AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.1.3

Biotic factors

Past-paper questions

Tier	**Foundation**
Question groups	**36**
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

January 2007 | BLY1F | Original Q4 | Legacy

4 (a) Use words from the box to complete the sentences about curing disease.

antibiotics	**antibodies**	**antitoxins**	**painkillers**	**statins**

The substances made by white blood cells to kill pathogens are called ..... .

The substances made by white blood cells to counteract poisons produced by pathogens are called ..... .

Medicines which kill bacteria are called ..... .

(3 marks)

(b) The MMR vaccine protects people against three diseases.

Write down the names of **two** of these diseases.

1 .....

2 .....

(2 marks)

(c) All vaccinations involve some risk.

The table shows the risk of developing harmful effects:

- from the disease if a child is **not** given the MMR vaccine;
- if a child **is** given the MMR vaccine.

Harmful effect	**Risk of getting the harmful effect from the disease (if not vaccinated)**	**Risk of getting the harmful effect from MMR vaccine**
Convulsions	1 in 200	1 in 1000
Meningitis	1 in 3000	Less than 1 in 1 000 000
Brain damage	1 in 8000	0

4.7.1.3 Biotic factors

Question 01 · continued

BLANK

A mother is considering if she should have her child vaccinated with the MMR vaccine.

Use information from the table to persuade the mother that she should have her child vaccinated.

.....

.....

.....

.....

(2 marks)

(d) The vaccine used to protect us from the Hepatitis B virus is produced by genetic engineering.

Yeast cells are used to produce the vaccine.

Use words from the box to complete the sentence.

chromosomes	**drugs**	**enzymes**	**genes**	**hormones**

To produce the vaccine ..... are used to cut out .....

from the Hepatitis B virus which are then inserted into the yeast cells.

(2 marks)

9

4.7.1.3 Biotic factors

Question 02

March 2007 | BLY1A | Original Q6 | Legacy

QUESTION SIX

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 03

January 2008 | BLY1F | Original Q6 | Legacy

6 Polio is a disease caused by a virus. In the UK, children are given polio vaccine to protect them against the disease.

(a) In the sentences below, draw a ring around the correct words in each box.

(i) It is difficult to kill the polio virus inside the body

because the virus

is not affected by drugs
lives inside cells
produces antitoxins

.

(1 mark)

(ii) The vaccine contains an

active
infective
inactive

form of the polio virus.

(1 mark)

(iii) The vaccine stimulates the white blood cells to

produce

antibiotics
antibodies
drugs

which destroy the virus.

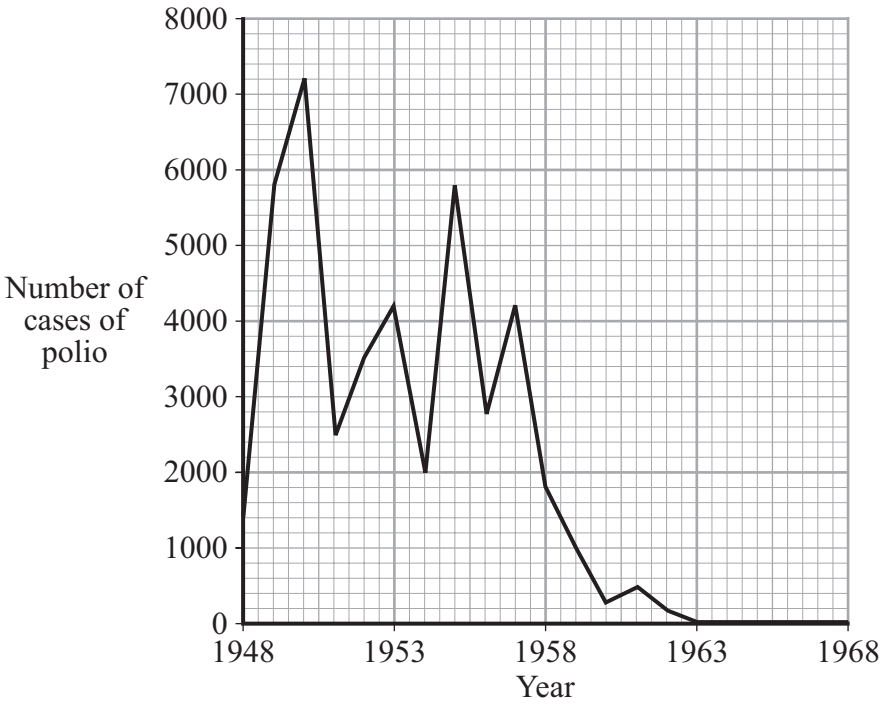
(1 mark)

4.7.1.3 Biotic factors

Question 03 · continued

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(b) The graph shows the number of cases of polio in the UK between 1948 and 1968.



(i) In which year was the number of cases of polio highest?

.....

(1 mark)

(ii) Polio vaccination was first used in the UK in 1955.

How many years did it take for the number of cases of polio to fall to zero?

.....

(1 mark)

(iii) There have been no cases of polio in the UK for many years. But children are still vaccinated against the disease.

Suggest **one** reason for this.

.....

.....

(1 mark)

6

4.7.1.3 Biotic factors

Question 04

March 2008 | BLY1AP | Original Q2 | Legacy

QUESTION TWO

This question is about drugs.

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

A cannabis

B painkiller

C antibiotic

D statin

	Information
1	kills bacteria in the body
2	may lead to addiction to hard drugs
3	lowers the level of cholesterol in the blood
4	relieves some of the symptoms of the disease

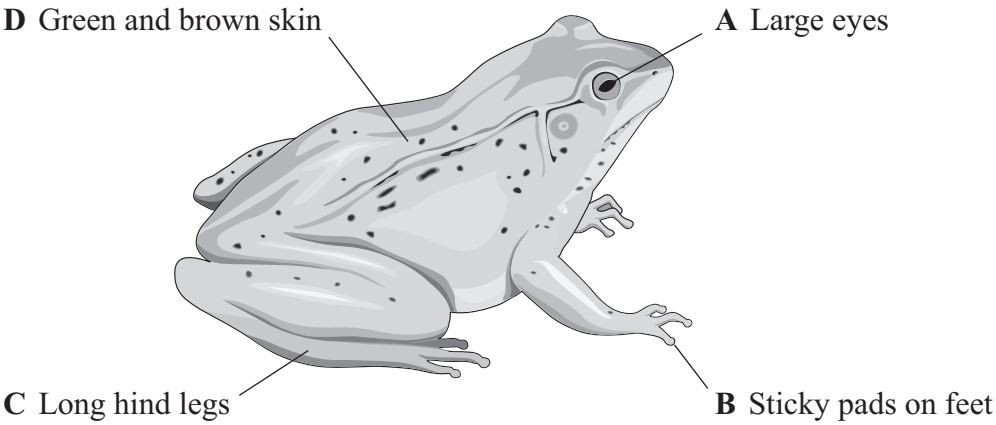
4.7.1.3 Biotic factors

Question 05

March 2008 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

The drawing shows a frog.



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

	Feature
1	helps the frog to locate prey in dim light
2	helps the frog to hide from predators
3	helps the frog to jump high
4	helps the frog to hold onto surfaces

4.7.1.3 Biotic factors

Question 06

June 2008 | BLY1AP | Original Q6 | Legacy

QUESTION SIX

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 07

June 2008 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

This question is about evolution.

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

A extinction

B natural selection

C mutation

D variation

1	a theory put forward by Darwin
2	differences shown by individuals in the same species
3	a change in a gene
4	may be caused by new predators

4.7.1.3 Biotic factors

Question 08

November 2008 | BLY1BP | Original Q6 | Legacy

QUESTION SIX

Students investigated competition between cress seedlings.

- Five dishes of different widths were filled with soil to the same depth.
- Six cress seeds were planted, evenly spread out, in each dish.
- The dishes were kept in the same place in a laboratory and the seedlings were watered with the same amount of nutrient solution each day.

The height of each cress seedling was measured after ten days. The results are shown in the table.

Width of dish in cm	Height of cress seedlings in cm						Mean height of cress seedlings in cm
5	7.8	7.3	7.6	7.2	8.0	7.7	7.6
10	7.0	7.0	7.1	6.9	6.9	7.1	7.0
15	6.5	6.7	6.9	6.7	6.6	6.7	6.7
20	6.6	6.3	6.6	6.4	6.5	6.4	6.4
25	6.1	5.9	6.0	6.3	6.1	6.2	6.1

6A Why was the same number of cress seeds planted in each dish?

1 so that the results would be accurate

2 in order to calculate a mean

3 to make the experiment a fair test

4 so that the seeds would not be overcrowded

4.7.1.3 Biotic factors

Question 08 · continued

6B In which dish was there the greatest range of seedling heights?

1 5 cm dish

2 10 cm dish

3 15 cm dish

4 20 cm dish

6C Which pattern is supported by the data in the table?

1 The wider the dish, the taller the cress plants.

2 The narrower the dish, the greater the mass of the cress plants.

3 The narrower the dish, the shorter the cress plants.

4 The narrower the dish, the taller the cress plants.

6D The main reason for the differences in the mean heights of the seedlings was competition for . . .

1 light.

2 nutrients.

3 space.

4 water.

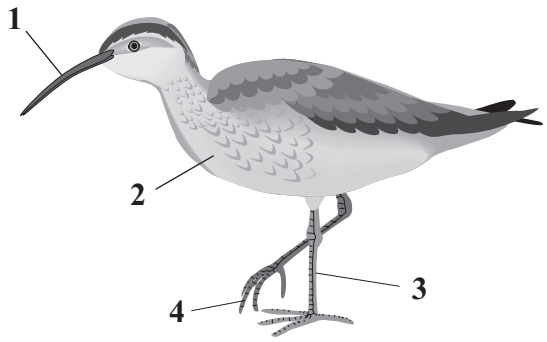
4.7.1.3 Biotic factors

Question 09

June 2009 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

The picture shows a bird which lives on sandy beaches. It feeds on animals that burrow into the sand.



Match adaptations, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram.

A wide, to stop the bird from sinking into the sand

B long, to reach animals buried deep in the sand

C long, to help the bird to see predators approaching

D thick, to provide an insulating layer

4.7.1.3 Biotic factors

Question 10

June 2009 | BLY1F | Original Q4 | Legacy

4 Some organisms are in danger of extinction.
The photograph shows an African elephant feeding on tree leaves.



4 (a) Read the information about elephants and humans in Africa.

- The African elephant is the largest land animal.
- The African elephant feeds on lots of leaves.
- Adult African elephants have no natural predators.
- Elephants are killed by poachers for their ivory tusks.
- African elephants live for about 70 years.
- Most African elephants live in large herds.
- Land available to elephants is disappearing rapidly.

The African elephant is now extinct in many parts of Africa.

Use information from the list to give **three** reasons why.

1.....

.....

2.....

.....

3.....

.....

(3 marks)

4.7.1.3 Biotic factors

Question 10 · continued

for mark

4 (b) Organisms that are in danger of extinction can be cloned.

List A gives the names of three different cloning techniques.

List B gives information about these techniques.

Draw a line from each technique in **List A** to the correct information about it in **List B**.

List A **Technique**	**List B** **Information**
	Small groups of cells from parts of a plant are grown on a special jelly.
Adult cell cloning	
	Cells from a developing animal are separated before they become specialised and then placed into host mothers.
Embryo transplanting	
	Genes are cut out from chromosomes and inserted into other organisms.
Tissue culture	
	A nucleus is removed from an unfertilised egg cell. The nucleus from a body cell is inserted into the egg cell. An electric shock causes the egg to start to divide.

(3 marks)

6

4.7.1.3 Biotic factors

Question 11

June 2009 | BLY1F | Original Q6 | Legacy

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

6 (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)

6 (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.

.....

.....

(1 mark)

4.7.1.3 Biotic factors

Question 11 · continued

for mark

6 (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 350m above ground level
Times at which birds feed	Mainly when it is light	Almost 24 hours per day

6 (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) .....

6 (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 12

January 2019 | BLY3F | Original Q5 | Legacy

5 (a) (i) Which **two** antibiotics from **A**, **B**, **C**, **D**, **E** and **F**, did **not** kill this species of bacterium?

☐ and ☐

(1 mark)

5 (a) (ii) Which would be the best antibiotic, **A**, **B**, **C**, **D**, **E** or **F**, to treat an infection caused by this species of bacterium? ☐

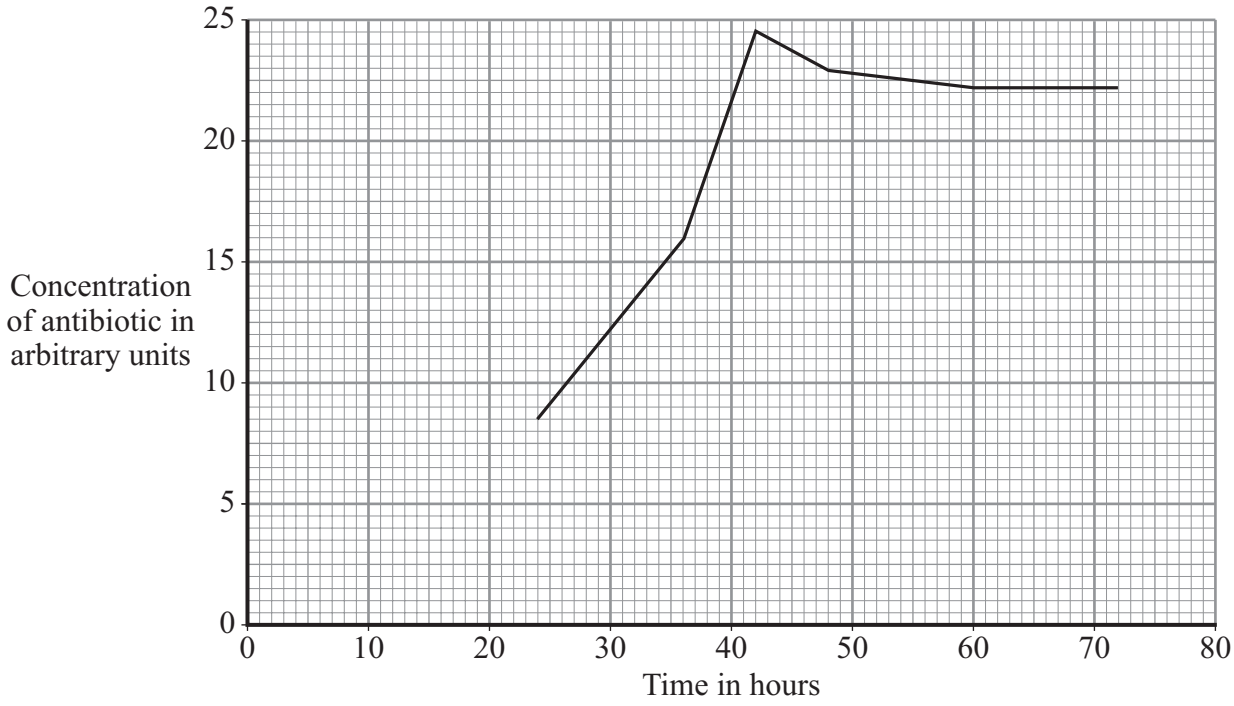
(1 mark)

Question 12 · continued

for mark

5 (b) The scientists measured the production of an antibiotic by a mould.

The graph shows their results.



5 (b) (i) Describe what happened to the concentration of antibiotic between 24 and 72 hours.

.....

.....

.....

.....

(2 marks)

5 (b) (ii) The scientists decided to grow the mould for 42 hours in future.

Why did they choose this time?

.....

.....

(1 mark)

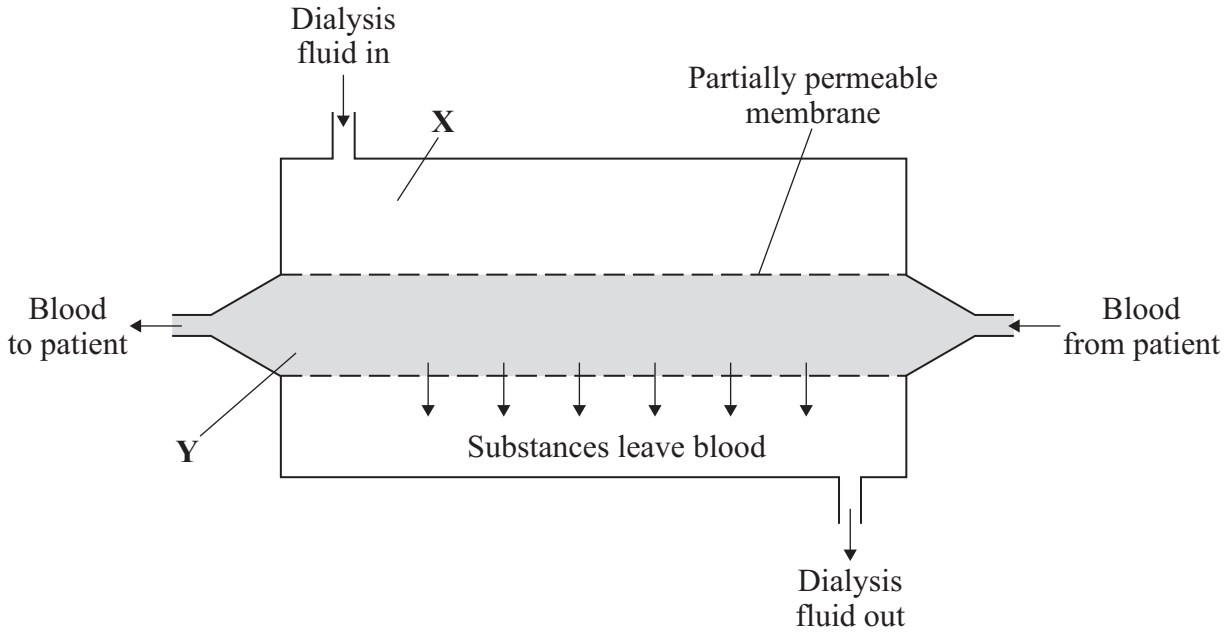
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4.7.1.3 Biotic factors

Question 12 · continued

for mark

6 People with kidney disease may be treated by dialysis.
The diagram shows a dialysis machine.



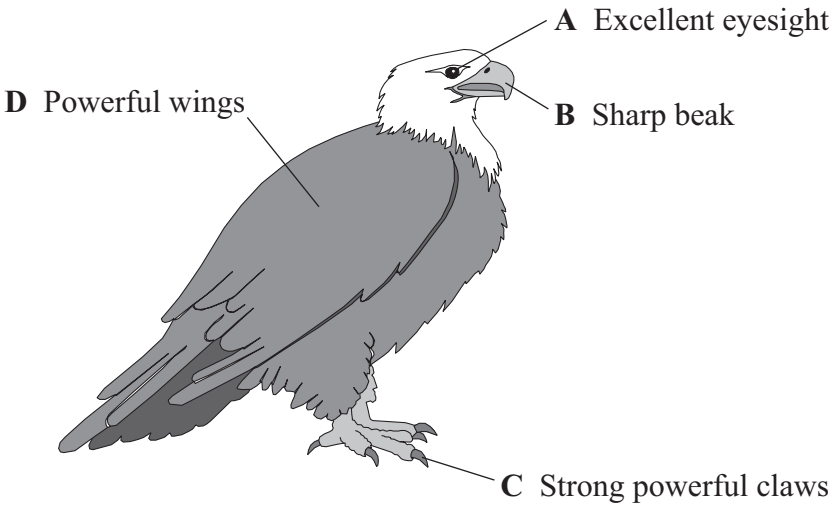
4.7.1.3 Biotic factors

Question 13

March 2010 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

The eagle is a predator that swoops on other animals on which it feeds.



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

	Function
1	enable the bird to swoop down on prey
2	keep a firm grip on prey to carry it to its nest
3	used to spot prey from a great distance
4	used to peck prey into small pieces

4.7.1.3 Biotic factors

Question 14

June 2010 | BLY1F | Original Q7 | Legacy

7 The photograph shows an *Anolis* lizard. This lizard lives on a tiny island.



Scientists investigated how the leg length of the *Anolis* lizards affected their survival. At the start of the investigation the *Anolis* lizards had a large range of leg lengths.

- The scientists placed six *Curly-tailed* lizards onto the island.
- The *Curly-tail* lizard is a predator of the *Anolis* lizard.
- After one year the population of *Anolis* lizards had halved.
- Nearly all the remaining *Anolis* lizards had long legs.

7 (a) Why did the population of *Anolis* lizards halve?

.....

.....

(1 mark)

7 (b) The remaining *Anolis* lizards had long legs.

Suggest an explanation for this.

.....

.....

.....

.....

.....

(2 marks)

4.7.1.3 Biotic factors

Question 14 · continued

7 (c) Answer each of these questions by placing a tick (✓) in the correct box.

7 (c) (i) Which theory is supported by evidence from this investigation?

Global warming	☐
Natural selection	☐
Sustainability	☐

(1 mark)

7 (c) (ii) Which scientist proposed this theory?

Darwin	☐
Lamarck	☐
Semmelweiss	☐

(1 mark)

5

4.7.1.3 Biotic factors

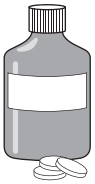
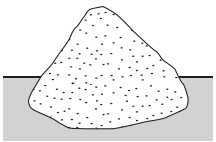
Question 15

3 Drugs affect our bodies.

3 (a) **List A** gives the names of four different substances.

List B gives information about different substances.

Draw **one** line from each substance in **List A** to the correct information about the substance in **List B**.

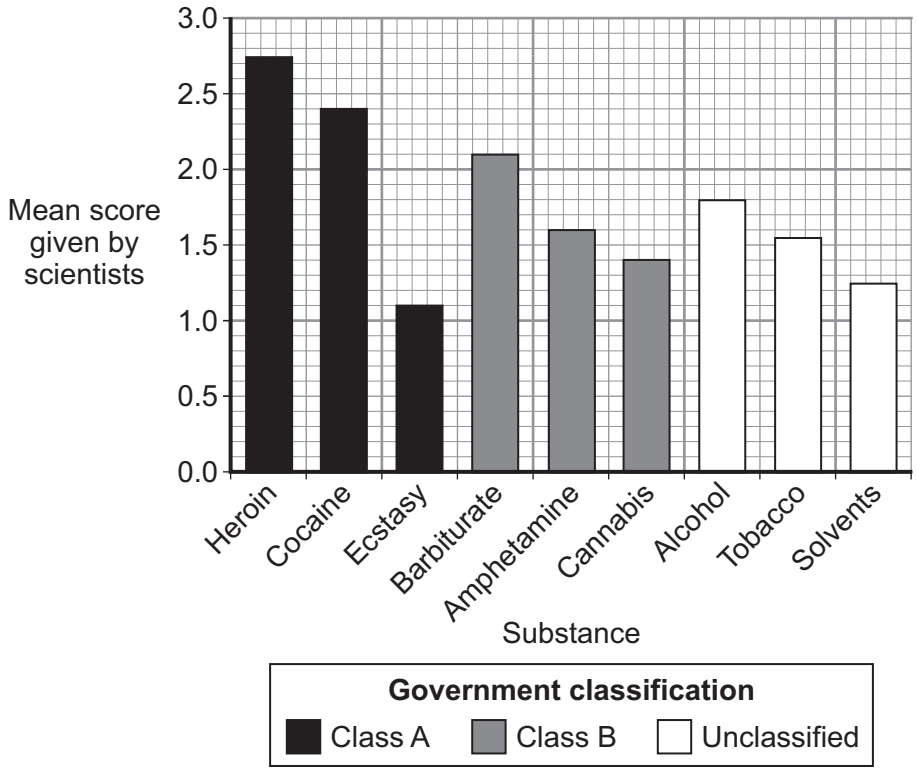
List A Substance	**List B Information**
Alcohol 	Used to treat bacterial diseases
Antibiotic 	A very addictive drug
Heroin 	May cause lung cancer
Cigarette smoke 	May cause babies to be born with abnormal limbs
	May cause liver disease

(4 marks)

4.7.1.3 Biotic factors

Question 15 · continued

3 (b) A group of scientists was asked to say how much harm recreational drugs cause.
The scientists used a scale of 1–3, with 3 being the most harmful.
Their results are shown on the graph.
The government classifies drugs into three groups.
The groups are shown in the key below the graph.



3 (b) (i) Name the drug which **scientists** think is least harmful.

.....

(1 mark)

3 (b) (ii) In the government classification, class A drugs are the most harmful and unclassified drugs are the least harmful.

Does the government classification agree with the scientists' classification for **all** the drugs?

Draw a ring around your answer. **Yes / No**

Give **one** piece of evidence from the graph to support your answer.

.....

.....

(1 mark)

Question 3 continues on the next page

4.7.1.3 Biotic factors

Question 15 · continued

3 (c) Draw a ring around the correct answer to complete the sentence.

People use recreational drugs

- to cure disease.
- to prevent diseases.
- for pleasure.

(1 mark)

7

4.7.1.3 Biotic factors

Question 16

March 2011 | BLY1AP | Original Q7 | Legacy

QUESTION SEVEN

Read this account of a students investigation.

I first tested three drinks, **X**, **Y** and **water**, on two friends, Pete and Raj, to find out which drink was best to use when jogging.

- I tested their reactions using a reaction timer.
- They jogged for 30 minutes, during which they drank 1 dm^3 of drink **X**.
- I then tested their reactions again in the same way.

After they had rested, they did the complete test again:

- with drink **Y**
- then with **water**
- then with **no drink**.

7A How could the student have improved his investigation?

1 by getting the two friends to jog for 1 hour

2 by testing ten friends

3 by using five different drinks

4 by asking the two friends to drink 2 dm^3 of each drink

The student's results are shown in the table.

	Reaction time in seconds				
	Before jogging	**Drink X**	**Drink Y**	**Water**	**No drink**
Pete	1.2	1.3	0.9	1.3	1.6
Raj	1.4	1.5	1.1	1.4	1.7

7B For drink **X**, what is the difference between the reaction times before jogging and after jogging?

1 0.1 seconds

2 0.2 seconds

3 0.3 seconds

4 0.4 seconds

4.7.1.3 Biotic factors

Question 16 · continued

7C Using these results, which is the best advice for people running in a competitive race?

1 do not drink at all

2 use drink **X**

3 use drink **Y**

4 drink only **water**

7D Sports drinks should contain ions to replace those lost mainly by . . .

1 breathing.

2 eating.

3 sweating.

4 urinating.

Turn over for the next question

4.7.1.3 Biotic factors

Question 17

March 2011 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

The picture shows a kiwi.



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

A long beak

B wide-spread toes

C short wings

D brown feathers

1	stops the kiwi from sinking into soft ground
2	reduces the chance of predators seeing the kiwi
3	helps the kiwi to collect insects from underground
4	makes the kiwi easy for predators to catch

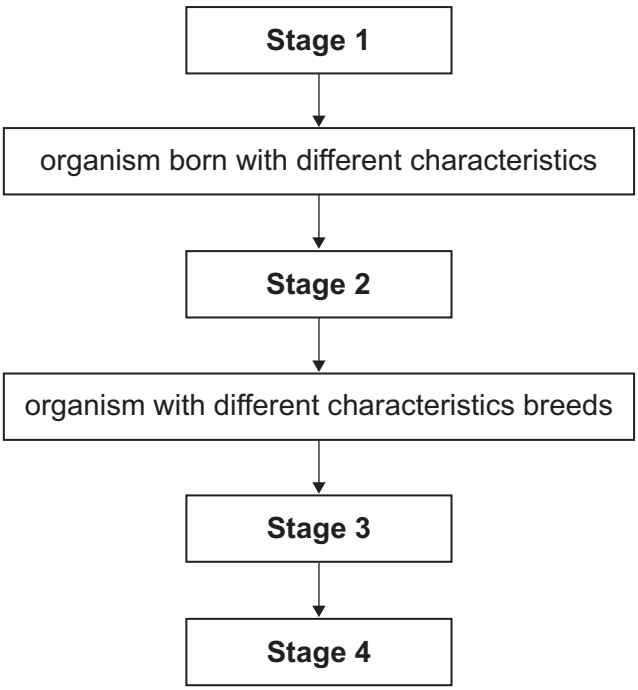
4.7.1.3 Biotic factors

Question 18

March 2011 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

The diagram shows a flow chart for evolution.



Match stages of evolution, **A**, **B**, **C** and **D**, with the stages **1**–**4** in the flow chart.

A the organism is now a better competitor

B the mutated gene is passed on to offspring

C a gene mutates

D a new species is produced

4.7.1.3 Biotic factors

Question 19

November 2011 | BLY1AP | Original Q2 | Legacy

QUESTION TWO

Infectious diseases make us feel ill.

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

A antibodies

B antibiotics

C toxins

D painkillers

Bacteria make us feel ill because bacteria produce . . . **1** . . . .

To kill bacteria, a doctor might give a patient . . . **2** . . . .

To kill bacteria, our white blood cells produce . . . **3** . . . .

To relieve disease symptoms quickly, a doctor might give a patient . . . **4** . . . .

Turn over for the next question

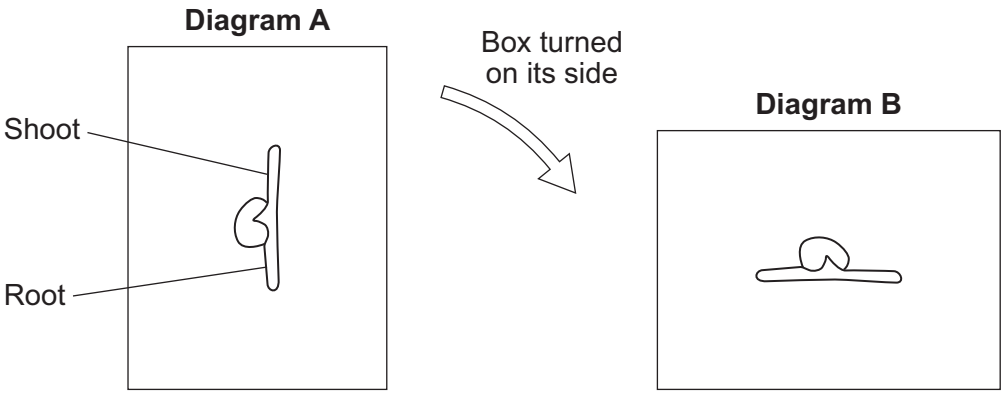
4.7.1.3 Biotic factors

Question 20

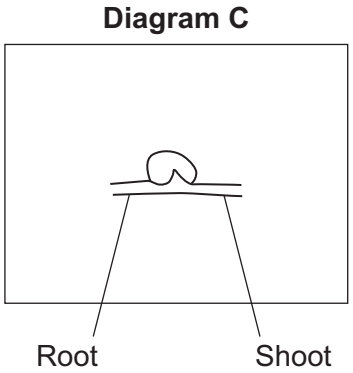
January 2012 | BL1FP | Original Q2 | Legacy

2 A student investigated growth responses in plants.

The student grew a bean seed in a box filled with moist soil, as shown in **Diagram A**. After the seed had started to grow, the box was turned onto its side and placed in a dark room, as shown in **Diagram B**.



2 (a) Complete **Diagram C** to show what the root and shoot will look like three days later.



(2 marks)

2 (b) Draw a ring around the correct answer to complete the sentence.

The results of the investigation show that the root is sensitive to

light.
moisture.
gravity.

(1 mark)

4.7.1.3 Biotic factors

Question 20 · continued January 2012 | BL1FP | Original Q2 | Legacy

2 (c) A hormone in the plant causes the growth responses.

What is the name of this hormone?

Tick (✓) **one** box.

Auxin ☐

Statin ☐

Steroid ☐

(1 mark)

2 (d) Gardeners can use some plant hormones as weed killers.

2 (d) (i) Give **one different** use of plant hormones by gardeners.

.....

.....

(1 mark)

2 (d) (ii) Selective weed killers only kill some plants in a garden.

Killing weeds in a garden reduces competition between plants.

Give **three** factors that plants compete for.

1 .....

2 .....

3 .....

(3 marks)

8

4.7.1.3 Biotic factors

Question 21

June 2012 | BL1FP | Original Q8 | Legacy

8 *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)

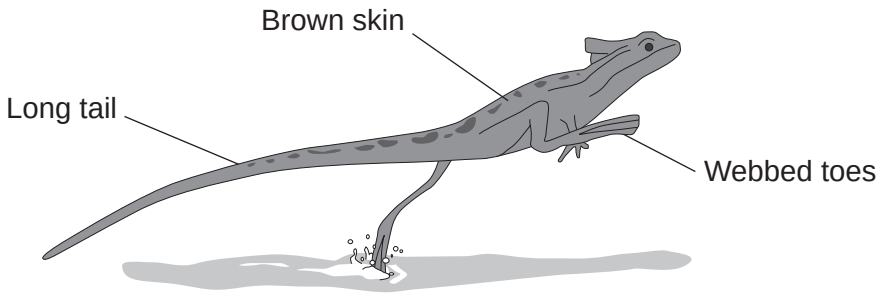
6

4.7.1.3 Biotic factors

Question 22

January 2013 | BL1FP | Original Q1 | Legacy

1 The picture shows a basilisk lizard. Some of the adaptations of the lizard are labelled.



Basilisk lizards are often found resting on branches of trees that grow next to water. Basilisk lizards can run across the surface of the water.

1 (a) Draw **one** line from each adaptation of the lizard to the advantage of the adaptation.

Adaptation	Advantage
Toes on the back feet are webbed	For camouflage on branches of trees
Long tail	Helps the lizard to balance when running
Brown skin	Warning colours to deter predators
	Increases surface area in contact with the water

(3 marks)

4.7.1.3 Biotic factors

Question 22 · continued

1 (b) Suggest **one** advantage to the basilisk lizard of being able to run across the surface of the water.

.....

.....

(1 mark)

1 (c) Animals, such as lizards, compete with each other.

Give **two** factors that animals compete for.

Tick (✓) **two** boxes.

Oxygen ☐

Food ☐

Territory ☐

Light ☐

(2 marks)

6

4.7.1.3 Biotic factors

Question 23

January 2013 | BL1FP | Original Q3 | Legacy

3 Viruses and bacteria cause diseases in humans.

3 (a) Draw a ring around the correct word to complete the sentence.

Organisms that cause disease are called

algae.

pathogens.

vaccines.

(1 mark)

3 (b) In August 2011 the United Nations gave a warning that there was a new strain of the bird flu virus in China.

Bird flu may kill humans. The new strain of the bird flu virus could cause a *pandemic* very quickly.

3 (b) (i) What is a *pandemic*?

Tick (✓) **one** box.

A disease affecting the people all over one country. ☐

A disease affecting hundreds of people. ☐

A disease affecting people in many countries. ☐

(1 mark)

3 (b) (ii) The swine flu virus is carried by pigs.

The bird flu virus is likely to spread much more quickly than the swine flu virus.

Suggest **one** reason why.

.....

.....

(1 mark)

4.7.1.3 Biotic factors

Question 23 · continued

3 (c) This notice is from a doctor's surgery.

Unfortunately, antibiotics will NOT get rid of your flu.

3 (c) (i) Why will antibiotics **not** get rid of flu?

.....

.....

(1 mark)

3 (c) (ii) The symptoms of flu include a sore throat and aching muscles.

What would a doctor give to a patient to relieve the symptoms of flu?

.....

(1 mark)

3 (c) (iii) It is important that antibiotics are **not** overused.

Explain why.

Use words from the box to complete the sentence.

antibody	**bacteria**	**immune**	**resistant**	**viruses**

Overuse of antibiotics might speed up the development

of ..... strains of ..... .

(2 marks)

7

4.7.1.3 Biotic factors

Question 24

June 2013 | BL1FP | Original Q2 | Legacy

2 Many organisms are adapted to avoid being eaten.

2 (a) The photograph shows a gecko on a leafy branch.



The gecko is adapted to avoid being eaten by predators.

Explain how.

.....

.....

.....

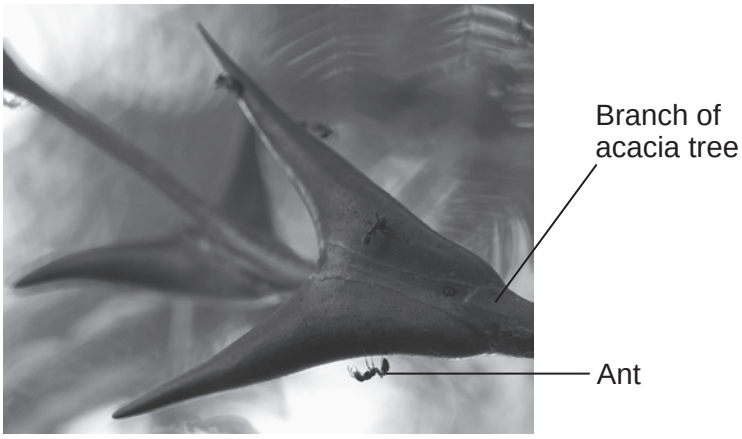
.....

(2 marks)

2 (b) Ants can give a painful bite.

The photograph shows a type of ant living on acacia trees.

Acacia trees have thorns on their branches.



4.7.1.3 Biotic factors

Question 24 · continued

2 (b) (i) Predators are less likely to eat ants living on acacia trees than ants living on the ground.

Suggest why.

.....

.....

(1 mark)

2 (b) (ii) Giraffes eat the leaves of acacia trees.

Giraffes do **not** eat the leaves of acacia trees that have ants living on them.

Suggest why.

.....

.....

(1 mark)

2 (c) The photographs show a wasp and a hoverfly.

The wasp and the hoverfly both have black and yellow stripes.

Wasp



Hoverfly



Wasps have stings, but hoverflies do **not**.

The stripes on the hoverfly help the hoverfly to avoid being eaten by predators.

Explain why.

.....

.....

.....

.....

(2 marks)

6

4.7.1.3 Biotic factors

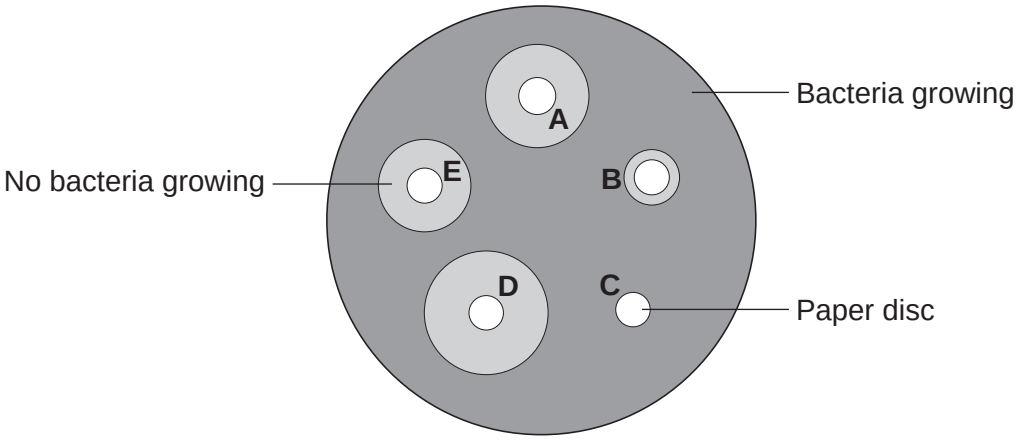
Question 25

June 2013 | BL1FP | Original Q3 | Legacy

3 Students in a school investigated the effect of five different antibiotics, **A**, **B**, **C**, **D** and **E**, on one type of bacterium.

The students:
- grew the bacteria on agar jelly in a Petri dish
- soaked separate paper discs in each of the antibiotics
- put the paper discs onto the bacteria in the Petri dish
- put the Petri dish into an incubator.

The diagram shows what the Petri dish looked like after 3 days.



3 (a) (i) What is the maximum temperature the incubator should be set at in the school?

Draw a ring around your answer.

10°C **25°C** **50°C**

(1 mark)

3 (a) (ii) Draw a ring around the correct answer to complete the sentence.

The incubator should **not** be set at a higher temperature because the higher

temperature might help the growth of

pathogens.
toxins.
viruses.

(1 mark)

4.7.1.3 Biotic factors

Question 25 · continued

3 (b) Which antibiotic, **A**, **B**, **C**, **D** or **E**, would be best to treat a disease caused by this type of bacterium?

Write your answer in the box. ☐

Give the reason for your answer.

.....

.....

(2 marks)

3 (c) Antibiotics **cannot** be used to treat diseases caused by viruses.

Why?

Tick (✓) **one** box.

Viruses are not pathogens ☐

There are too many different types of virus ☐

Viruses live inside cells ☐

(1 mark)

5

4.7.1.3 Biotic factors

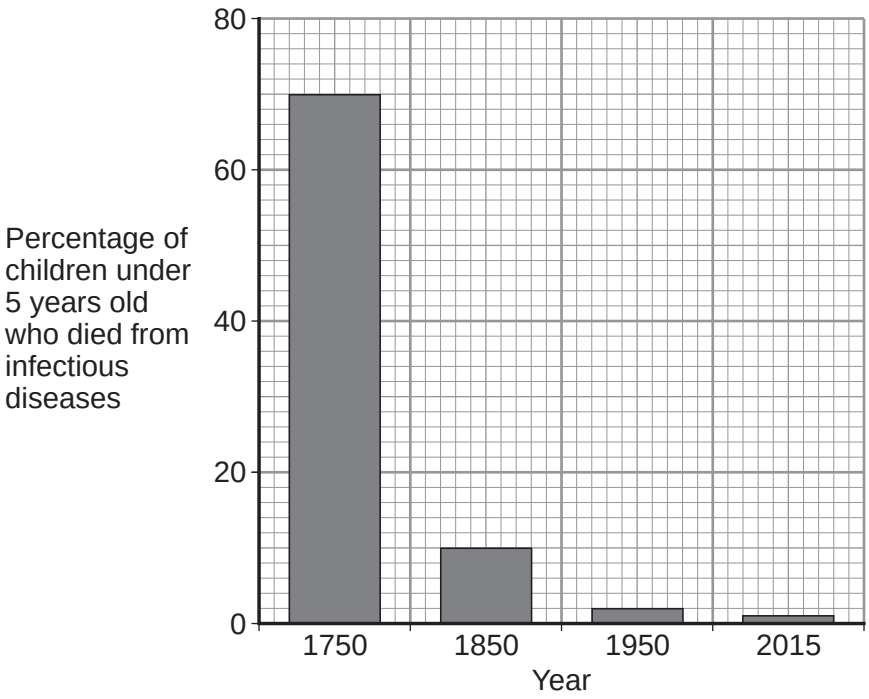
Question 26

June 2016 | BL1FP | Original Q5 | Legacy

5 Pathogens are microorganisms that cause infectious diseases.

5 (a) **Figure 7** shows the percentage of children under 5 years old who died from infectious diseases, in the UK, in four different years.

Figure 7



5 (a) (i) In the 1840s Dr Semmelweis introduced a new idea into hospitals.
What was this idea?

[1 mark]

Tick (✓) **one** box.

- hand-washing ☐
- immunisation ☐
- painkillers ☐

5 (a) (ii) Between 1750 and 1850 vaccinations were also developed.
What is in a vaccine?

[1 mark]

Tick (✓) **one** box.

- large amounts of dead pathogens ☐
- large amounts of live pathogens ☐
- small amounts of dead pathogens ☐

4.7.1.3 Biotic factors

Question 26 · continued

5 (a) (iii) The advances in medicine had an effect on death rate.

Describe the effect these advances had between 1750 and 1850.

To gain full marks you should include data from **Figure 7**.

[2 marks]

5 (b) Antibiotics were developed in the 1940s. Antibiotics kill bacteria.

5 (b) (i) Which **one** of the following is an antibiotic?

[1 mark]

Draw a ring around the correct answer.

cholesterol **penicillin** **thalidomide**

5 (b) (ii) The use of antibiotics has **not** reduced the death rate due to all diseases to zero.

Suggest **two** reasons why.

[2 marks]

1

2

5 (c) In school laboratories, bacteria should be grown at a maximum temperature of 25 °C.

Give **one** reason why companies testing new antibiotics grow bacteria at 37 °C.

[1 mark]

8

4.7.1.3 Biotic factors

Question 27

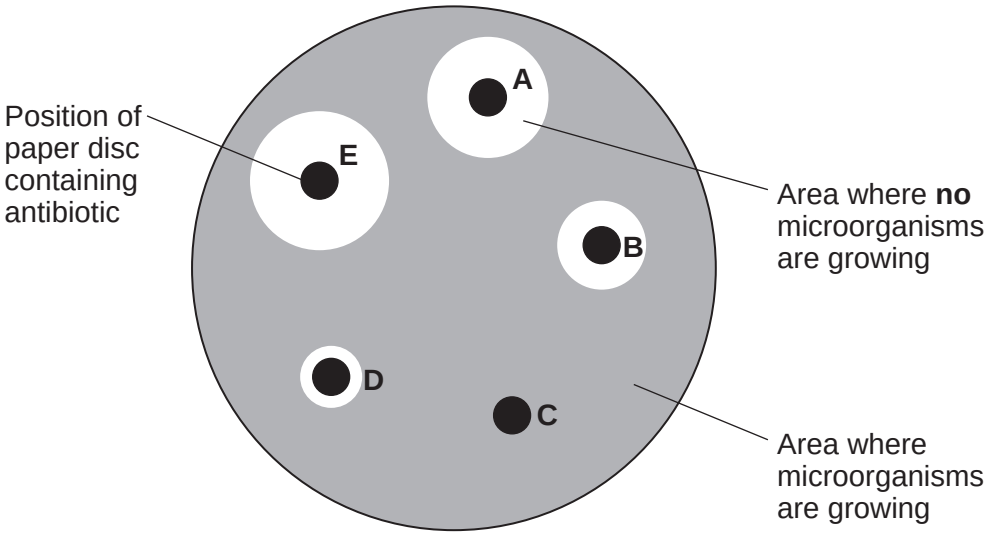
5 Some students investigated antibiotics.

The students:

- spread one type of microorganism on a sterile Petri dish containing an agar culture medium
- added five paper discs, each with one drop of a different antibiotic, **A**, **B**, **C**, **D** and **E**
- secured the lid on the dish with adhesive tape
- incubated the dish for 3 days at 25° C.

Figure 6 shows the Petri dish after the 3 days.

Figure 6



5 (a) Give **one** safety precaution that the students used in their investigation.

State why this safety precaution is needed.

[2 marks]

Safety precaution used _____

_____

Why the safety precaution is needed _____

_____

Question 27 · continued

5 (b) One student made a conclusion:

'Doctors should always give antibiotic **E** to get rid of any disease.'

5 (b) (i) Describe the evidence from **Figure 6** which supports the student's conclusion.

[1 mark]

_____

_____

5 (b) (ii) Suggest **one** reason why the student's conclusion may **not** be correct.

[1 mark]

_____

_____

5 (c) Antibiotics can be given to farm animals as well as to humans.

Table 2 shows the mass of different antibiotics that have been given to farm animals and to humans.

Table 2

Antibiotic	Mass of antibiotic in kilograms	
	Given to farm animals	Given to humans
A	121 600	314 500
B	323 000	47 500
C	37 000	5 400
D	71 200	47 700
E	42 000	49 000

5 (c) (i) Write down **all** of the antibiotics, **A**, **B**, **C**, **D** or **E**, which have been used **more** for farm animals than for humans.

[1 mark]

_____

Question 5 continues on the next page

4.7.1.3 Biotic factors

Question 27 · continued

5 (c) (ii) Farmers in some countries use antibiotics to prevent disease in farm animals. This prevents the animals becoming ill or dying.

Suggest **one** other advantage to the farmer of giving antibiotics to farm animals.

[1 mark]

Tick (✓) **one** box.

The antibiotics will be passed to people who consume the animals. ☐

Healthy animals will produce a higher yield. ☐

The antibiotics will build up in the animals. ☐

5 (c) (iii) What is the possible effect of using too much antibiotic?

[1 mark]

Tick (✓) **one** box.

Animals become resistant to the antibiotic. ☐

Microorganisms become resistant to the antibiotic. ☐

People become immune to the antibiotic. ☐

People become resistant to the antibiotic. ☐

5 (d) The human body defends itself against pathogens using one type of blood cell.

5 (d) (i) Complete the sentence.

[1 mark]

Pathogens in the body can be killed by _____ blood cells.

4.7.1.3 Biotic factors

Question 27 · continued

5 (d) (ii) Give **two** ways in which the blood cells you have named in part **(d)(i)** protect the body from disease.

[2 marks]

Tick (✓) **two** boxes.

These blood cells produce antibiotics. ☐

These blood cells produce antibodies. ☐

These blood cells ingest pathogens. ☐

These blood cells reproduce pathogens. ☐

These blood cells produce toxins. ☐

10

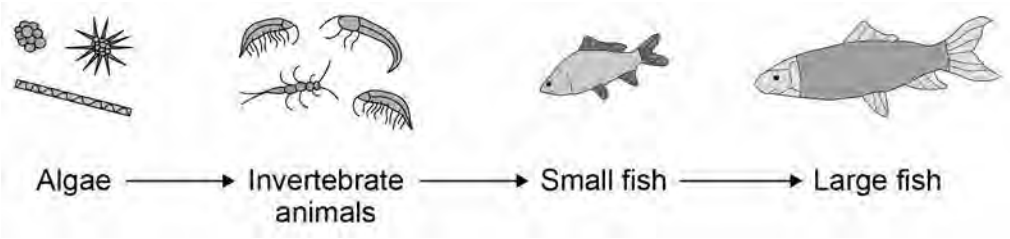
4.7.1.3 Biotic factors

Question 28

June 2018 | 8461/2F | Original Q1

0 1 **Figure 1** shows a food chain in a river.

Figure 1



0 1 . 1 Draw **one** line from each scientific term to the correct organism in the food chain.

[3 marks]

Scientific term	Organism in the food chain
	Algae
Apex predator	Invertebrate animals
Primary consumer	Large fish
Producer	Small fish

Question 28 · continued

0 1 . 2 **Table 1** shows the biomass of the organisms at each stage in the food chain.

Table 1

Organism	Biomass in arbitrary units
Algae	840
Invertebrate animals	200
Small fish	40
Large fish	10

Calculate the percentage of the biomass of the invertebrate animals that is transferred to the large fish.

[2 marks]

Use the equation:

$$\text{percentage} = \frac{\text{biomass of large fish}}{\text{biomass of invertebrate animals}} \times 100$$

Percentage = _____

Question 1 continues on the next page

4.7.1.3 Biotic factors

Question 28 · continued

0 1 . 3 A large amount of biomass is lost from the food chain.

Complete the sentences.

[3 marks]

Choose answers from the box.

coordination	**digestion**	**excretion**
filtration	**ingestion**	**respiration**

When the small fish eat the invertebrate animals, not all of this material is broken down during _____ .

Materials absorbed from the gut may enter the body cells of the small fish. These materials are broken down into carbon dioxide and water by _____ .

The carbon dioxide and other waste materials from the body cells are removed from the small fish by _____ .

0 1 . 4 A disease kills many of the small fish.

Why does the number of invertebrate animals increase?

[1 mark]

_____

_____

9

4.7.1.3 Biotic factors

Question 29

November 2020 | 8461/1F | Original Q3

0 3 The human body can defend itself against microorganisms that cause disease.

Viruses are one type of microorganism that cause disease.

0 3 . 1 Name **one** type of microorganism that causes disease in humans.

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

[1 mark]

0 3 . 2 Which **two** defence systems prevent microorganisms infecting the human body?

[2 marks]

Tick (✓) **two** boxes.

- Air is warmed as it is breathed into the lungs. ☐
- Hairs on the skin trap microorganisms. ☐
- Hydrochloric acid is produced by the stomach. ☐
- Teeth in the mouth crush and kill microorganisms. ☐
- The skin is a barrier covering the whole body. ☐

0 3 . 3 If microorganisms enter the human body the immune system can destroy the microorganisms.

How does the immune system destroy microorganisms?

[1 mark]

Tick (✓) **one** box.

- Platelets kill the microorganisms. ☐
- Red blood cells stick to the microorganisms. ☐
- White blood cells engulf the microorganisms. ☐

4.7.1.3 Biotic factors

Question 29 · continued

0 3 . 4 Vaccinations prevent people becoming ill with diseases such as measles.

Complete the sentences.

[2 marks]

Choose answers from the box.

active	**fast**	**resistant**	**slow**	**weakened**

In a vaccine the measles virus is _____.

If the measles virus enters the body after vaccination the immune system reaction will be _____.

0 3 . 5 How is the measles virus spread from one person to another?

[1 mark]

_____

_____

Question 3 continues on the next page

Question 29 · continued

Doctors investigated the spread of the virus that causes chickenpox.

The first symptom of chickenpox after exposure to the virus is spots on the body.

23 children were playing together at a party.

On the day of the party one of the children developed chickenpox spots.

Every two days after the party, the doctors recorded when the other 22 children first showed chickenpox spots.

Table 1 shows the results.

Table 1

Day when chickenpox spots first showed	Number of children
2	0
4	0
6	0
8	0
10	1
12	1
14	6
16	4
18	2
20	0
Total	**14**

0 3 . 6 What was the range for the days on which children first showed chickenpox spots?

Use **Table 1**.

[1 mark]

From day _____ to day _____

0 3 . 7 Incubation time is the usual time from exposure to a pathogen until the first symptoms appear.

Suggest the most likely incubation time for chickenpox.

[1 mark]

Incubation time = _____ days

4.7.1.3 Biotic factors

Question 29 · continued

0 3 . 8 Suggest **one** reason why some of the children did **not** develop chickenpox.

[1 mark]

0 3 . 9 One mother gave antibiotics to her child who had chickenpox.

Suggest why this child did **not** recover more quickly than the other children who had chickenpox.

[1 mark]

11

Turn over for the next question

4.7.1.3 Biotic factors

Question 30

June 2022 | 8461/2F | Original Q9

0 9 Earthworms:

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

0 9 . 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 30 · continued

0 9 . 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

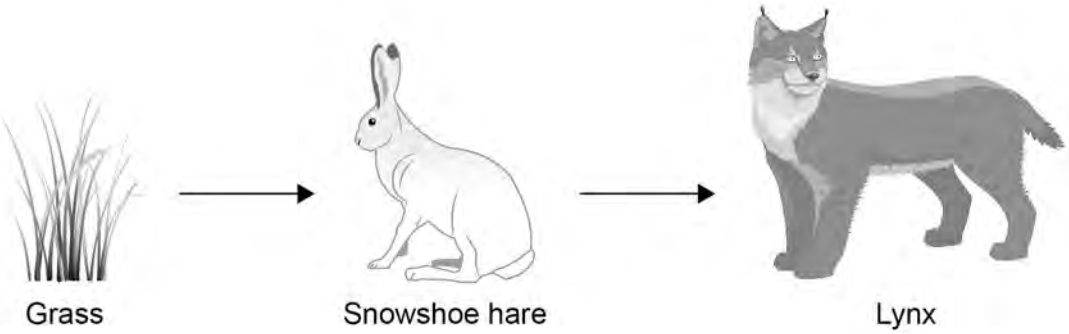
Question 31

June 2023 | 8461/2F | Original Q3

0 3 Different species in a habitat may depend on each other for food.

Figure 3 shows a food chain.

Figure 3



0 3 . 1 The grass needs energy to grow.

What is the source of energy for the grass?

[1 mark]

4.7.1.3 Biotic factors

Question 31 · continued

0 3 . 2 **Table 2** lists different types of feeding relationship.

Table 2

Feeding relationship	Organism
Secondary consumer	Lynx
Primary consumer	
Producer	
Herbivore	
Carnivore	
Prey	
Predator	

Write the name of **one** organism from **Figure 3** in each box in **Table 2**.

[3 marks]

Each organism may be written in one box or in more than one box.

The first box has been completed for you.

Question 3 continues on the next page

4.7.1.3 Biotic factors

Question 31 · continued

0 3 . 3 **Figure 4** shows the appearance of the snowshoe hare in the summer and in the winter.

Figure 4

Snowshoe hare in summer



Snowshoe hare in winter



The snowshoe hare has a different fur colour in the summer than in the winter.

Explain how the different fur colour increases the chance of survival of the snowshoe hare.

[3 marks]

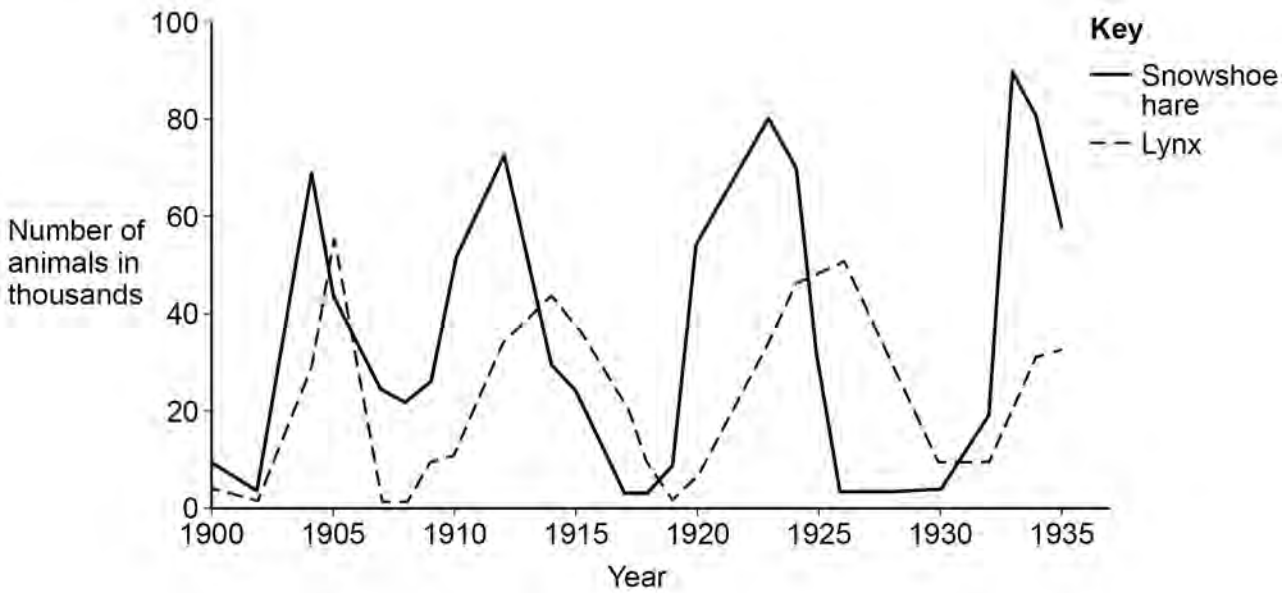
Question 3 continues on the next page

4.7.1.3 Biotic factors

Question 31 · continued

Figure 5 shows how the number of snowshoe hares and the number of lynx varied in one area between 1900 and 1935.

Figure 5



0 3 . 4 **Figure 5** shows that the number of snowshoe hares and the number of lynx increase and decrease several times.

Suggest **two** reasons why the number of **snowshoe hares** increases.

[2 marks]

1 _____

_____

2 _____

_____

4.7.1.3 Biotic factors

Question 31 · continued

0 3 . 5 The number of snowshoe hares increased and decreased four times between 1900 and 1935.

What effect does an **increase** in the number of snowshoe hares have on the number of lynx?

[1 mark]

0 3 . 6 Suggest **one** reason why the number of lynx decreased from 1915 to 1919.

Use information from **Figure 5**.

[1 mark]

0 3 . 7 When the snowshoe hare eats grass, about 90% of the biomass of the grass is lost.

Give **two** ways the biomass is lost.

[2 marks]

1

2

13

4.7.1.3 Biotic factors

Question 32

0 4 Some farmers keep cows indoors in large sheds.

Other farmers keep cows outdoors in fields of grass.

Figure 6 shows cows being kept indoors and outdoors.

Figure 6



Table 3 shows the energy inputs and energy outputs for keeping cows.

Table 3

	Energy in kJ/m^2/year	
	Indoors	**Outdoors**
Input as food	10 000	5 950
Input as fossil fuel	6 000	50
Output as meat and milk	40	2

0 4 . 1 Calculate the total energy input for keeping cows **outdoors**.

Use data from **Table 3**.

[1 mark]

Total energy input = _____ kJ/m^2/year

Question 32 · continued

0 4 . 2 The total energy input for keeping cows **indoors** is 16 000 kJ/m^2/year.

Calculate the percentage efficiency of keeping cows **indoors**.

Use the equation:

$$\text{percentage efficiency} = \frac{\text{energy output}}{\text{total energy input}} \times 100$$

[2 marks]

Percentage efficiency = _____ %

0 4 . 3 The percentage efficiency of keeping cows outdoors is 0.03%.

Why is it more energy efficient to keep cows indoors than to keep cows outdoors?

[2 marks]

Tick (✓) **two** boxes.

- Cows are more stressed indoors. ☐
- Cows move less indoors. ☐
- It is noisier indoors. ☐
- It is warmer indoors. ☐
- There is less light indoors. ☐

Diseases in cows can cause problems for farmers.

0 4 . 4 Suggest why diseases spread more quickly when the cows are kept indoors.

[1 mark]

One species of bacterium causes a disease in cows.

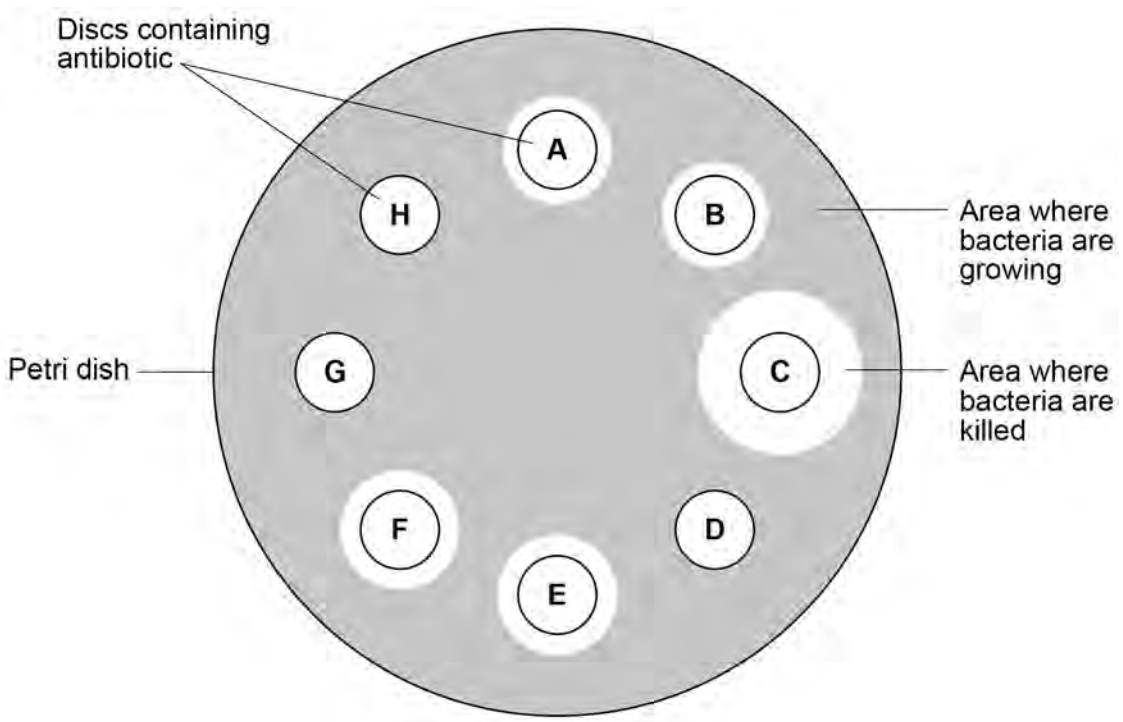
Scientists investigated the effect of eight different antibiotics on the growth of this species of bacterium.

The scientists put discs containing the different antibiotics onto a Petri dish containing the bacteria.

Antibiotics **A** to **H** were used in the investigation.

Figure 7 shows what the Petri dish looked like after 2 days.

Figure 7



0 4 . 5 This species of bacterium is resistant to some of the antibiotics.

Give the letter of **one** antibiotic the bacterium is resistant to.

[1 mark]

_____

4.7.1.3 Biotic factors

Question 32 · continued

0 4 . 6 Complete the sentence.

Choose the answer from the box.

[1 mark]

carbohydrate	DNA	lipid

Antibiotic resistance in a single bacterium is caused by a change in the bacterium's _____ .

0 4 . 7 Complete the sentence.

Choose the answer from the box.

[1 mark]

excretion	feeding	reproduction

A change in one bacterium can cause millions of bacteria to become resistant to the antibiotic.

This is because bacteria have a high rate of _____ .

0 4 . 8 Suggest why the production of millions of antibiotic-resistant bacteria is a problem for farmers.

[2 marks]

_____

_____

_____

_____

11

4.7.1.3 Biotic factors

Question 33

June 2023 | 8461/2F | Original Q7

0 7 Many different species can live together in the same habitat.

0 7 . 1 What name is given to all of the organisms living in the same habitat?

[1 mark]

Tick (✓) **one** box.

- A community ☐
- A food chain ☐
- A population ☐
- An ecosystem ☐

Question 7 continues on the next page

4.7.1.3 Biotic factors

Question 33 · continued

Figure 12 shows four species of bird from the same habitat in the UK.

Figure 12



Brambling (*Fringilla montifringilla*)



Bullfinch (*Pyrrhula pyrrhula*)



Chaffinch (*Fringilla coelebs*)



Goldfinch (*Carduelis carduelis*)

4.7.1.3 Biotic factors

Question 33 · continued

0 7 . 2 Which species of bird in **Figure 12** do scientists think are most closely related?

[1 mark]

Tick (✓) **one** box.

- Brambling and chaffinch ☐
- Brambling and goldfinch ☐
- Bullfinch and chaffinch ☐
- Bullfinch and goldfinch ☐

0 7 . 3 Scientists think the brambling and the bullfinch belong to different species.

What evidence is used by scientists to classify the brambling and the bullfinch as different species?

[1 mark]

Tick (✓) **one** box.

- The brambling and the bullfinch are different sizes. ☐
- The brambling and the bullfinch cannot breed together to give fertile offspring. ☐
- The brambling and the bullfinch live in different parts of the habitat. ☐
- The brambling eats mainly seeds and the bullfinch eats mainly insects. ☐

Question 7 continues on the next page

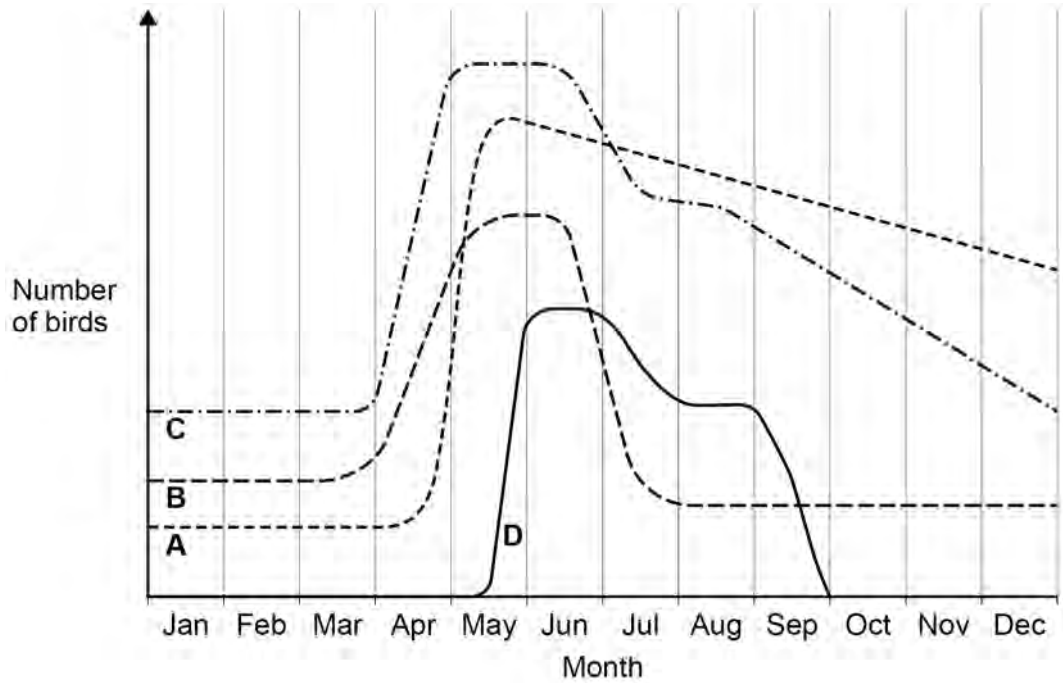
4.7.1.3 Biotic factors

Question 33 · continued

Four other species of bird (**A**, **B**, **C** and **D**) live in a habitat in the UK.

Figure 13 shows how the numbers of each species of bird varied during one year.

Figure 13



Use information from **Figure 13** to answer Questions **07.4** to **07.6**

0 7 . 4 Describe what happens to the number of birds of species **A** during the year.

[3 marks]

4.7.1.3 Biotic factors

Question 33 · continued

0 7 . 5 In June and July, a disease affected the populations of some of the species.

Which species had the **lowest** resistance to the disease?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 7 . 6 One species migrates between the UK and other countries.

Which species migrates between the UK and other countries?

Give a reason for your answer.

[1 mark]

Species _____

Reason _____

_____

_____

8

4.7.1.3 Biotic factors

Question 34

June 2024 | 8461/2F | Original Q9

0 9 Evolution of new species occurs by mutation and natural selection.

0 9 . 1 What is a mutation?

[1 mark]

0 9 . 2 Describe the process of natural selection.

[3 marks]

0 9 . 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 ☐

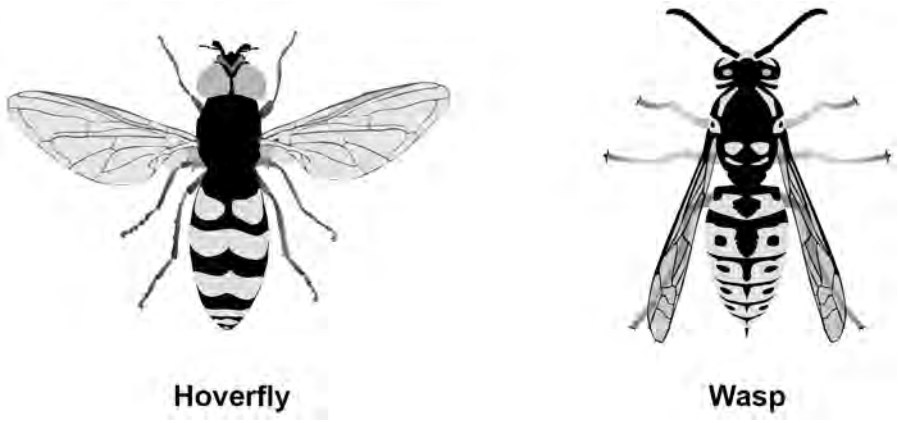
4.7.1.3 Biotic factors

Question 34 · continued

0 9 . 4 The hoverfly and the wasp are insects with bright yellow and black markings.

Figure 12 shows a hoverfly and a wasp.

Figure 12



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 35

June 2025 | 8461/1F | Original Q3

0 3 Blood contains different types of cell.

0 3 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

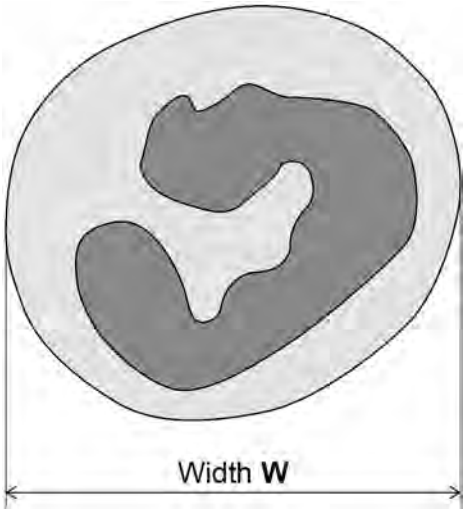
antibiotics	**antitoxins**	**painkillers**	**pathogens**

White blood cells defend the body against _____.

Some white blood cells release chemicals that neutralise toxins. These chemicals are called _____.

0 3 . 2 **Figure 3** shows a white blood cell.

Figure 3



The image of the white blood cell in **Figure 3** is magnified 4000 times.

4.7.1.3 Biotic factors

Question 35 · continued

Calculate the real width of the white blood cell.

[4 marks]

Complete the following steps.

Measure width **W** in millimetres (mm).

Width **W** = _____ mm

Convert your measurement to micrometres (µm).

1 millimetre (mm) = 1000 micrometres (µm).

_____

_____

Width **W** in micrometres = _____ µm

Calculate the real width of the white blood cell.

Use the equation:

$$\text{real width} = \frac{\text{width } \mathbf{W} \text{ (µm)}}{\text{magnification}}$$

_____

_____

_____

_____

Real width = _____ µm

Question 35 · continued

Table 3 shows information about different types of blood vessel.

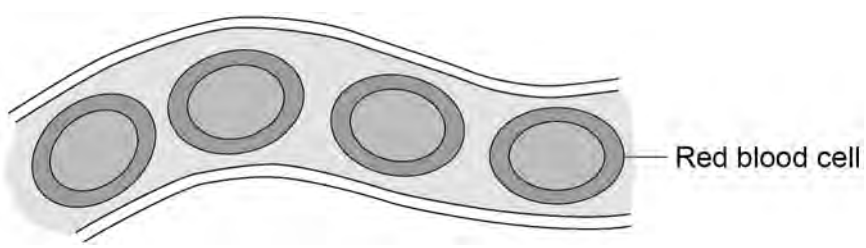
Table 3

Blood vessel	Width of blood vessel in micrometres (µm)	Pressure of blood travelling through the blood vessel
Artery	10 000	High
Capillary	10	Low
Vein	20 000	Very low

0 3 . 3 The width of a red blood cell is 8 µm.

Figure 4 shows red blood cells in one type of blood vessel.

Figure 4



Which type of blood vessel is shown in **Figure 4**?

Use **Table 3**.

[1 mark]

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

4.7.1.3 Biotic factors

Question 35 · continued

0 3 . 4 Explain why arteries need to have thick walls.

Use **Table 3**.

[2 marks]

Coronary arteries in the heart can become narrowed.

0 3 . 5 What happens inside coronary arteries to cause them to become narrowed?

[1 mark]

0 3 . 6 Explain why narrowed coronary arteries can be dangerous.

[2 marks]

Question 3 continues on the next page

4.7.1.3 Biotic factors

Question 35 · continued

0 3 . 7 Treatments are available for some cardiovascular diseases.

Draw **one** line from each cardiovascular disease to a treatment for the disease.

[3 marks]

Cardiovascular disease	Treatment
A blocked coronary artery	Antibiotics
Heart failure	Heart transplant
High blood cholesterol	Statins
	Stent

0 3 . 8 Why is coronary heart disease described as a 'non-communicable disease'?

[1 mark]

_____

_____

16

4.7.1.3 Biotic factors

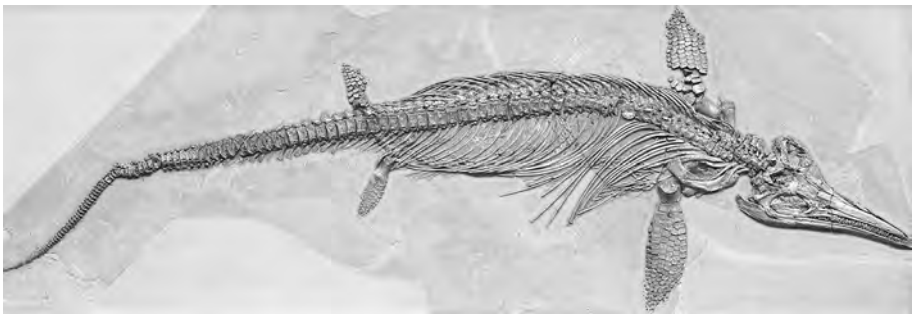
Question 36

June 2025 | 8461/2F | Original Q8

0 8 Ichthyosaurs are reptiles that lived in the sea millions of years ago.

Figure 13 shows the fossilised remains of an ichthyosaur.

Figure 13



0 8 . 1 Suggest how the fossil in **Figure 13** was formed after the ichthyosaur died.

[2 marks]

0 8 . 2 The length of the image of the ichthyosaur in **Figure 13** is 120 mm.

The real length of the ichthyosaur was 17 times longer than the image in **Figure 13**.

Calculate the real length of the ichthyosaur.

Give your answer in metres.

[3 marks]

Real length of ichthyosaur = _____ metres

0 8 . 3 **Table 5** gives the classification of the ichthyosaur in **Figure 13**.

Table 5

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

Complete **Table 5**.

[2 marks]

Choose answers from the box.

Community	Family	Mammal	Phylum	Population

0 8 . 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