence system?

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(2 marks)

5 (a) (ii) A person has been vaccinated against measles. The person comes in contact with the measles pathogen. The person does **not** catch measles.

Explain why.

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(3 marks)

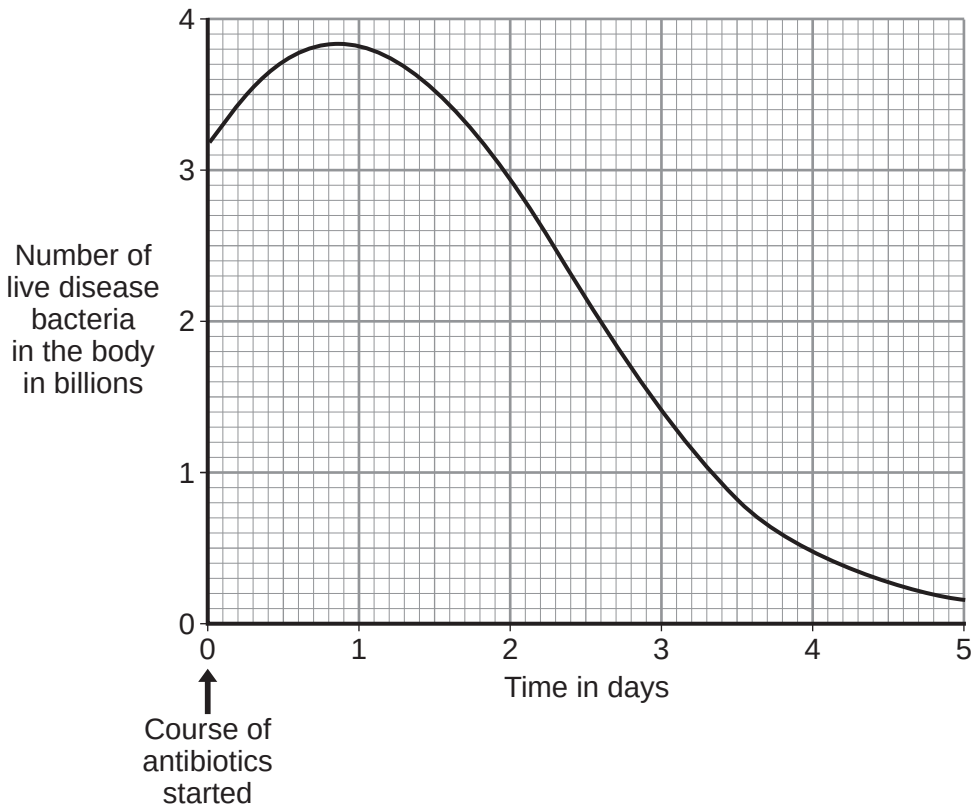
Question 5 continues on the next page

4.6.3.7 Resistant bacteria

Question 12 · continued

5 (b) A man catches a disease. The man has **not** been immunised against this disease. A doctor gives the man a course of antibiotics.

The graph shows how the number of live disease bacteria in the body changes when the man is taking the antibiotics.



4.6.3.7 Resistant bacteria

Question 12 · continued

5 (b) (i) Four days after starting the course of antibiotics the man feels well again.
It is important that the man does **not** stop taking the antibiotics.

Explain why.

Use information from the graph.

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.....

(2 marks)

5 (b) (ii) Occasionally a new, resistant strain of a pathogen appears.

The new strain may spread rapidly.

Explain why.

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(3 marks)

10

4.6.3.7 Resistant bacteria

Question 13

June 2015 | BL1HP | Original Q4 | Legacy

4 Antibiotics can be used to protect our bodies from pathogens.

4 (a) What is a pathogen?

[1 mark]

.....

.....

4 (b) Bacteria may become resistant to antibiotics.

How can doctors reduce the number of bacteria that become resistant to antibiotics?

[2 marks]

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4 (c) Scientists grow microorganisms in industrial conditions at a higher temperature than is used in school laboratories.

4 (c) (i) Which temperature would be most suitable for growing bacteria in industrial conditions?

Draw a ring around the correct answer.

[1 mark]

25 °C **40 °C** **100 °C**

4 (c) (ii) What is the advantage of using the temperature you gave in part **(c)(i)**?

[1 mark]

.....

.....

5

4.6.3.7 Resistant bacteria

Question 14

June 2017 | BL1HP | Original Q6 | Legacy

6 (a) Tuberculosis (TB) is an infectious disease caused by a bacterium.

A person can be vaccinated against TB.

The vaccine contains the TB bacterium.

6 (a) (i) Describe the difference between the bacteria in the vaccine and the bacteria that cause the disease.

[1 mark]

6 (a) (ii) **Table 3** shows antibody production in a non-vaccinated person and a vaccinated person when infected with TB bacteria.

Table 3

	Number of antibodies produced	Speed of antibody production
Non-vaccinated person	Few	Slow
Vaccinated person	Many	Very fast

Explain the differences in antibody production shown in **Table 3**.

[2 marks]

4.6.3.7 Resistant bacteria

Question 14 · continued

6 (b) Bacteria may mutate and become resistant to an antibiotic.

Table 4 shows how the percentages of non-resistant and resistant strains in the population of bacteria change over time when an antibiotic is used.

Table 4

Number of generations of bacteria	Percentage (%) in population of bacteria	
	Non-resistant strain	Resistant strain
5	99	1
50	95	5
500	80	20
5 000	60	40
50 000	30	70

6 (b) (i) Why does the percentage of the resistant strain in the population of bacteria change?

[3 marks]

6 (b) (ii) Suggest why antibiotics should **not** be used to treat some people who have sore throats.

[2 marks]

8

4.6.3.7 Resistant bacteria

Question 15

June 2023 | 8461/1H | Original Q3

0 3 *Salmonella* bacteria cause outbreaks of food poisoning in humans.

To prevent food poisoning in humans, farmers vaccinate their animals against *Salmonella* bacteria.

0 3 . 1 How do *Salmonella* bacteria in food cause the symptoms of vomiting and diarrhoea?

[1 mark]

During a food poisoning outbreak, scientists identified the farm where the food came from.

The farmer had **not** vaccinated the farm animals against *Salmonella* bacteria.

0 3 . 2 The food poisoning outbreak could have been prevented if the farm animals had been vaccinated.

Explain how:

- the immune systems of animals respond to a vaccination
- the immune response in farm animals prevents an outbreak of food poisoning in humans.

[4 marks]

Question 3 continues on the next page

4.6.3.7 Resistant bacteria

Question 15 · continued

Most cases of food poisoning do **not** need to be treated with antibiotics.

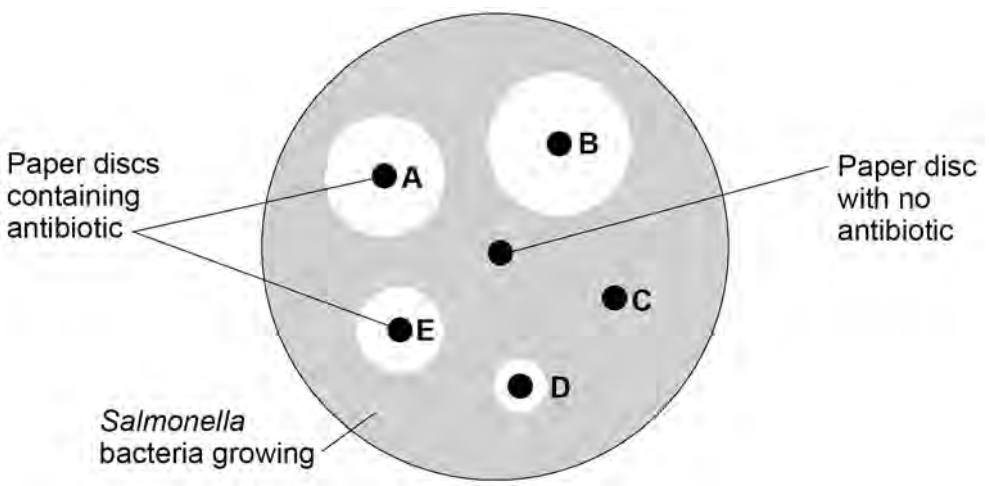
However, some patients may need to take antibiotics to recover.

Scientists investigated the effectiveness of five different antibiotics on the *Salmonella* bacteria in the outbreak.

Antibiotics **A**, **B**, **C**, **D** and **E** were used in the investigation.

Figure 4 shows the results.

Figure 4



0 3 . 3 Describe **two** aseptic techniques the scientists should have used in the investigation.

[2 marks]

1 _____

_____

2 _____

_____

4.6.3.7 Resistant bacteria

Question 15 · continued

0 3 . 4 The scientists incubated the bacteria at 37 °C.
Students in school laboratories incubate bacteria at 25 °C.

Explain why scientists use 37 °C but students must use 25 °C to incubate bacteria.

[3 marks]

0 3 . 5 What is the purpose of the paper disc with no antibiotic in **Figure 4**?

[1 mark]

0 3 . 6 The scientists concluded that either antibiotic **A** or antibiotic **B** should be prescribed to patients with food poisoning.

Why should antibiotic **A** or antibiotic **B** be prescribed?

[1 mark]

0 3 . 7 The scientists wanted to be more certain about which antibiotic should be prescribed.

Describe how the results in **Figure 4** could be used to obtain a **quantitative** comparison of antibiotics **A** and **B**.

[1 mark]

4.6.3.7 Resistant bacteria

Question 15 · continued

0 3 . 8 One year later, there was another outbreak at the farm involving *Salmonella* bacteria.

Antibiotic **B** did **not** have an effect.

Suggest why antibiotic **B** no longer had an effect.

[1 mark]

0 3 . 9 Antibiotics treat food poisoning because they kill *Salmonella* bacteria inside the human body.

Some antibiotics work because they damage the bacterial cell wall.

The bacteria die because the cells burst.

Explain why the cells burst.

[3 marks]

17

4.6.3.7 Resistant bacteria

Question 16

0 6 This question is about pathogens.

A scientist investigated antibiotic resistance in bacteria.

0 6 . 1 Name **one** antibiotic.

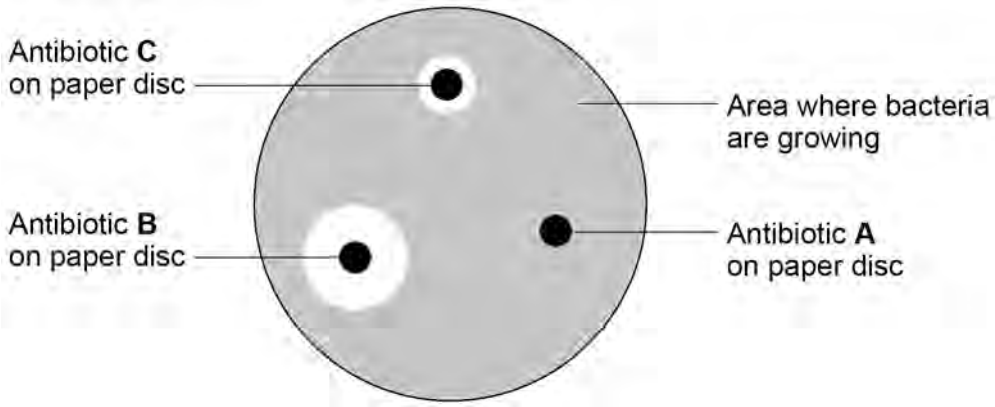
[1 mark]

The scientist grew one type of bacterium on agar in a Petri dish.

The scientist placed paper discs each containing a different antibiotic on the agar.

Figure 5 shows the appearance of the Petri dish after 2 days.

Figure 5



4.6.3.7 Resistant bacteria

Question 16 · continued

0 6 . 2 A student said:

'The bacterium is resistant to antibiotic **C**.'

Explain how the results in **Figure 5** show that the student is **not** correct.

[2 marks]

0 6 . 3 Suggest why doctors are concerned about antibiotic resistance.

[2 marks]

Question 6 continues on the next page

4.6.3.7 Resistant bacteria

Question 16 · continued

Diseases caused by viruses **cannot** be treated using antibiotics.

0 6 . 4 Suggest why viruses **cannot** be grown on agar.

[1 mark]

0 6 . 5 Why is it difficult for scientists to develop drugs to destroy viruses?

[1 mark]

0 6 . 6 Which disease is caused by a virus that damages white blood cells?

[1 mark]

Tick (✓) **one** box.

- AIDS ☐
- Gonorrhoea ☐
- Measles ☐
- Salmonella ☐

8