AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.1.3

Biotic factors

Past-paper questions

Tier	**Higher**
Question groups	**29**
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.

4.7.1.3 Biotic factors

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.

4.7.1.3 Biotic factors

Question 02

March 2007 | BLY1B | Original Q5 | Legacy

QUESTION FIVE

5A What is an animal's territory?

1 an area defended by an animal against other members of the same species

2 an area defended by an animal against all other animals

3 the place where animals compete with other animals

4 an area to which an animal has become adapted

5B Which of the following is **not** an adaptation to living in arctic conditions?

1 white fur of polar bears

2 thick layer of body fat in seals

3 small ears of arctic foxes

4 large wings of birds

5C Which line, **1**, **2**, **3** or **4**, in the table is correct?

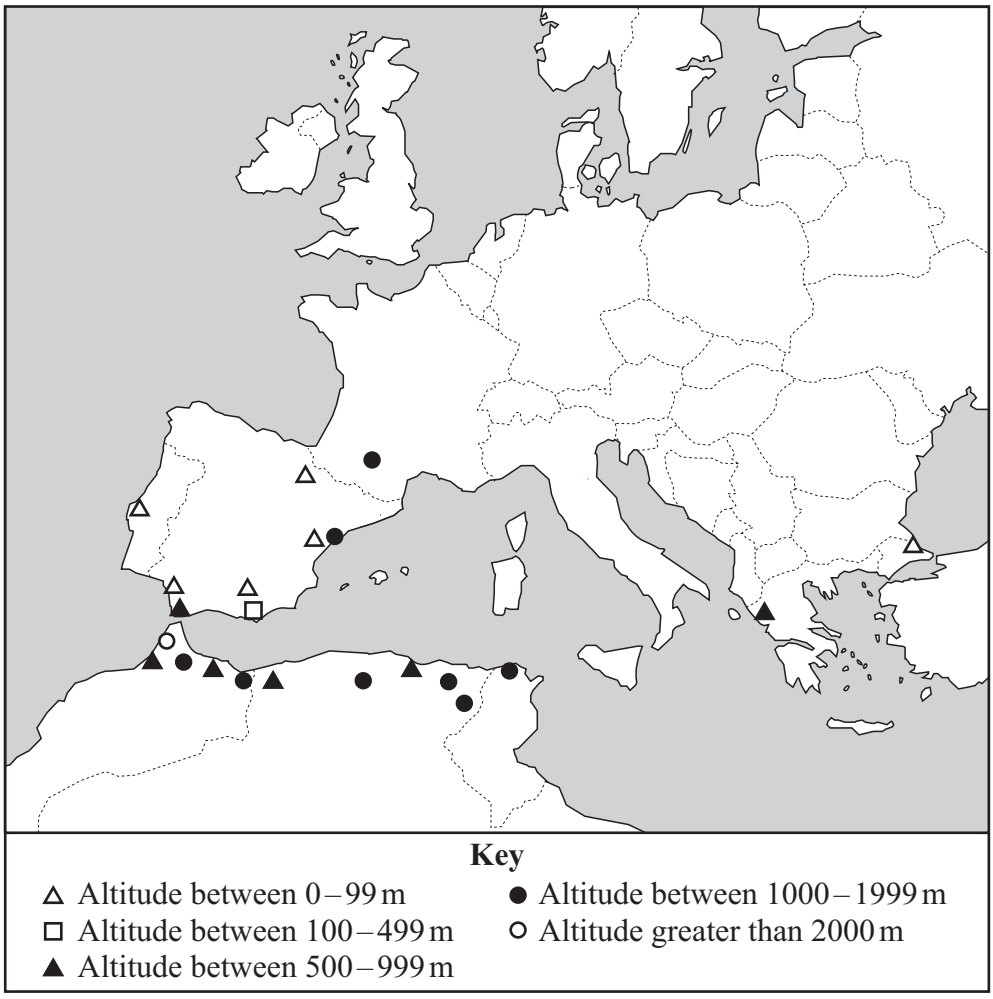
	Adaptation for protection against predators	
	Plants	**Animals**
1	long roots of cacti	warning colours of some snakes
2	thorns on berberis plants	camouflage colours of flatfish
3	poisonous seeds of the henbane plant	long neck of the giraffe
4	waxy leaves of the agave plant	long beak of humming birds

4.7.1.3 Biotic factors

Question 02 · continued

5D The distribution of plants is affected by altitude (height above sea level in metres).

The map shows the altitudes of the only known sites where a rare plant grows.



The plant grows mainly at altitudes . . .

1 between 0 – 99 m

2 between 100 – 499 m

3 between 500 – 999 m

4 between 1000 – 1999 m

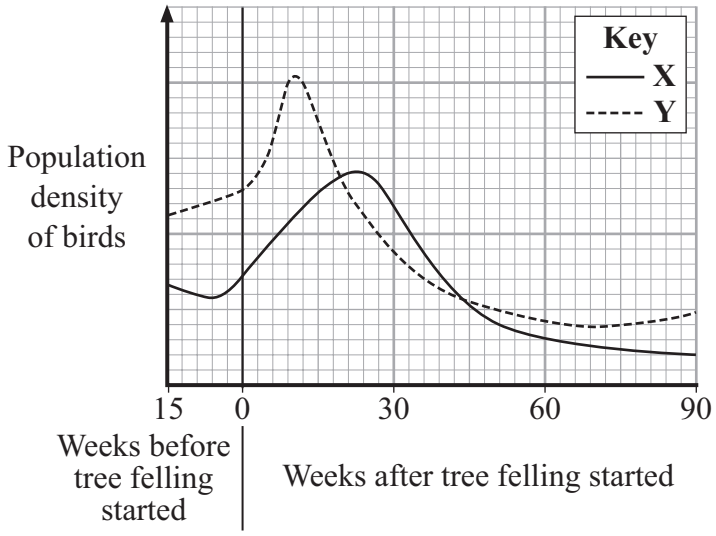
4.7.1.3 Biotic factors

Question 03

June 2007 | BLY1B | Original Q9 | Legacy

QUESTION NINE

The graph shows the results of a survey into the effect of tree felling on the population density of two different species of bird, **X** and **Y**.



9A Which one of the following statements suggests that species **X** might be a predator of species **Y**?

1 The population density of species **X** is always lower than that of species **Y**.

2 The maximum population density of species **Y** reaches a peak 20 weeks before the population density of species **X** begins to fall.

3 The maximum population density of species **X** occurs as the population density of species **Y** is falling.

4 A fall in the population density of species **X** causes an increase in the population density of species **Y**.

9B The survey team concluded that tree felling caused a reduction in the population density of the birds.

What evidence in the graph supports this conclusion?

1 48 weeks after the start of tree felling, the population density of both species of bird was less than before the tree felling started.

2 72 weeks after the start of tree felling, the population density of species **Y** was less than half of its lowest population density before tree felling started.

3 The fall in the population density of species **Y** occurs before that of species **X**.

4 The fall in the population density of species **Y** was faster than that of species **X**.

4.7.1.3 Biotic factors

Question 03 · continued

9C How might the data about the population density of the two species of bird have been collected in the area where the trees were being felled?

1 Every six weeks, count all the birds of both species for 24 hours over all the area where the trees are being felled.

2 Every six weeks, count all the nests of the birds of both species over all the area where the trees are being felled.

3 Put a numbered ring on all the birds of both species and record how many of these birds are caught and released every six weeks.

4 Mark out several smaller areas and count the number of birds of both species that are seen during a 24-hour period every six weeks.

9D What other evidence might be used to confirm the conclusions of the survey?

1 data from other surveys on the effects of tree felling on bird population densities

2 data from other surveys on the effects of tree felling on the plant population where the birds live

3 data from other surveys on the availability of the birds' food resources

4 data from other surveys on the breeding habits of birds

END OF TEST

4.7.1.3 Biotic factors

Question 04

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)

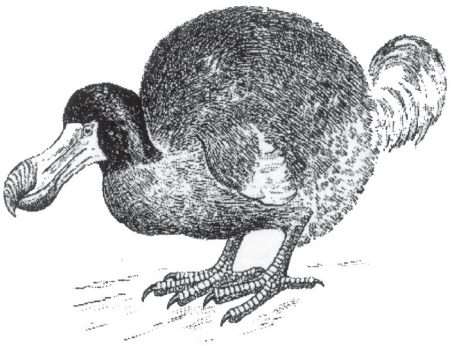
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4.7.1.3 Biotic factors

Question 05

January 2008 | BLY1H | Original Q7 | Legacy

7 The dodo is an extinct bird. The drawing shows an artist's impression of the bird.



Dodo – a flightless bird

The dodo lived on a small island in the middle of the Indian Ocean. Its ancestors were pigeon-like birds which flew to the island millions of years ago. There were no predators on the island. There was a lot of fruit on the ground. This fruit became the main diet of the birds. Gradually, the birds became much heavier, lost their ability to fly and evolved into the dodo.

(a) Suggest an explanation for the evolution of the pigeon-like ancestor into the flightless dodo.

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(4 marks)

4.7.1.3 Biotic factors

Question 05 · continued

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(b) The dodo became extinct about 80 years after Dutch sailors first discovered the island in the eighteenth century.

Scientists are uncertain about the reasons for the dodo's extinction.

Suggest an explanation for this uncertainty.

.....

.....

(1 mark)

5

Turn over for the next question

4.7.1.3 Biotic factors

Question 06

March 2008 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

Read the passage:

> Mount Rainier in America is home to some very rare plants. Many of them grow there even though the weather is so cold that trees cannot grow. As global warming continues, the mountain will become warmer. For every one degree Celsius rise in temperature, the trees can grow 75 metres higher up the mountain.

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

A competition

B environmental change

C survival

D extinction

1	allows trees to grow higher up the mountain
2	a possible consequence of global warming for the rare plants
3	a possible consequence of global warming for both the trees and the rare plants
4	a possible consequence of protecting the rare plants

4.7.1.3 Biotic factors

Question 07

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

4.7.1.3 Biotic factors

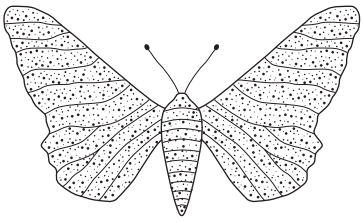
Question 08

June 2008 | BLY1BP | Original Q9 | Legacy

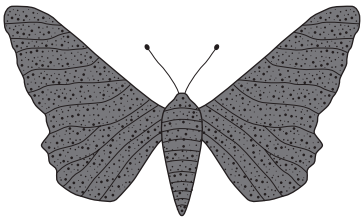
QUESTION NINE

Before the mid-nineteenth century, almost all peppered moths in England were light coloured and were not easy to spot as they rested on light-coloured tree bark and lichens.
The burning of coal during the Industrial Revolution produced gases that killed many of the lichens and blackened the environment with soot.
It was during this period that the first sighting of the dark-coloured peppered moths were reported in 1848.
By 1895, the percentage of dark-coloured moths in industrial cities such as Manchester had risen from about 2% to around 95%.
Birds are the main predators for both types of moth.

The picture below shows the two forms of peppered moth.



Pale form
(light-coloured)



Dark form
(dark-coloured)

9A The most likely reason for the increase in the proportion of dark moths compared with pale moths in cities was . . .

1 better resistance to poisonous gases produced by burning coal.

2 birds preferred to eat the paler form.

3 good camouflage when resting on a blackened surface.

4 pollutants caused a reduction in the number of birds that eat moths.

9B In the past, some scientists have suggested that moths become darker in colour as a result of exposure to certain pollutants.

This is an example of . . .

1 a prediction.

2 a hypothesis.

3 an investigation.

4 an observation.

9C Scientists agree that the observed changes in the most common colour of the moths is an example of the process of natural selection.

This means that . . .

1 male moths in polluted areas select the colour of the female whose eggs they fertilise.

2 the darker moths have a better chance of survival in polluted areas and will be more common in the next generation.

3 the moths can select which colour to display in polluted areas to make themselves least visible.

4 the moths choose the colour of the trees that they rest on.

9D Some scientists suggested that the darker moths had migrated (moved) into cities from the countryside.

To find out if this is correct we would need to know the numbers of . . .

1 dark moths that lived in the cities and in the countryside at the start of the Industrial Revolution and later in the nineteenth century.

2 pale and dark moths that lived in the cities at the start of the Industrial Revolution and later in the nineteenth century.

3 pale moths that lived in the countryside at the start of the Industrial Revolution.

4 pale moths that lived in the cities at the start of the Industrial Revolution and later in the nineteenth century.

END OF TEST

4.7.1.3 Biotic factors

Question 09

June 2008 | BLY1H | Original Q1 | Legacy

1 Organisms have adaptations that enable them to survive in extreme conditions.

1 (a) The photograph shows an arctic fox.



This fox lives in the arctic, where it is very cold.

Suggest **two** ways in which the arctic fox is adapted for life in very cold conditions.
Explain how each adaptation helps the arctic fox to survive in very cold conditions.

Adaptation 1 .....

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How this adaptation helps the arctic fox to survive in very cold conditions.

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Adaptation 2 .....

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How this adaptation helps the arctic fox to survive in very cold conditions.

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(4 marks)

4.7.1.3 Biotic factors

Question 09 · continued

for mark

1 (b) The photograph shows an antelope that lives in a sandy desert.



The antelope is prey to large cats such as cheetah.

Suggest **two** adaptations that help this antelope to avoid being killed by predators.
Explain how each adaptation helps the antelope to avoid being killed by predators.

Adaptation 1 .....

.....

How this adaptation helps the antelope to avoid being killed by predators.

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Adaptation 2 .....

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How this adaptation helps the antelope to avoid being killed by predators.

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(4 marks)

8

4.7.1.3 Biotic factors

Question 10

June 2008 | BLY1H | Original Q5 | Legacy

5 The photograph shows a Crossbill.



A Crossbill feeds by using its bill (beak) to force apart the scales on conifer cones. It then uses its tongue to extract the seeds. If the bill is clipped it grows back again.

Scientists were interested in the evolution of the bill of the Crossbill.

In an investigation, they clipped the bills of several Crossbills so that their bills no longer crossed.

They observed that Crossbills with clipped bills took much longer to get seeds.

Use information from the investigation to suggest an explanation for the evolution of the bill in the Crossbill.

In your explanation, use the ideas of *selection, competition* and *mutation*.

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(4 marks)

4

4.7.1.3 Biotic factors

Question 11

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.

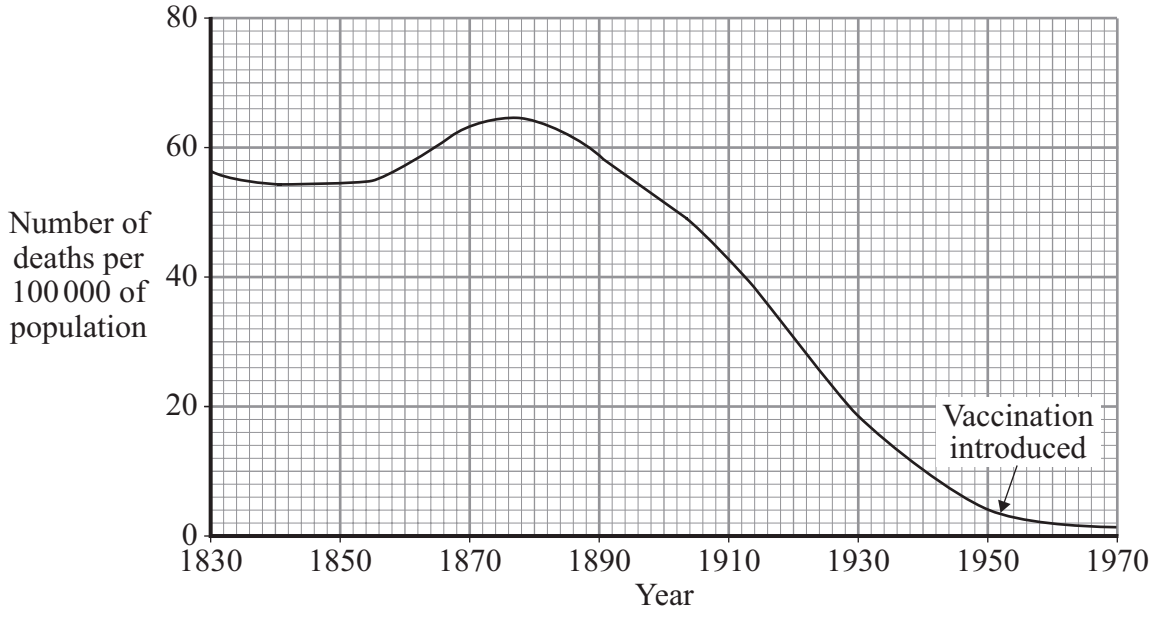
2 caused by smoking.

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 11 · 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

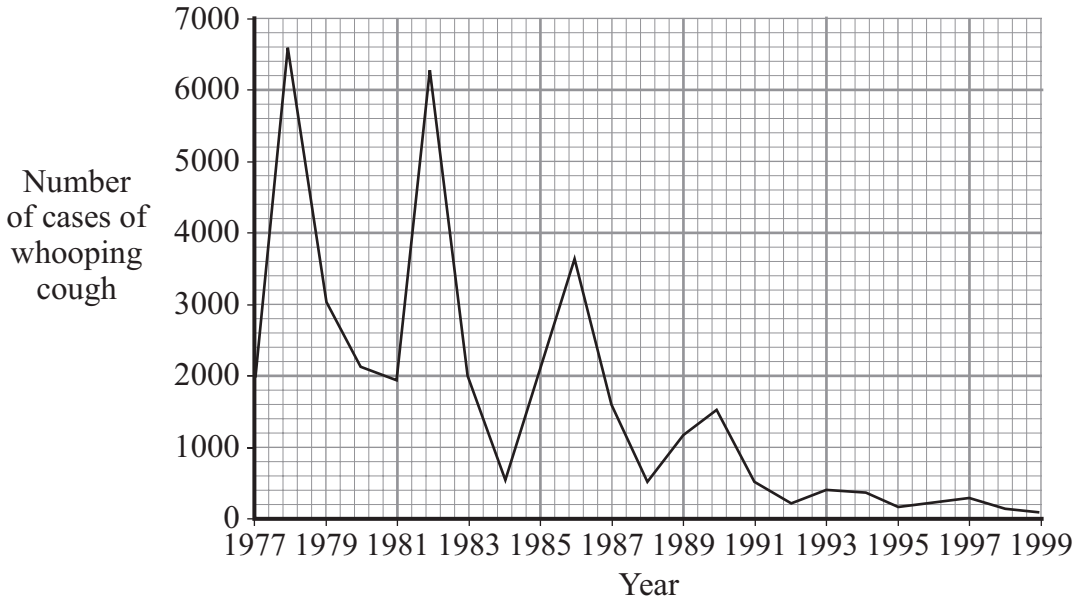
2 antibiotic resistance

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.

4.7.1.3 Biotic factors

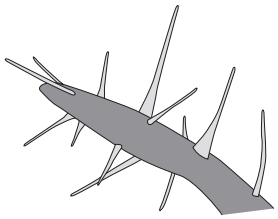
Question 12

November 2008 | BLY1BP | Original Q2 | Legacy

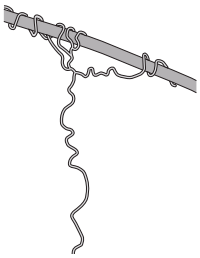
QUESTION TWO

The plants shown in drawings **1–4** are adapted in different ways for survival.

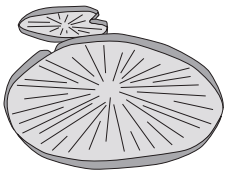
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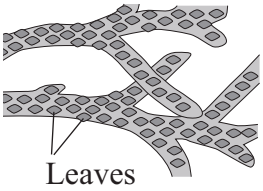
2



3



4



Match statements, **A**, **B**, **C** and **D**, with the drawings **1–4**.

The plant has leaves adapted . . .

A for floating.

B to deter predators.

C for climbing.

D for reducing water loss.

4.7.1.3 Biotic factors

Question 13

March 2009 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

Read the passage about controlling rabbit numbers.

Before 1859 there were no rabbits in Australia. 24 rabbits were released in 1859.

In 1926, it was estimated that there were 1 000 000 000 rabbits.

The rabbit is a native of southern Europe where its population remained relatively constant until the introduction of myxomatosis, a viral disease that kills rabbits.
The disease was introduced into the populations of Australian and European rabbits in the 1950s. It killed 99.8 % of all rabbits. In recent years, the rabbit population has recovered a little. It is believed that up to 10 % of the rabbit population is now genetically resistant to the disease. In a few areas of Australia, rabbits have destroyed all the acacia plants. Many farmers in Australia now use poisons to control rabbit numbers.

8A Which is a likely reason for the more rapid increase in rabbit numbers in Australia compared with Europe?

1 The rabbits evolved more rapidly in Australia.

2 Some rabbits in Australia were resistant to myxomatosis.

3 The rabbits could breed more rapidly in Australia.

4 The rabbits faced little competition in Australia.

8B Resistance to myxomatosis in rabbits was caused initially by changes in their . . .

1 competitors.

2 environment.

3 genes.

4 reproductive systems.

8C The European lynx, a natural predator of the rabbit, is an endangered species.

The evidence in the passage suggests that this could have been caused by . . .

1 the increased percentage of resistant rabbits.

2 the use of poisons.

3 the loss of the acacia plants.

4 the introduction of myxomatosis.

4.7.1.3 Biotic factors

8D Which is the main reason why Australian farmers *now use poisons to control rabbit numbers*?

1 Poisons will selectively kill genetically resistant rabbits.

2 Poisons are cheaper than using myxomatosis.

3 Myxomatosis is not as effective as it once was in killing rabbits.

4 The rabbit is not a native species in Australia.

Turn over for the next question

4.7.1.3 Biotic factors

Question 14

June 2009 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

There are several theories of how new species of plants and animals have developed.

The statements below outline four of these theories.

- Creationism: Each organism is made independently. Evolution does not occur. Gaps in the fossil record support this idea.
- Intelligent Design: Living things work in too complex a way for them to have evolved by chance. A higher being has designed all living things.
- Lamarckism: Changes occur during the lifetime of an individual. These changes can be passed on to offspring.
- Darwinism: Variation exists between members of a population. Only the organisms best suited to a habitat survive. Survivors pass on their advantages to their offspring.

Use the above information and your own knowledge and understanding to answer this question.

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

A Creationism

B Intelligent Design

C Lamarckism

D Darwinism

The idea that Manx cats, which have no tails, are the offspring of a cat which originally lost its tail in an accident could be used to support . . . **1** . . . .

Unsuccessful competitors die and so do not reproduce, is part of the theory of . . . **2** . . . .

The complicated way in which cells work can be used to support . . . **3** . . . .

The observation that fossils of all the different kinds of animals appear suddenly in the rocks, with no evidence of ancestors, supports . . . **4** . . . .

4.7.1.3 Biotic factors

Question 15

June 2009 | BLY1H | Original Q1 | Legacy

1 Swallows and swifts migrate between Britain and South Africa every year.

1 (a) **Photograph 1** shows a swallow.

Photograph 1



Swallows can fly very quickly.

Use information from the photograph to give **one** way in which the swallow is adapted for flying very quickly.

.....

.....

(1 mark)

1 (b) **Photograph 2** shows swifts.

Photograph 2



Swallows and swifts both feed on flying insects.
They both spend the summer in Britain and then migrate to South Africa in the autumn.

Suggest **one** reason why swallows and swifts do not stay in Britain in the winter.

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.....

(1 mark)

4.7.1.3 Biotic factors

Question 15 · continued

for mark

1 (c) The table gives data about swallows and swifts.

	Swallows	Swifts
Arrival date in Britain	April	Early May
Leaving date from Britain	October	Early August
Food	Flying insects	Flying insects
Height at which the birds feed	Near ground level	Up to 350 m above ground level
Times at which birds feed	Mainly when it is light	Almost 24 hours per day

1 (c) (i) There is very little competition between swallows and swifts for food.

Use information from the table to suggest **two** reasons for this.

1 .....

.....

2 .....

.....

(2 marks)

(Extra space) .....

1 (c) (ii) Swallows and swifts do compete for some factors.

Suggest **one** of these factors.

.....

.....

(1 mark)

5

4.7.1.3 Biotic factors

Question 16

March 2010 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

Bristlecone pines are some of the oldest known trees.



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

A The trees' leaves live for about 30 years.

B The trees can grow new bark.

C The trees have needle-shaped leaves.

D The trees grow far apart.

1	The tree trunks can survive being struck by lightning.
2	There is little competition for minerals between the trees.
3	The trees can survive long periods of drought.
4	The trees need few minerals each year for growth.

4.7.1.3 Biotic factors

Question 17

March 2010 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Read the passage about the introduction of invasive species.

Birds are important members of forest communities.

Guam, a Pacific island, lost most of its native birds after a predator, the brown tree snake, was introduced by accident. The snake population density is now quite high – estimated at more than 4000 per square kilometre.

Before the introduction of the brown tree snake, Guam had 12 species of native forest birds. Today, 10 of those are extinct on Guam, and the other two species each have fewer than 200 individuals.

9A The main reason for the rapid increase in the population of brown snakes on Guam was probably that . . .

1 the climate on Guam suited them.

2 there was an abundant supply of tree seeds for food for the snakes.

3 the bird population on Guam had decreased rapidly.

4 there were no predators of brown snakes on Guam.

9B The bird populations on Guam fell rapidly after the introduction of the brown snake.

One possible reason for this was that . . .

1 the number of trees on Guam declined rapidly.

2 the birds on Guam did not recognise the brown snake as a predator.

3 there was competition between the snake and the birds for food.

4 the number of insects on Guam declined rapidly.

Question 17 · continued

A scientist investigated seed dispersal in forests on Pacific islands. She set seed traps beneath and near trees on Guam and on the nearby island of Saipan. Saipan does not have brown tree snakes.

On Saipan, the scientist found seeds in nearly every trap at each location. But on Guam, the seeds appeared only in traps directly under the trees.

Use all the information in this question to answer the following two questions.

9C The scientist's results suggest that . . .

1 seeds on Guam are mainly dispersed by birds.

2 seeds on Guam are mainly dispersed by wind.

3 the distance that seeds on Guam are dispersed depends mainly on their mass.

4 fewer seeds are produced by the trees on Guam than on Saipan.

9D Overall, the most serious long-term effect of the introduction of brown snakes into Guam is likely to be . . .

1 a reduction in the number of birds.

2 a reduction in the number of trees.

3 a reduction in biodiversity.

4 a reduction in sustainable development.

END OF TEST

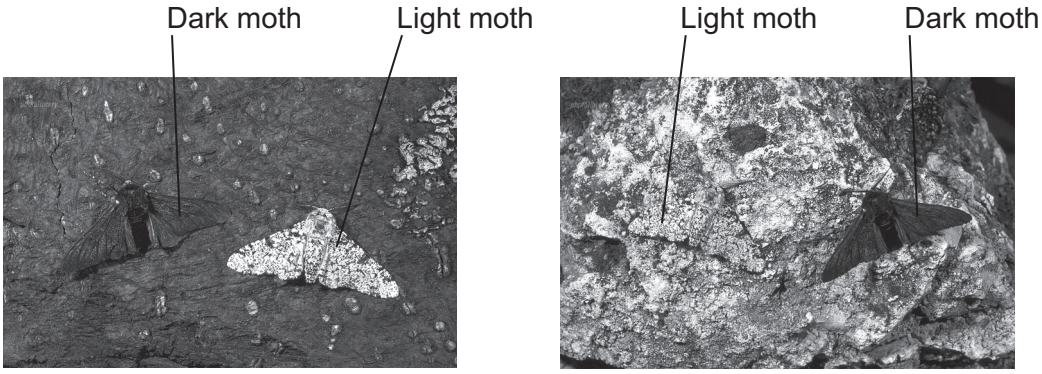
4.7.1.3 Biotic factors

Question 18

March 2011 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

The peppered moth has two colour forms, dark and light. The moths can be camouflaged against a similar coloured background, so a predator is less likely to see the moths.



Dark tree **Light tree**

8A Scientists surveyed the number of light and dark coloured moths in woods in which the trees had either mainly light or mainly dark (polluted) coloured trunks. Their results are shown in **Table 1**.

Table 1

Wood	Percentage of each type of moth found (%)	
	Light moths	Dark moths
Wood with mainly light tree trunks	95	5
Polluted wood with mainly dark tree trunks	10	90

This data provides evidence for . . .

1 artificial selection.

2 extinction.

3 inheritance of acquired characteristics.

4 survival of the fittest.

A scientist investigated the survival rates of the moths that were released in two different types of woodland areas which had trees:

- with the same colour background as the moth colour
- with a different colour background from the moth colour.

The two areas of woodland were enclosed to stop the moths from flying out of them. Birds that are predators of moths were present in both areas.

The moths were released in the morning. The surviving moths were recaptured early the next night, when they normally fly about.

Question 18 · continued

Table 2 shows the results.

Table 2

	Number of moths released	Moths lost or eaten by birds	% decrease in numbers of moths
Area which had trees with same colour background as moth colour	751	128	17.0
Area which had trees with different colour background from moth colour	53	17	32.1

8B The scientist did not use the same number of moths in each area.

Because of this, . . .

1 the results are not valid.

2 the scientist had to calculate the percentage change in moth numbers.

3 the number of predators cannot be calculated.

4 the survival rate for each moth colour cannot be calculated.

8C Which of the following is the best conclusion from the data in **Table 2**?

1 Moths released into a contrasting coloured background were more likely to be eaten by predators.

2 All the non-recaptured moths were eaten by birds.

3 The colour of the moth did not affect the chance of being eaten by predators.

4 More moths were eaten by birds when released in areas with similar background colours.

Bats eat moths and the bats fly at night. The moths are active at night, but not during the day. A scientist released both colours of moths into areas where the bats were flying at night.

Table 3 shows the results.

Table 3

Colour of moths	Number of moths released	Number of moths eaten by bats
Light coloured	164	53
Dark coloured	157	47

8D Using information from **Tables 1**, **2** and **3**, which of the moth predators chose their prey by colour?

1 bats only

2 birds only

3 bats and birds

4 neither bats nor birds

4.7.1.3 Biotic factors

Question 19

June 2012 | BL1HP | Original Q3 | Legacy

3 *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Plants and animals have become adapted in many different ways to reduce the risk of being eaten by predators.

Describe these adaptations.

Give examples of animals and plants adapted in the ways you describe.

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(6 marks)

6

4.7.1.3 Biotic factors

Question 20

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.

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(3 marks)

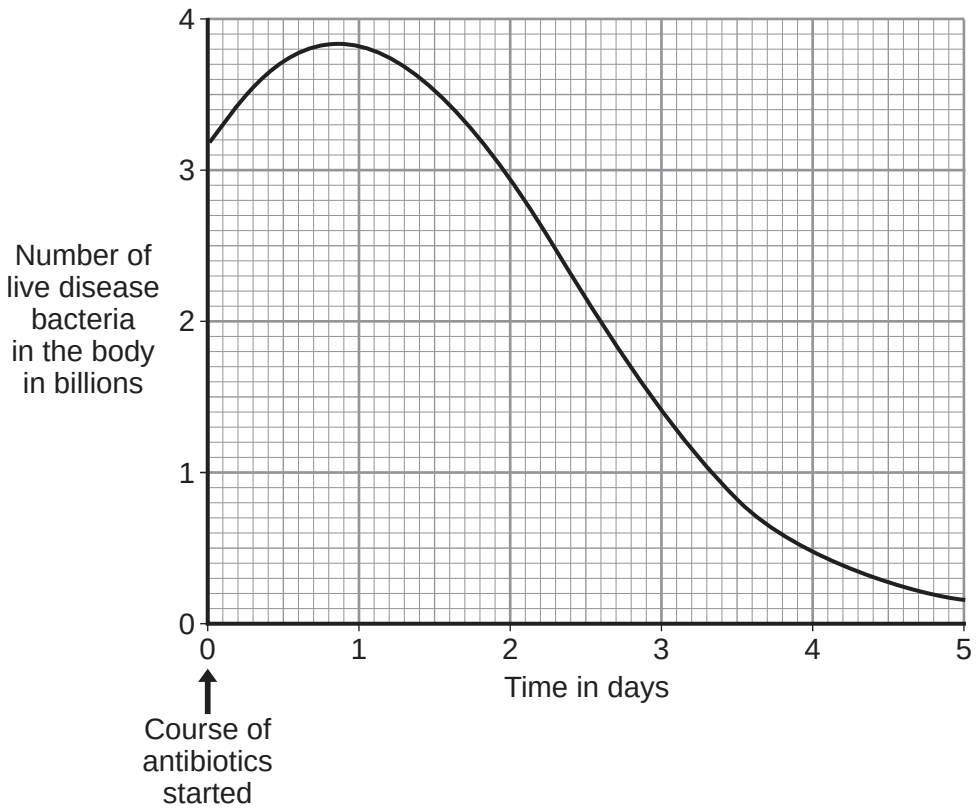
Question 5 continues on the next page

4.7.1.3 Biotic factors

Question 20 · 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.



4.7.1.3 Biotic factors

Question 20 · 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

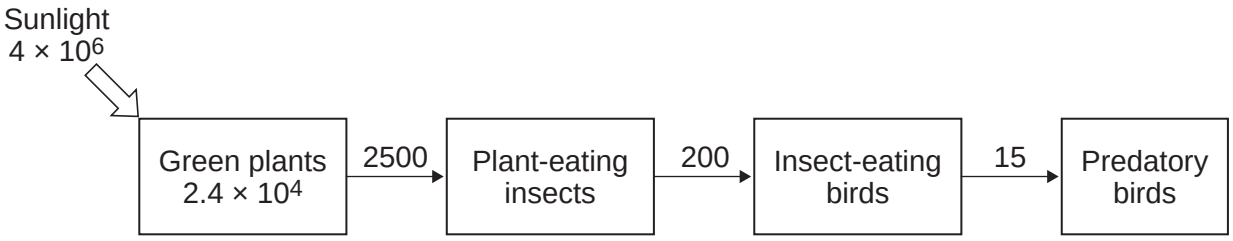
4.7.1.3 Biotic factors

Question 21

June 2012 | BL1HP | Original Q8 | Legacy

8 The diagram shows the annual flow of energy through a habitat.

The figures are in kJ m^{-2}.



8 (a) (i) Calculate the percentage of the energy in sunlight that was transferred into energy in the green plants.

Show clearly how you work out your answer.

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.....

.....

.....

Answer = ... %

(2 marks)

8 (a) (ii) Suggest reasons why the percentage energy transfer you calculated in part **(a)(i)** was so low.

.....

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(2 marks)

4.7.1.3 Biotic factors

Question 21 · continued

8 (b) Compare the amount of energy transferred to the insect-eating birds with the amount transferred to the predatory birds.

Suggest explanations for the difference in the amount of energy transferred to the two types of bird.

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(3 marks)

7

4.7.1.3 Biotic factors

Question 22

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]

.....

4.7.1.3 Biotic factors

Question 22 · continued

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

[1 mark]

.....

.....

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

[3 marks]

.....

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

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

[2 marks]

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.....

.....

.....

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

[1 mark]

.....

.....

11

4.7.1.3 Biotic factors

Question 23

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]

4.7.1.3 Biotic factors

Question 23 · 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

4.7.1.3 Biotic factors

Question 24

November 2021 | 8461/2H | Original Q5

0 5 The growth of daisy plants on a lawn is affected by biotic factors and by abiotic factors.

0 5 . 1 **Table 2** shows six factors.

Tick (✓) **one** box in each row to show whether the factor is biotic or abiotic.

[3 marks]

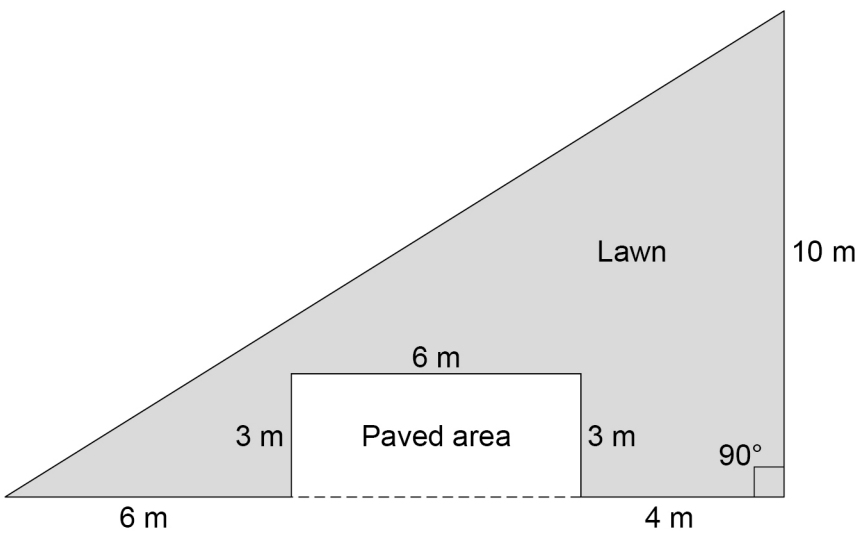
Table 2

Factor	Biotic	Abiotic
Nitrates in the soil		
Rabbits eating the plants		
Shading by a building		
Soil pH		
Temperature		
Trampling by people		

Question 5 continues on the next page

Figure 8 shows a plan of a garden.

Figure 8



A student estimates the number of daisy plants growing on the lawn.

The student places a quadrat at 10 different positions on the lawn.

The quadrat measures 50 cm × 50 cm.

The student counts the number of daisy plants in each quadrat.

0 5 . 2 How should the student decide where to place the quadrat?

Give the reason for your answer.

[2 marks]

4.7.1.3 Biotic factors

Question 24 · continued

0 5 . 3 The mean number of daisy plants in each quadrat is 6.

Calculate the number of daisy plants on the lawn.

Give your answer to 3 significant figures.

[6 marks]

Number of daisy plants on the lawn = _____

0 5 . 4 Using the mean from this investigation to calculate the number of daisy plants on the lawn may **not** be accurate.

Give **two** reasons why.

[2 marks]

1 _____

2 _____

13

4.7.1.3 Biotic factors

Question 25

June 2022 | 8461/2H | Original Q2

0 2 Earthworms:

- live in soil
- feed on dead and decaying plant matter
- have soft, moist skin
- exchange gases through their skin.

0 2 . 1 Give **two** abiotic factors and **two** biotic factors that could affect the size of an earthworm population.

[4 marks]

Abiotic factors

1 _____

_____

2 _____

_____

Biotic factors

1 _____

_____

2 _____

_____

4.7.1.3 Biotic factors

Question 25 · continued

0 2 . 2 Students investigated the populations of earthworms in the soil in two different areas:

- Area **A**: a grass lawn
- Area **B**: a farmer's field.

Chemical **X** can be mixed with water and poured onto the soil.

The mixture brings earthworms to the surface of the soil but does **not** harm the earthworms.

Plan an investigation using chemical **X** to compare the number of earthworms per m^2 in areas **A** and **B**.

[6 marks]

10

4.7.1.3 Biotic factors

Question 26

June 2023 | 8461/1H | Original Q4

0 4 This question is about exercise.

0 4 . 1 During vigorous exercise, anaerobic respiration occurs in a person's body.

Explain **two** effects of anaerobic respiration on the person's body.

[4 marks]

1 _____

2 _____

4.7.1.3 Biotic factors

Question 26 · continued

0 4 . 2 Design an investigation to show the effect of different types of exercise on the heart rate of athletes.

[6 marks]

Question 4 continues on the next page

Question 26 · continued

Anabolic steroids are drugs.

Anabolic steroids:

- increase muscle mass in humans
- are banned in most competitive sports.

Some athletes take anabolic steroids to improve their performance in sport.

0 4 . 3 Explain how taking anabolic steroids could improve an athlete's performance.

[2 marks]

Scientists use monoclonal antibodies to test for the presence of anabolic steroids in an athlete's urine.

To produce monoclonal antibodies, a mouse lymphocyte is combined with a tumour cell.

0 4 . 4 What type of cell is created when a mouse lymphocyte and a tumour cell combine?

[1 mark]

Tick (✓) **one** box.

- Embryo ☐
- Hybridoma ☐
- Phagocyte ☐
- Stem cell ☐

4.7.1.3 Biotic factors

Question 26 · continued

0 4 . 5 Describe how scientists make monoclonal antibodies using the cell created when a mouse lymphocyte and a tumour cell combine.

[3 marks]

0 4 . 6 What property makes a monoclonal antibody useful in detecting the presence of an anabolic steroid in urine?

[1 mark]

Tick (✓) **one** box.

A monoclonal antibody is quick and easy to produce. ☐

A monoclonal antibody is specific to only one person's urine. ☐

A monoclonal antibody only binds to the anabolic steroid. ☐

A monoclonal antibody can identify many different drugs at the same time. ☐

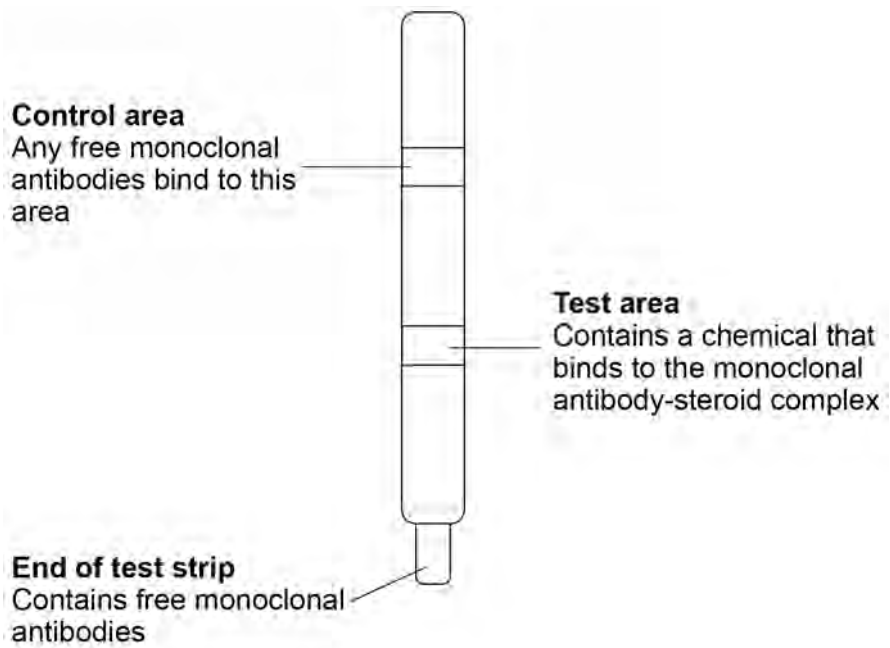
Question 4 continues on the next page

4.7.1.3 Biotic factors

Question 26 · continued

Figure 5 shows a test strip that can detect the presence of an anabolic steroid in an athlete's urine.

Figure 5



The end of the test strip is dipped in urine.

The urine moves up through the test strip.

The test area and the control area contain a dye.
The dye turns blue when monoclonal antibodies bind to it.

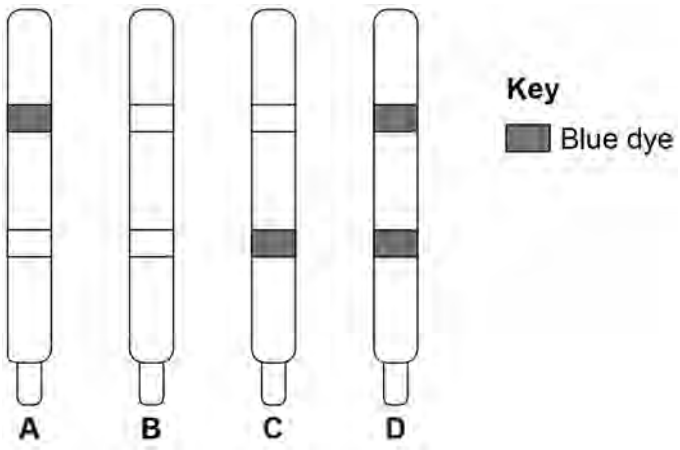
0 4 . 7 Suggest the purpose of the control area in the test strip.

[1 mark]

Question 26 · continued

Figure 6 shows the urine test results of four athletes.

Figure 6



0 4 . 8 Describe the evidence in **Figure 6** that shows the test for athlete **B** has **not** worked.

Suggest **one** reason why the test did **not** work.

[2 marks]

Evidence _____

_____

Reason _____

_____

0 4 . 9 Which athlete has tested positive for anabolic steroids in their urine?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

21

4.7.1.3 Biotic factors

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.

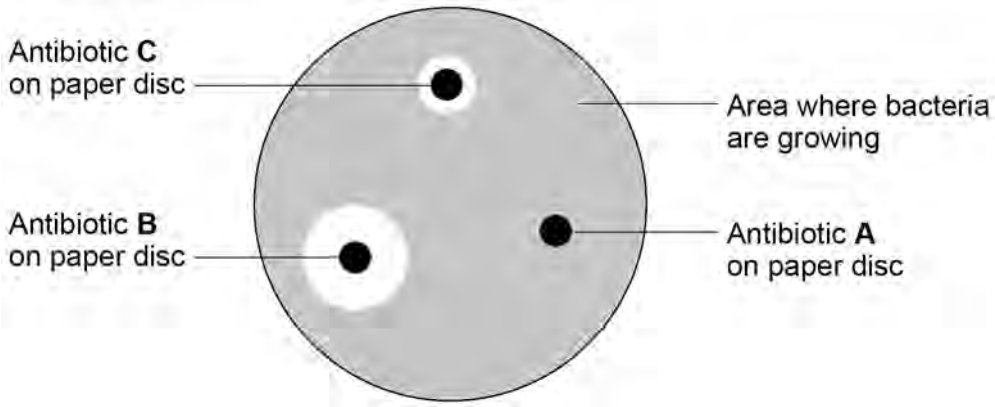
[1 mark]

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



4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

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

4.7.1.3 Biotic factors

Question 28

June 2024 | 8461/2H | Original Q1

0 1 Evolution of new species occurs by mutation and natural selection.

0 1 . 1 What is a mutation?

[1 mark]

0 1 . 2 Describe the process of natural selection.

[3 marks]

0 1 . 3 Which scientists suggested the theory of evolution by natural selection?

[1 mark]

Tick (✓) **one** box.

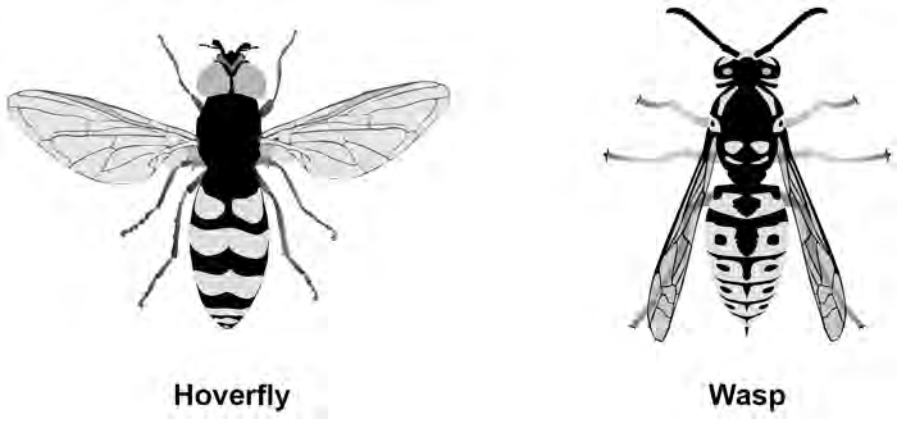
- Alexander Fleming and Carl Woese ☐
- Alfred Wallace and Alexander Fleming ☐
- Alfred Wallace and Charles Darwin ☐
- Charles Darwin and Carl Woese ☐

Question 28 · continued

0 1 . 4 The hoverfly and the wasp are insects with bright yellow and black markings.

Figure 1 shows a hoverfly and a wasp.

Figure 1



The wasp has a sting to defend itself against predators.

The hoverfly does **not** have a sting.

Hoverflies and wasps live in the same habitat.

Explain how having yellow and black markings helps the **hoverfly** survive.

[3 marks]

8

4.7.1.3 Biotic factors

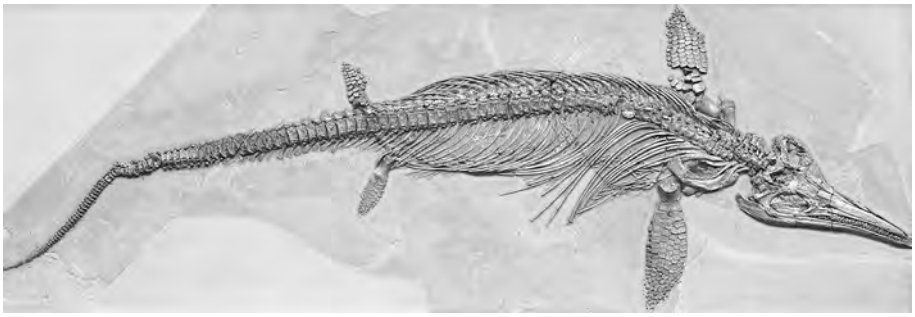
Question 29

June 2025 | 8461/2H | Original Q1

0 1 Ichthyosaurs are reptiles that lived in the sea millions of years ago.

Figure 1 shows the fossilised remains of an ichthyosaur.

Figure 1



0 1 . 1 Suggest how the fossil in **Figure 1** was formed after the ichthyosaur died.

[2 marks]

0 1 . 2 The length of the image of the ichthyosaur in **Figure 1** is 120 mm.

The real length of the ichthyosaur was 17 times longer than the image in **Figure 1**.

Calculate the real length of the ichthyosaur.

Give your answer in metres.

[3 marks]

Real length of ichthyosaur = _____ metres

4.7.1.3 Biotic factors

Question 29 · continued

0 1 . 3 **Table 1** gives the classification of the ichthyosaur in **Figure 1**.

Table 1

Classification group	Name
Kingdom	Animalia
	Chordata
Class	Reptilia
Order	Ichthyosauria
	Ichthyosauridae
Genus	Ichthyosaurus
Species	intermedius

Complete **Table 1**.

[2 marks]

Choose answers from the box.

Community	Family	Mammal	Phylum	Population

0 1 . 4 Ichthyosaurs were predators.

Ichthyosaurs are now extinct.

Scientists think that extinction of the ichthyosaurs was caused by increased competition with other predators for food.

Suggest **two other** possible causes of extinction of the ichthyosaurs.

[2 marks]

1 _____

_____

2 _____

_____

9