AQA GCSE Biology | 8461

SPECIFICATION POINT 4.3.1.8

Antibiotics and painkillers

Past-paper questions

Tier	**Higher**
Question groups	**28**
Available paper years	**2007–2025**

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.

4.3.1.8 Antibiotics and painkillers

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.

4.3.1.8 Antibiotics and painkillers

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.

.....

.....

.....

.....

(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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.....

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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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.....

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(3 marks)

7

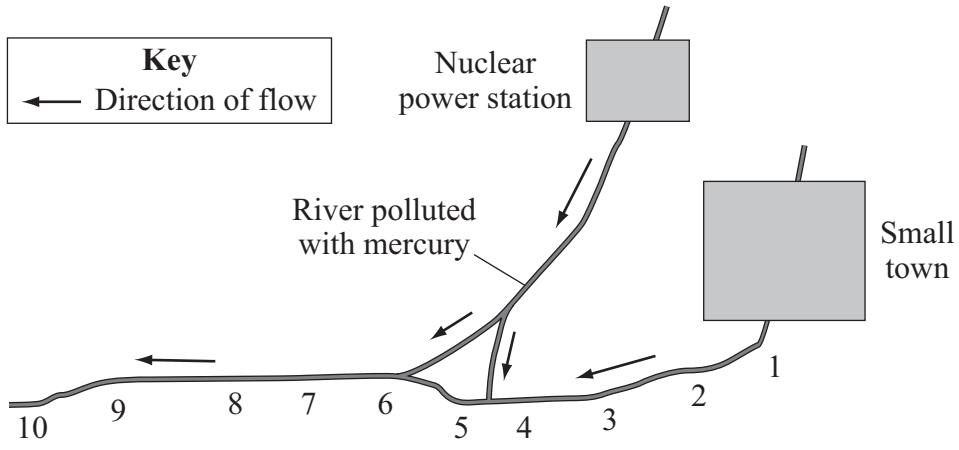
4.3.1.8 Antibiotics and painkillers

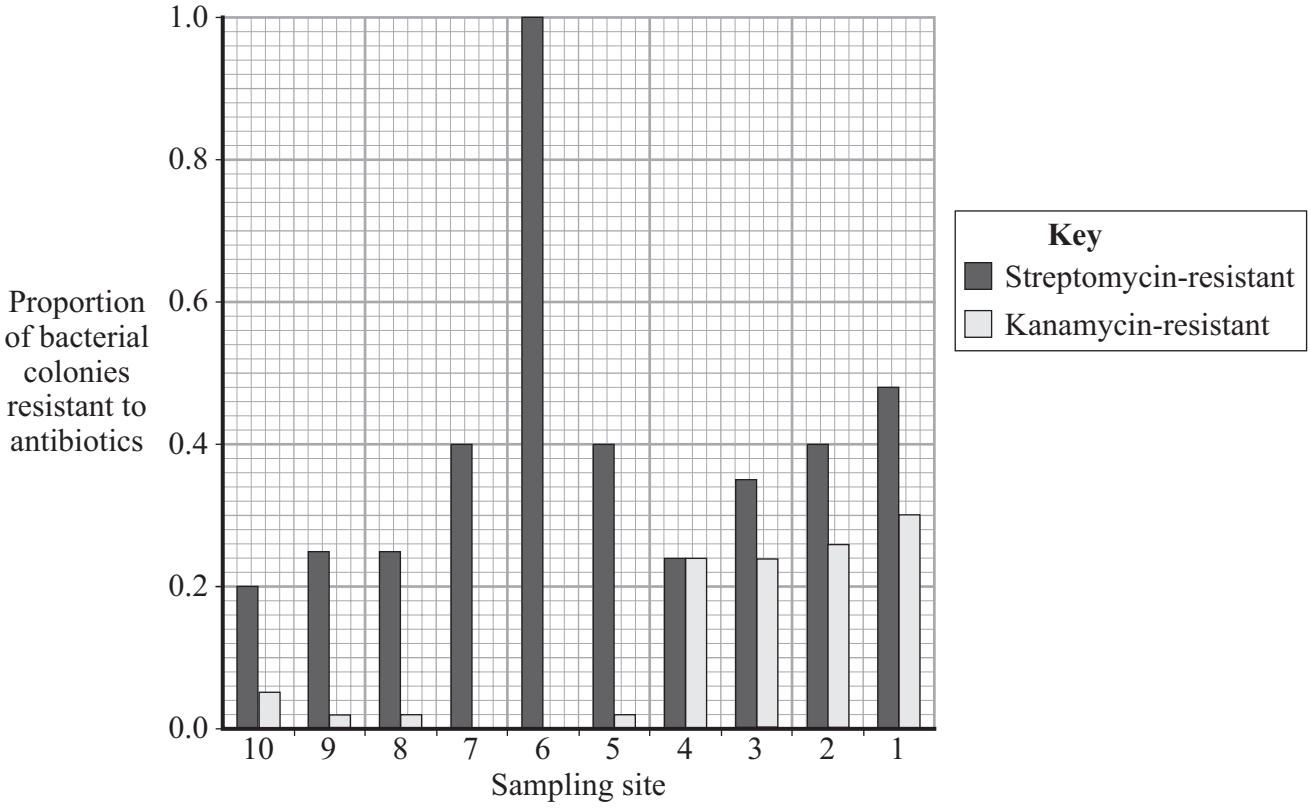
Question 03

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.





4.3.1.8 Antibiotics and painkillers

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.

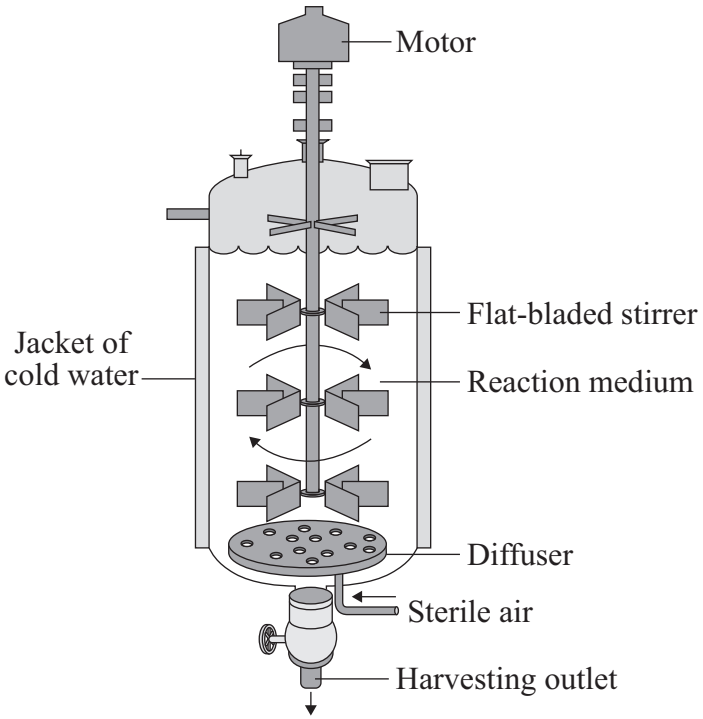
END OF TEST

4.3.1.8 Antibiotics and painkillers

Question 04

January 2008 | BLY3H | Original Q7 | Legacy

7 The diagram shows a fermenter. This fermenter was used to grow the fungus *Cephalosporium* which makes the antibiotic Cephalosporin C. The reaction medium contains a mixture of the sugars glucose and sucrose and a variety of mineral ions.



(a) (i) The stirrer continuously mixes the contents of the fermenter. Why is this important?

.....

.....

(1 mark)

(ii) Explain why the fermenter is surrounded by a jacket of cold water.

.....

.....

.....

.....

(2 marks)

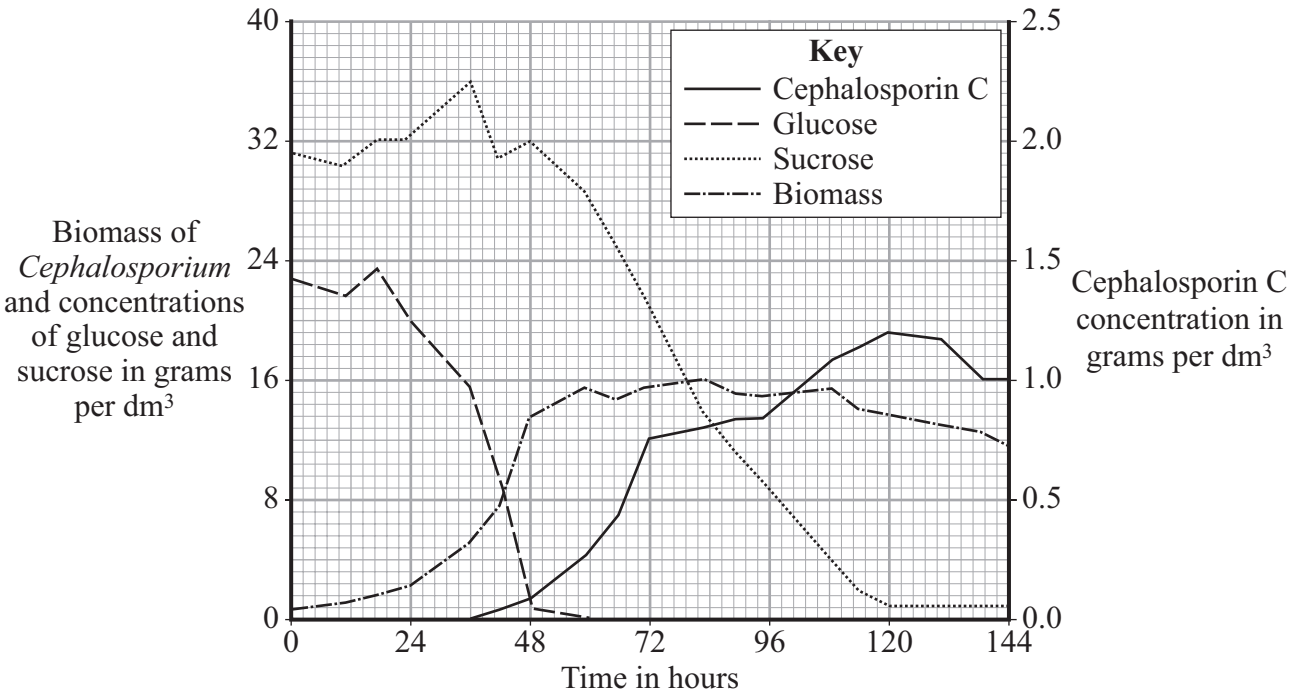
Question 7 continues on the next page

4.3.1.8 Antibiotics and painkillers

Question 04 · continued

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(b) The graph shows changes in the concentrations of glucose, sucrose, Cephalosporin C and the biomass of *Cephalosporium* measured in the fermenter over 6 days.



(i) During which 6-hour time period is the antibiotic being produced at its maximum rate?

.....

(1 mark)

(ii) What evidence is there that *Cephalosporium* is able to use glucose more easily than sucrose?

.....

.....

(1 mark)

4.3.1.8 Antibiotics and painkillers

Question 04 · continued

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(iii) Describe and explain the relationship between glucose concentration, the biomass of *Cephalosporium* and the concentration of Cephalosporin C.

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(4 marks)

9

4.3.1.8 Antibiotics and painkillers

Question 05

June 2008 | BLY1AP | Original Q1 | Legacy

QUESTION ONE

Our bodies defend themselves naturally against infections. We also use other methods to protect ourselves against infections and to relieve the symptoms of disease.

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

A antibiotics

B painkillers

C antibodies

D vaccines

1	given to people to provide immunity
2	medicines that kill bacteria
3	produced by white blood cells
4	relieve symptoms of disease

4.3.1.8 Antibiotics and painkillers

Question 06

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.

.....

.....

.....

.....

.....

.....

(2 marks)

4.3.1.8 Antibiotics and painkillers

Question 06 · 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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.....

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.....

(4 marks)

8

4.3.1.8 Antibiotics and painkillers

Question 07

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**.

4.3.1.8 Antibiotics and painkillers

Question 07 · 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.

4.3.1.8 Antibiotics and painkillers

Question 08

November 2008 | BLY1AP | Original Q5 | Legacy

QUESTION FIVE

Read the information about whooping cough.

- Whooping cough is a harmful disease which can damage the lungs.
- Whooping cough is often caught in childhood.
- Whooping cough can be treated with antibiotics.

5A Whooping cough is . . .

1 caused by bacteria.

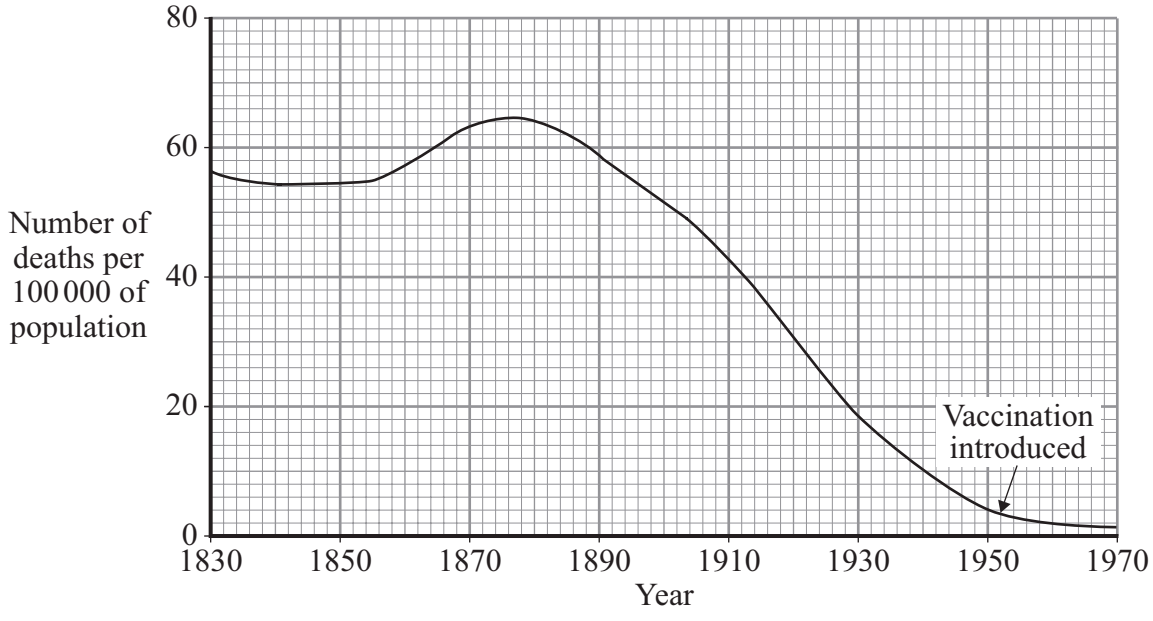
2 caused by smoking.

3 caused by a virus.

4 a deficiency disease.

Graph 1 shows the number of deaths due to whooping cough in England and Wales between 1830 and 1970.

Graph 1



5B In 1950, the population of England and Wales was 45 million.

How many people died from whooping cough in England and Wales in 1950?

1 180

2 1800

3 18 000

4 180 000

Question 08 · continued

5C A whooping cough vaccine was introduced in 1952.

From the information in the graph, what was the most likely reason for the changes in the number of deaths after 1950?

1 improved standards of hygiene

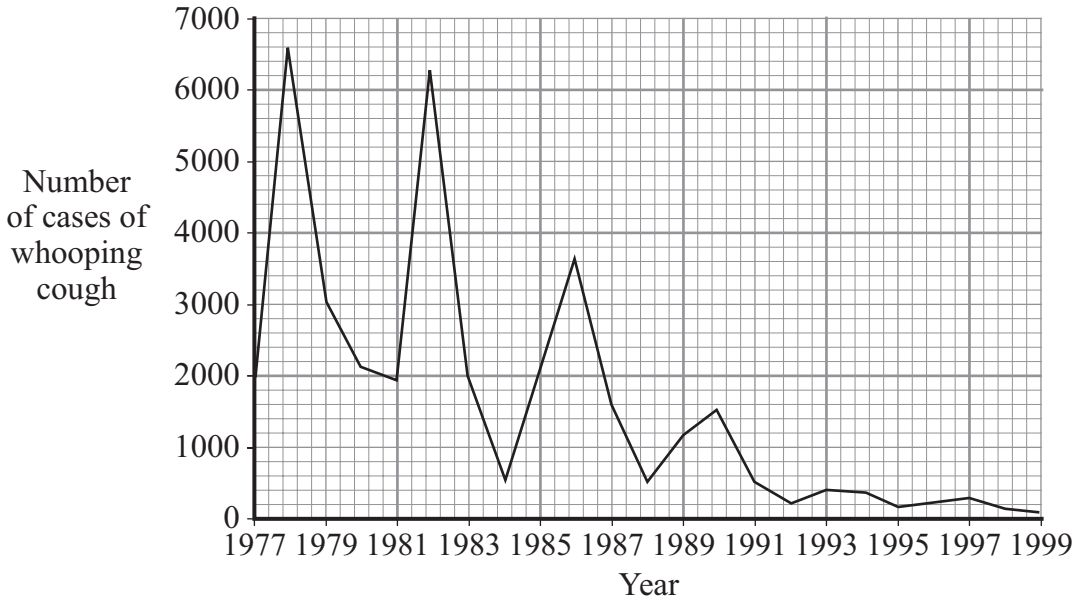
2 antibiotic resistance

3 better education

4 vaccination

5D **Graph 2** shows information about the number of cases of whooping cough in England and Wales after 1977.

Graph 2



What conclusion can be drawn from the data?

1 Deaths from whooping cough were much higher in 1982 than in 1882.

2 Cases of whooping cough occurred in four-year cycles between 1977 and 1993.

3 Whooping cough had been wiped out in England and Wales by 1999.

4 Cases of whooping cough and time are directly related.

4.3.1.8 Antibiotics and painkillers

Question 09

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?

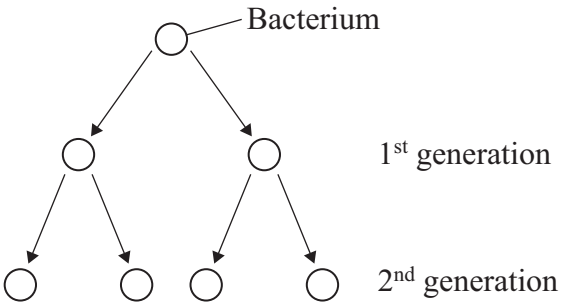
1 immunity

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

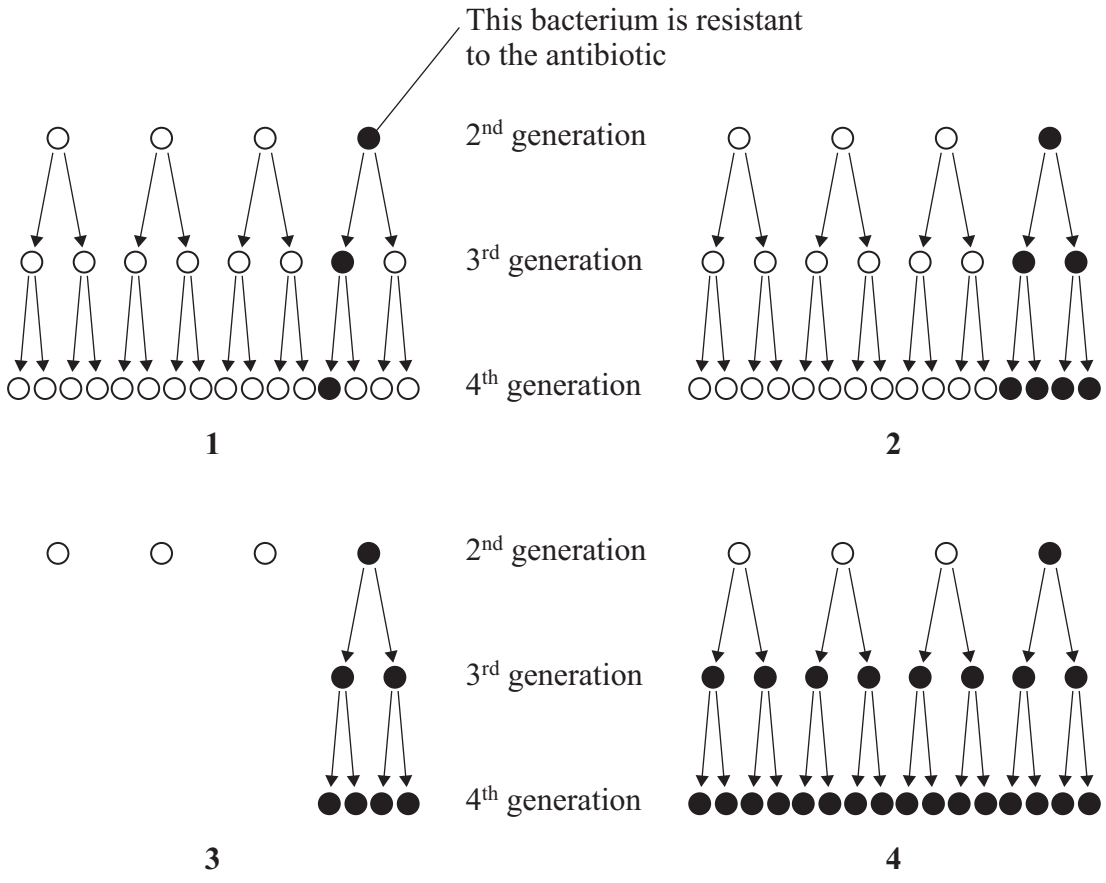
4 128

4.3.1.8 Antibiotics and painkillers

Question 09 · 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.

4.3.1.8 Antibiotics and painkillers

Question 10

March 2009 | BLY1AP | Original Q8 | Legacy

QUESTION EIGHT

Influenza (flu) is caused by a virus.

8A Viruses can reproduce . . .

1 anywhere in the human body.

2 only in human lungs.

3 inside human cells.

4 on the surface of the human skin.

Bird flu virus does not normally infect humans. In 1997, one strain of bird flu, HN51, spread from infected chickens to 18 people in Hong Kong and killed 6 of them.

Since 2003 there have been over 300 cases of HN51 in humans. The World Health Organisation is worried that mutations of the HN51 virus will enable it to spread rapidly from human to human. Scientists believe that 13 different mutations of the HN51 virus will be required for it to transfer rapidly between humans. Up to now, two of these mutations have occurred.

8B Bird flu cannot be treated with antibiotics.

This is because . . .

1 white blood cells do not recognise the bird flu virus.

2 antibiotics only work in humans.

3 bird flu is caused by a virus.

4 antibiotics do not affect the toxins produced by the bird flu virus.

8C Which row of the table is correct?

	Statement	Reason
1	Human-to-human transfer of HN51 could cause millions of deaths.	It could be transferred rapidly between people living in cities.
2	Human-to-human transfer of HN51 will never occur.	The virus could never undergo enough mutations to make this possible.
3	It is not possible to vaccinate people against all strains of bird flu.	Vaccines damage body cells.
4	The World Health Organisation should ignore the possibility of a HN51 pandemic.	There have been very few cases of HN51 in humans.

4.3.1.8 Antibiotics and painkillers

8D The success of vaccinating humans against HN51 may be limited because . . .

1 some people may catch HN51 from the vaccine.

2 HN51 mutates frequently.

3 vaccines are only effective against bacterial infections.

4 vaccines only work on certain people.

Turn over for the next question

4.3.1.8 Antibiotics and painkillers

Question 11

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.

4.3.1.8 Antibiotics and painkillers

Question 11 · continued

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

4.3.1.8 Antibiotics and painkillers

Question 12

March 2010 | BLY1AP | Original Q4 | Legacy

QUESTION FOUR

Read the passage about the discovery of thalidomide.

> A small German drugs company first made thalidomide in 1953. The company scientists could not find any beneficial effects of thalidomide, including antibiotic activity, in mice and rats. However, the new chemical seemed to be harmless. Very high doses did not kill rodents, rabbits, cats or dogs. In addition, the animals showed no other side effects.
>
> In further testing, the animals did not appear to become sleepy or calmer when given thalidomide. However, the company thought that selling thalidomide as a sleeping drug would make them lots of money.
>
> Soon the drug was being sold in 46 countries without any additional independent testing. Thalidomide became the drug of choice for pregnant women with morning sickness.

4A Nowadays, all drugs are thoroughly tested before being marketed.

Which stage of drug testing was not done by the company scientists?

1 tests on animals

2 toxicity tests

3 tests on humans

4 antibiotic activity

4B The company marketed thalidomide quickly because . . .

1 they thought that they could make a big profit.

2 they wanted to cure morning sickness in women.

3 it was a good sleeping drug.

4 it was a good antibiotic.

4.3.1.8 Antibiotics and painkillers

Question 12 · continued

4C When clinical trials of a new drug are carried out, half the volunteers are given a placebo.

A placebo contains . . .

1 only inactive substances.

2 a small quantity of the drug.

3 an antibiotic.

4 a painkiller.

4D Thalidomide was banned when its side effects became known.

It has recently been approved for the treatment of . . .

1 morning sickness.

2 leprosy.

3 limb abnormalities.

4 mental illness.

4.3.1.8 Antibiotics and painkillers

Question 13

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.

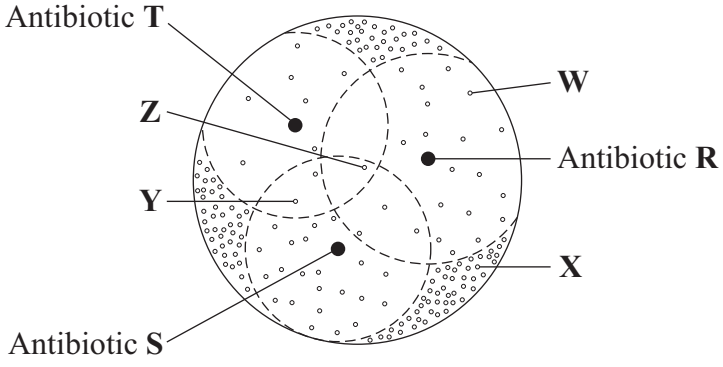
4 Antibiotics are overused.

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**

4.3.1.8 Antibiotics and painkillers

Question 13 · 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

4.3.1.8 Antibiotics and painkillers

Question 14

June 2010 | BLY1AP | Original Q3 | Legacy

QUESTION THREE

Our bodies defend themselves against attack by pathogens.

3A Our white cells produce antibodies which destroy . . .

1 all types of bacteria and all types of viruses.

2 all types of bacteria but no viruses.

3 all types of viruses but no bacteria.

4 some types of bacteria and some types of viruses.

3B Our white cells also produce antitoxins which . . .

1 counteract poisons produced by pathogens.

2 destroy both bacteria and viruses.

3 destroy bacteria but not viruses.

4 ingest pathogens.

3C Antibiotics destroy . . .

1 all types of bacteria and all types of viruses.

2 some types of bacteria and some types of viruses.

3 some types of bacteria but no viruses.

4 some types of viruses but no bacteria.

3D Vaccines . . .

1 can be made from dead pathogens.

2 can give protection against bacteria but not viruses.

3 can give protection against viruses but not bacteria.

4 destroy pathogens.

4.3.1.8 Antibiotics and painkillers

Question 15

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.

4.3.1.8 Antibiotics and painkillers

Question 15 · continued March 2011 | BLY1AP | Original Q7 | Legacy

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.

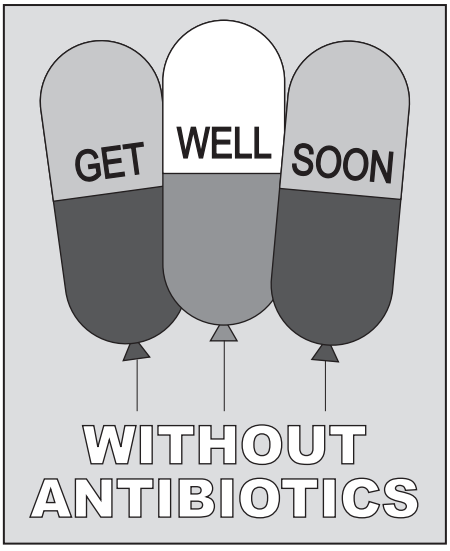
4.3.1.8 Antibiotics and painkillers

Question 16

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.

4.3.1.8 Antibiotics and painkillers

Question 16 · 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

4.3.1.8 Antibiotics and painkillers

Question 17

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.

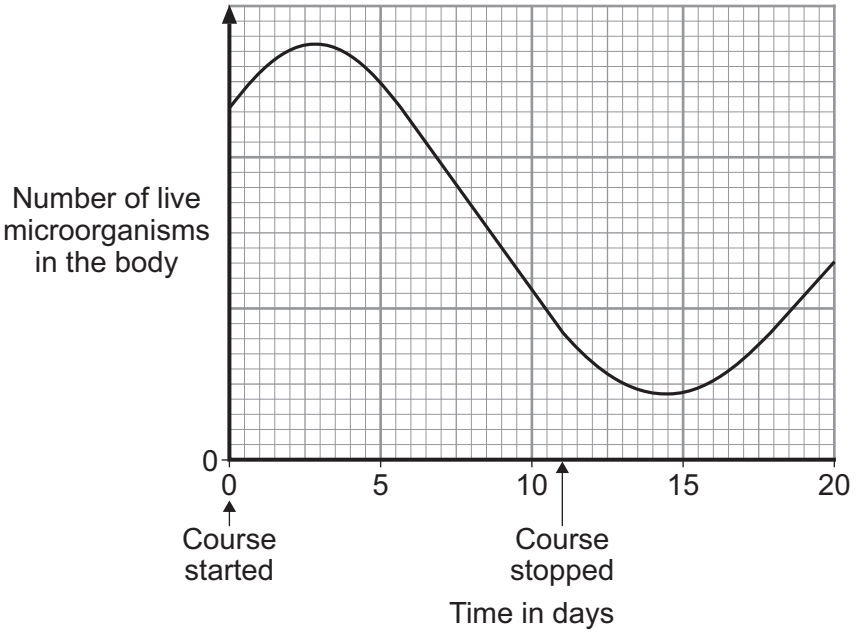
2 viruses are too small.

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

4.3.1.8 Antibiotics and painkillers

Question 17 · continued

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.

4.3.1.8 Antibiotics and painkillers

Question 18

June 2012 | BL1HP | Original Q1 | Legacy

1 Scientists at a drug company developed a new pain-killing drug, drug **X**.

1 (a) Painkillers do **not** cure infectious diseases.

Why?

.....

(1 mark)

1 (b) The scientists compared drug **X** with two other pain-killing drugs, drug **A** and drug **B**. In their investigation the scientists:

- chose 600 volunteers. The volunteers were all in pain
- gave 200 of the volunteers a standard dose of drug **A**
- gave 200 of the volunteers a standard dose of drug **B**
- gave 200 of the volunteers a standard dose of drug **X**.

Over the next seven hours the volunteers recorded how much pain they felt.

To get valid results the three groups of volunteers should be matched for as many factors as possible.

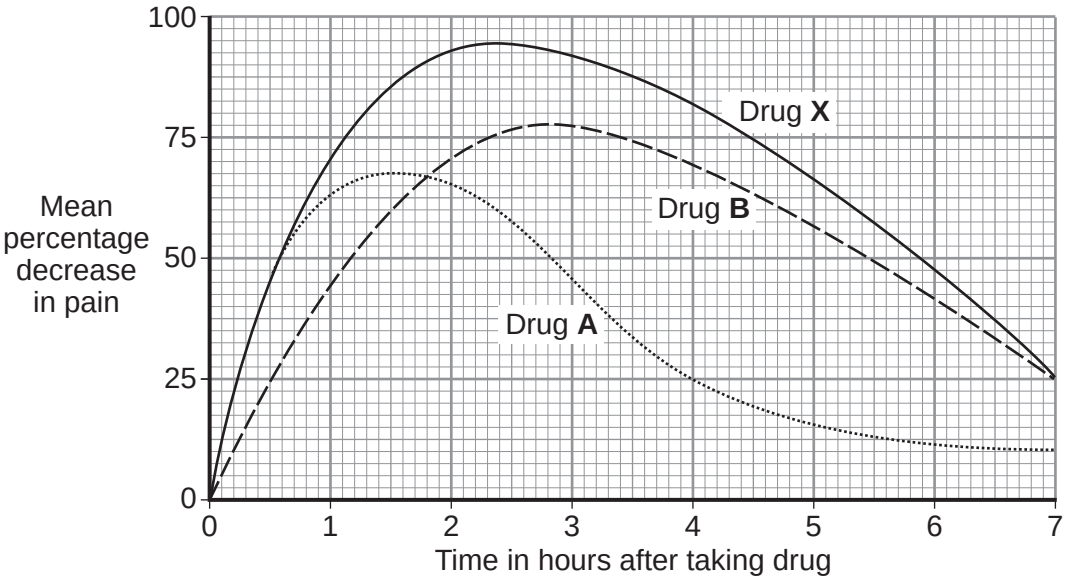
Suggest **two** of the factors that should be matched.

.....

.....

(2 marks)

1 (c) The graph shows the results of the investigation.



4.3.1.8 Antibiotics and painkillers

Question 18 · continued

1 (c) (i) How much pain did the volunteers still feel, four hours after taking drug **A**?

..... percent
(1 mark)

1 (c) (ii) Give **one** advantage of taking drug **A** and **not** drug **B**.

.....

.....
(1 mark)

1 (c) (iii) Give **two** advantages of taking drug **B** and **not** drug **A**.

.....

.....

.....

.....
(2 marks)

1 (d) Drug **X** is much more expensive than both drug **A** and drug **B**.

A pharmacist advised a customer that it would be just as good to take drug **A** and drug **B** together instead of drug **X**.

Do you agree with the pharmacist's advice?

Give reasons for your answer.

.....

.....

.....

.....

.....

.....

.....
(3 marks)

10

4.3.1.8 Antibiotics and painkillers

Question 19

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?

.....

.....

.....

.....

(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.

.....

.....

.....

.....

.....

.....

(3 marks)

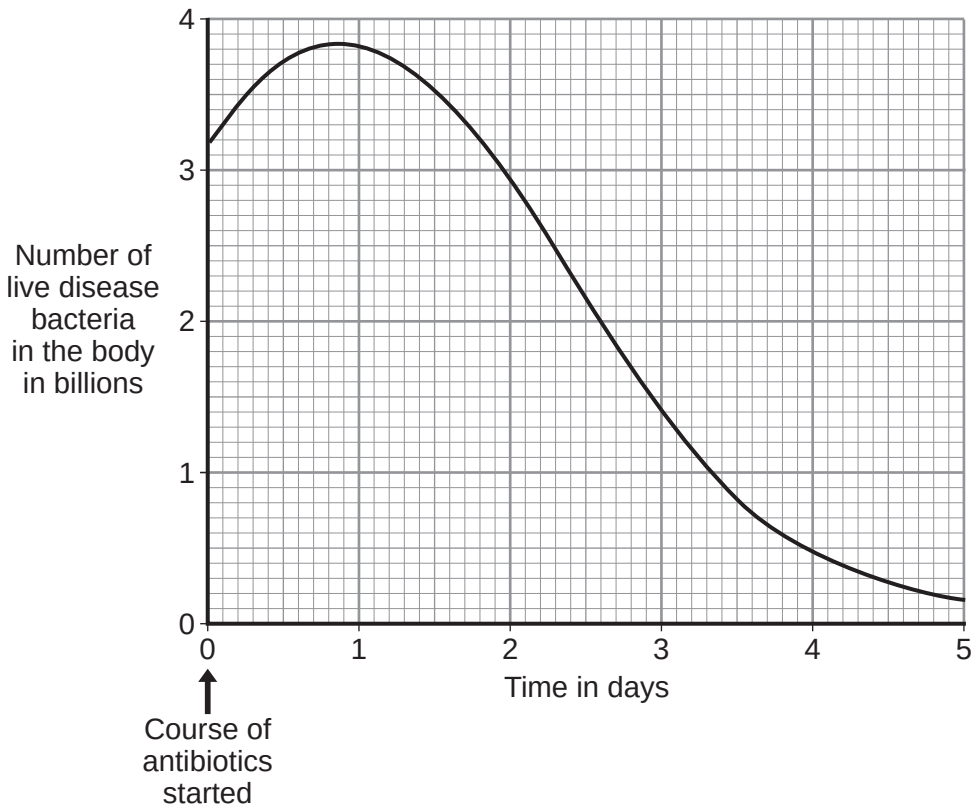
Question 5 continues on the next page

4.3.1.8 Antibiotics and painkillers

Question 19 · 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.



4.3.1.8 Antibiotics and painkillers

Question 19 · 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.

.....

.....

.....

.....

(2 marks)

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

The new strain may spread rapidly.

Explain why.

.....

.....

.....

.....

.....

.....

(3 marks)

10

4.3.1.8 Antibiotics and painkillers

Question 20

June 2014 | BL1HP | Original Q4 | Legacy

4 The MMR vaccine is used to protect against measles.

4 (a) Apart from measles, which **two** other diseases does the MMR vaccine protect against?

[1 mark]

..... and .....

4 (b) Read the information.

> Measles is a dangerous disease caused by a virus.
> Normally, MMR vaccinations are given at 1 year old and again at 4 years old.
> Each vaccination is 90% effective in protecting against the measles virus.
>
> In April 2013, there were 630 cases of measles in children aged 4 and over in a small area of the UK. Of these cases, 504 children had not been vaccinated against MMR at all and only a few had been given a second vaccination.

4 (b) (i) Calculate the percentage of the children who caught measles in April 2013 who had **not** been vaccinated against MMR.

[2 marks]

.....

.....

.....

Percentage = ...

4 (b) (ii) Suggest **one** advantage to the population as a whole of children having the second MMR vaccination.

[1 mark]

.....

4.3.1.8 Antibiotics and painkillers

Question 20 · continued

4 (c) (i) What does a vaccine contain?

[1 mark]

.....

.....

4 (c) (ii) Explain how a vaccination prevents infection.

[3 marks]

.....

.....

.....

.....

.....

.....

.....

4 (d) (i) Antibiotics can only be used to treat some infections.

Explain why antibiotics **cannot** be used to treat measles.

[2 marks]

.....

.....

.....

.....

4 (d) (ii) Why do antibiotics become less useful at treating an infection if the antibiotic is overused?

[1 mark]

.....

.....

11

4.3.1.8 Antibiotics and painkillers

Question 21

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]

.....

.....

.....

.....

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

4.3.1.8 Antibiotics and painkillers

Question 22

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]

4.3.1.8 Antibiotics and painkillers

Question 22 · 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

4.3.1.8 Antibiotics and painkillers

Question 23

November 2020 | 8461/1H | Original Q5

0 5 Many plants have evolved defence mechanisms.

Figure 8 shows part of a gorse plant and part of a deadly nightshade plant.

Figure 8



Gorse plant

Deadly nightshade plant

0 5 . 1 The gorse plant has evolved to have sharp thorns.

What type of defence response are thorns?

[1 mark]

0 5 . 2 How do thorns defend the gorse plant?

[1 mark]

0 5 . 3 The deadly nightshade plant has poisonous berries.

What type of defence response are poisonous berries?

[1 mark]

4.3.1.8 Antibiotics and painkillers

Question 23 · continued

0 5 . 4 A scientist noticed that in one area the gorse plants had yellow leaves and had stunted growth.

One reason for yellow leaves and stunted growth is a deficiency of nitrate ions in the soil.

Explain **two** other possible reasons for the yellow leaves and stunted growth.

Do **not** refer to nitrate ions in your answer.

[5 marks]

Reason 1 _____

_____

Explanation _____

_____

_____

_____

Reason 2 _____

_____

Explanation _____

_____

_____

_____

Question 5 continues on the next page

Question 23 · continued

The gorse plant has nodules on its roots.

The nodules are part of the living root tissue.

Bacteria which convert nitrogen gas into soluble nitrate ions live in the nodule tissue.

Figure 9 shows the nodules on the roots.

Figure 9



0 5 . 5 Suggest how the nodules benefit the bacteria.

[2 marks]

0 5 . 6 Explain how the nodules benefit the gorse plant.

[2 marks]

4.3.1.8 Antibiotics and painkillers

Question 23 · continued

0 5 . 7 For many years drugs have been extracted from plants.

Which plant material was chewed as a painkiller?

[1 mark]

Tick (✓) **one** box.

- Blackcurrant berries ☐
- Foxglove leaves ☐
- Rose petals ☐
- Willow bark ☐

13

Turn over for the next question

4.3.1.8 Antibiotics and painkillers

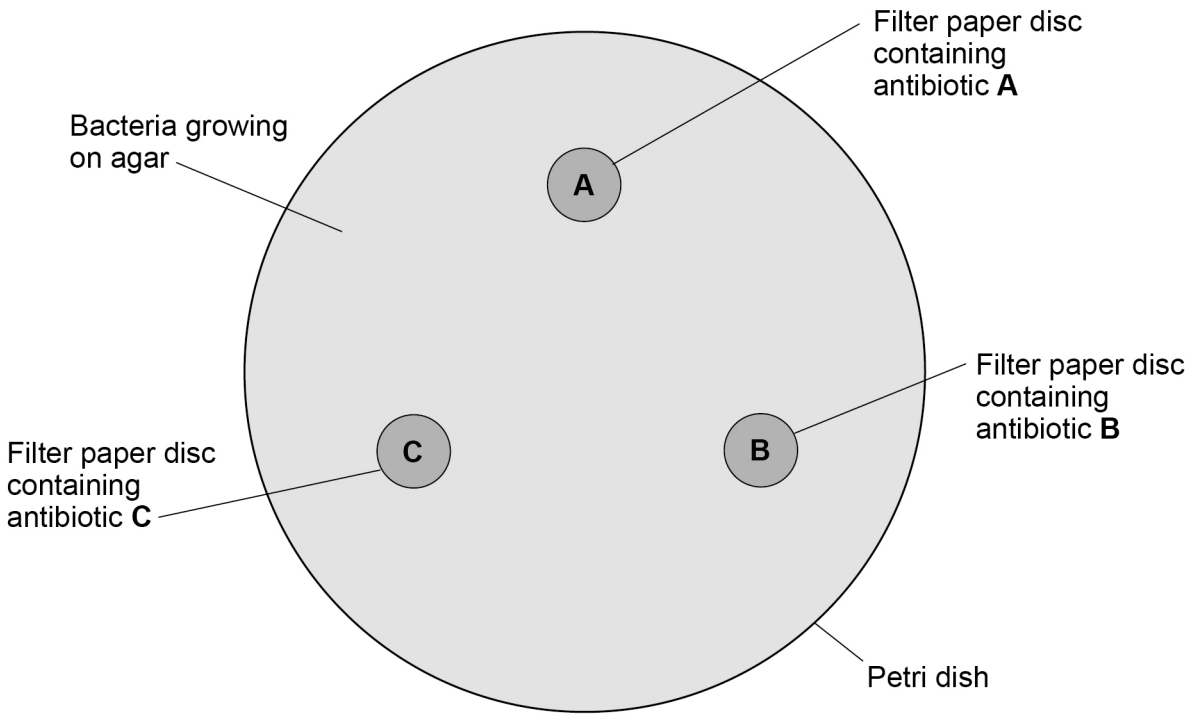
Question 24

November 2021 | 8461/1H | Original Q2

0 2 A student investigated the effectiveness of three different antibiotics.

Figure 3 shows how the student set up an agar plate.

Figure 3



The student used aseptic techniques to make sure that only one type of bacterium was growing on the agar.

0 2 . 1 Describe **two** aseptic techniques the student should have used.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

Question 2 continues on the next page

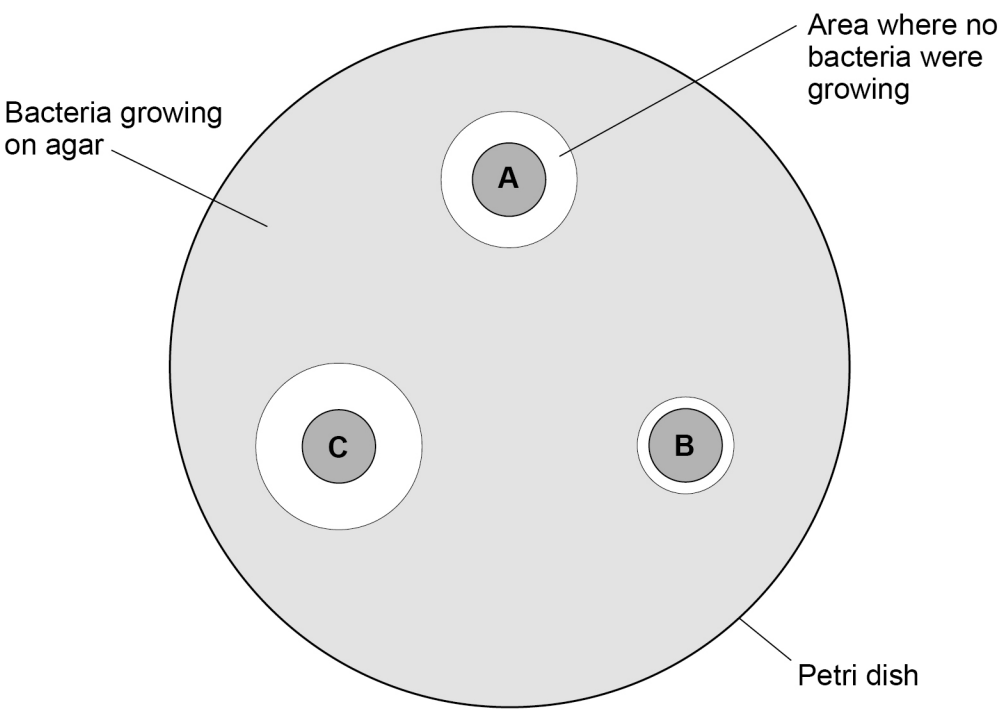
4.3.1.8 Antibiotics and painkillers

Question 24 · continued

The student placed the agar plate in an incubator at 25 °C for 48 hours.

Figure 4 shows the agar plate after 48 hours.

Figure 4



0 2 . 2 Which antibiotic is the **least** effective?

Give a reason for your answer.

[1 mark]

Least effective antibiotic _____

Reason _____

_____

_____

4.3.1.8 Antibiotics and painkillers

Question 24 · continued

0 2 . 3 Calculate the area where no bacteria were growing for antibiotic **C**.

Use $\pi = 3.14$

Give the unit.

[5 marks]

Area = _____ Unit _____

0 2 . 4 Suggest **one** way the student could improve the investigation.

[1 mark]

_____

_____

9

4.3.1.8 Antibiotics and painkillers

Question 25

June 2023 | 8461/1H | Original Q1

0 1 A root is a plant organ.

Plant roots contain many different types of tissue.

0 1 . 1 What is a tissue?

[1 mark]

0 1 . 2 Tissue in the tip of a plant root contains stem cells.

Stem cells can differentiate into any type of cell.

Name the type of tissue in plants that contains stem cells.

[1 mark]

In the past many drugs were extracted from plants.

0 1 . 3 Aspirin is a painkiller.

Which plant does aspirin originate from?

[1 mark]

Question 1 continues on the next page

4.3.1.8 Antibiotics and painkillers

Question 25 · continued

Scientists have extracted chemical **A** from the deadly nightshade plant.

Chemical **A** can be used as a painkiller.

Table 1 shows information about where chemical **A** is found.

Table 1

Part of deadly nightshade plant	Mass of chemical A in 100 g of plant tissue in grams
Roots	1.3
Leaves	1.2
Berries	0.7

0 1 . 4 The scientists usually extract chemical **A** from the berries of the deadly nightshade plant.

Suggest **one** reason why berries are used instead of leaves or roots.

[1 mark]

4.3.1.8 Antibiotics and painkillers

Question 25 · continued

A deadly nightshade plant has chlorosis (yellow leaves).

The mass of chemical **A** found in the **leaves** of the plant is 60% of the mass shown in **Table 1**.

0 1 . 5 Calculate the mass of chemical **A** in 200 g of the **leaves** with chlorosis.

Give your answer in mg.

[4 marks]

Mass of chemical **A** = _____ mg

0 1 . 6 Suggest **one** reason why the leaves of the deadly nightshade plant have chlorosis.

[1 mark]

Question 1 continues on the next page

4.3.1.8 Antibiotics and painkillers

Question 25 · continued

Chemical **A** has **not** been tested in large-scale clinical trials in the UK.

0 1 . 7 It is important for drugs to be tested in clinical trials before the drugs are approved for use by the public.

Give **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____

There are many online reports making claims about the effects of chemical **A**.

Some of these reports are biased.

0 1 . 8 Suggest **one** reason why a report making claims about the effects of chemical **A** may be biased.

[1 mark]

_____

_____

4.3.1.8 Antibiotics and painkillers

Question 25 · continued

0 1 . 9 How can scientists be sure that claims about new drugs are valid?

[1 mark]

Tick (✓) **one** box.

- Advertise the claims on social media. ☐
- Ask an international company to produce the drug. ☐
- Have the claims peer reviewed. ☐
- Publish the claims in a newspaper. ☐

13

Turn over for the next question

4.3.1.8 Antibiotics and painkillers

Question 26

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

Question 26 · continued

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

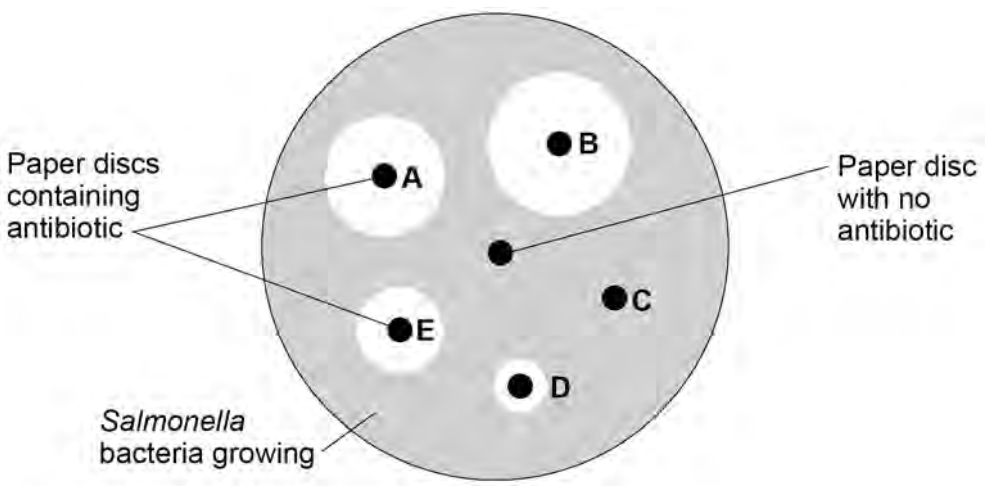
However, some patients may need to take antibiotics to recover.

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 _____

_____

4.3.1.8 Antibiotics and painkillers

Question 26 · 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]

4.3.1.8 Antibiotics and painkillers

Question 26 · 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

4.3.1.8 Antibiotics and painkillers

Question 27

June 2024 | 8461/1H | Original Q6

0 6 This question is about pathogens.

A scientist investigated antibiotic resistance in bacteria.

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

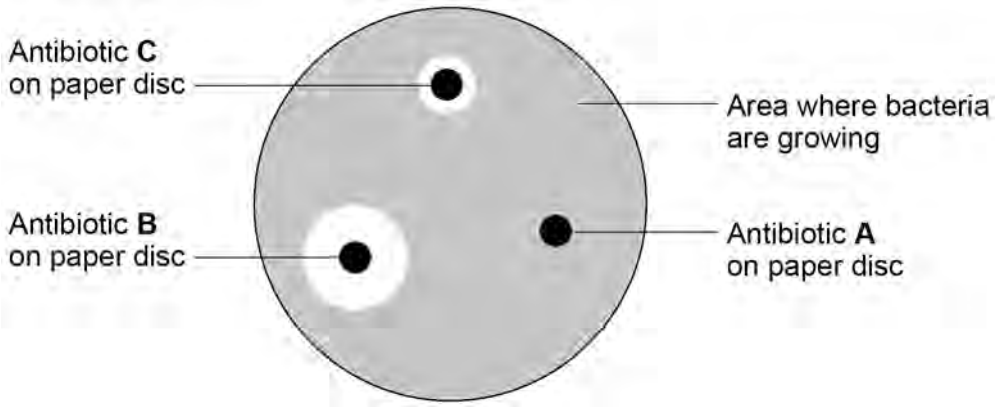
[1 mark]

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



4.3.1.8 Antibiotics and painkillers

Question 27 · 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

4.3.1.8 Antibiotics and painkillers

Question 27 · 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

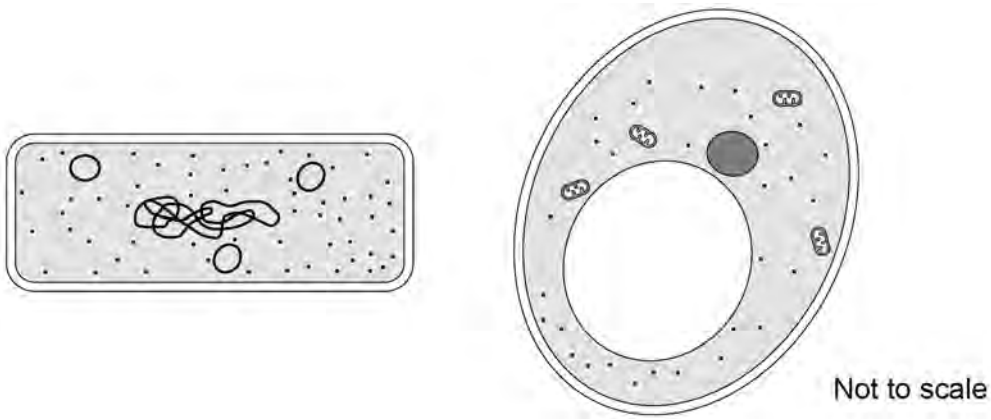
4.3.1.8 Antibiotics and painkillers

Question 28

June 2025 | 8461/1H | Original Q8

0 8 **Figure 10** shows a bacterial cell and a yeast cell.

Figure 10



0 8 . 1 Which statement about bacterial cells and yeast cells is correct?

[1 mark]

Tick (✓) **one** box.

- Bacterial cells and yeast cells are eukaryotic. ☐
- Bacterial cells and yeast cells are prokaryotic. ☐
- Bacterial cells are eukaryotic and yeast cells are prokaryotic. ☐
- Bacterial cells are prokaryotic and yeast cells are eukaryotic. ☐

0 8 . 2 Give **two** features of a yeast cell that are **not** found in a bacterial cell.

Use **Figure 10**.

[2 marks]

1 _____

_____

2 _____

_____

4.3.1.8 Antibiotics and painkillers

Question 28 · continued

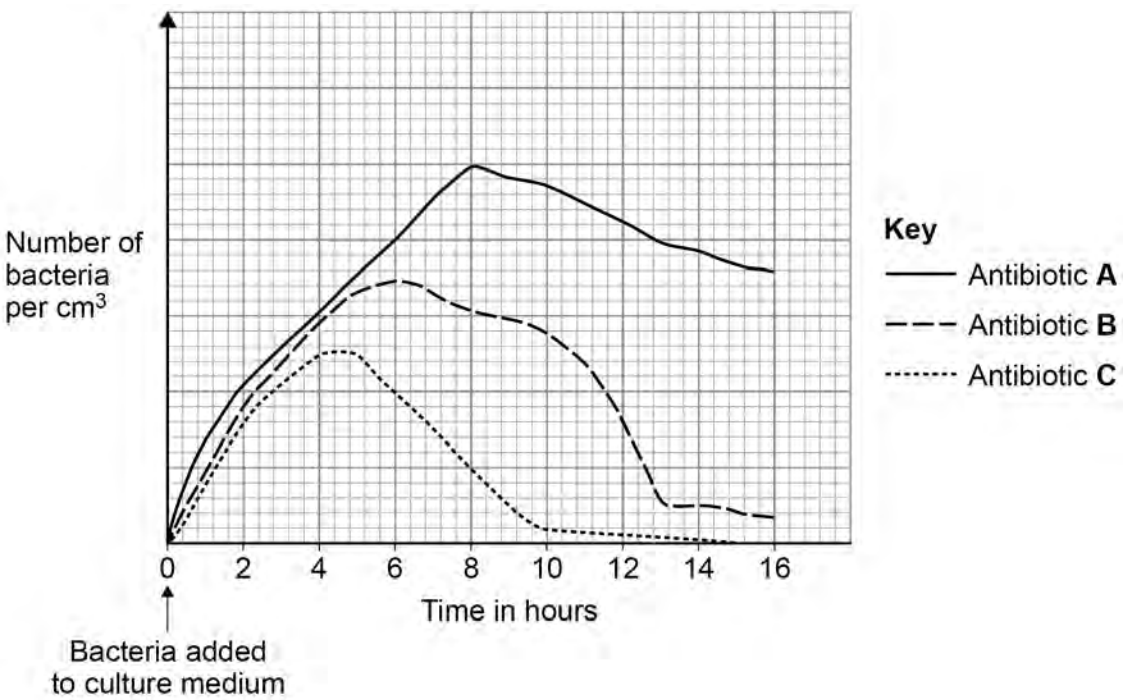
A scientist investigated the effect of different antibiotics on one type of bacterium.

The scientist:

- used three samples of culture medium
- added a different antibiotic to each sample
- added equal numbers of bacteria to each sample.

Figure 11 shows the results.

Figure 11



4.3.1.8 Antibiotics and painkillers

Question 28 · continued

0 8 . 3 Compare the effectiveness of the antibiotics shown in **Figure 11**.

[4 marks]

0 8 . 4 It was **not** possible for the scientist to count the total number of bacteria per cm^3 of culture medium.

The cells were too close together to be counted accurately.

The scientist took 10 samples from the culture medium.
Each sample had a volume of 0.02 cm^3.

Describe how the scientist could use the samples to estimate the number of bacteria in 1 cm^3 of culture medium.

[2 marks]

9