AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.3.2

Waste management

Past-paper questions

Tier	**Higher**
Question groups	**43**
Available paper years	**2007–2022**

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.

4.7.3.2 Waste management

Question 01

March 2007 | BLY1B | Original Q9 | Legacy

QUESTION NINE

Lichens are sensitive to the concentration of sulfur dioxide in different pollution zones.

Table 1 shows the range of sulfur dioxide concentrations in different pollution zones.

Table 2 shows which species of lichen are found in each pollution zone.

Lichens that can live in the red pollution zone are the most tolerant of sulfur dioxide.

Table 1

Pollution zone	Sulfur dioxide concentration in μg per m^3
red	greater than 75
brown	55 to 75
orange	45 to 54
yellow	35 to 44
blue	10 to 34
green	less than 10

Table 2

Species of lichens	Pollution zone
Desmococcus viridis	red
Evernia prunastri	brown
Physcia adscendens	brown
Xanthoria polycarpa	brown
Physcia aipolia	orange
Melanelia species	orange
Cetraria chlorophylla	yellow
Graphis scripta	yellow
Menegazzia terebrata	blue
Parmotrema arnoldii	blue
Usnea rigida	blue
Lobaria pulmonaria	green

Question 01 · continued

9A What is the maximum concentration of sulfur dioxide that Menegazzia terebrata can tolerate?

1 9 μg of sulfur dioxide / m^3

2 34 μg of sulfur dioxide / m^3

3 39 μg of sulfur dioxide / m^3

4 more than 40 μg of sulfur dioxide / m^3

9B **Table 3** shows the concentration of sulfur dioxide in the air in four areas, **P**, **Q**, **R** and **S**.

Table 3

Area	Concentration of sulfur dioxide in μg per cubic metre
P	89
Q	12
R	43
S	56

Which line, **1**, **2**, **3** or **4**, in **Table 4** is correct?

Table 4

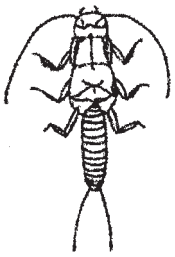
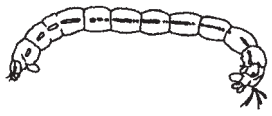
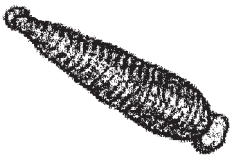
	Area	Pollution zone	Species found
1	**P**	red	Desmococcus viridis and Evernia prunastri
2	**Q**	brown	Physcia adscendens and Xanthoria polycarpa
3	**R**	yellow	Cetraria chlorophylla and Graphis scripta
4	**S**	blue	Parmotrema arnoldii and Lobaria pulmonaria

Question 9 continues on the next page

Question 01 · continued

9C **Table 5** shows some species of invertebrates and the level of pollution to which they are tolerant.

Table 5

LOW 0 to 60 units of pollution  Mayfly nymph  Stonefly nymph
INTERMEDIATE 61 to 120 units of pollution  Caddis fly larva  Freshwater shrimp  Crane fly larva
HIGH 121 units of pollution and above  Blood worm  Leech  Flatworm

A student found several caddis fly larvae in a habitat.

This suggests that the habitat . . .

1 had a pollution level above 120 units.

2 had a pollution level that could not be measured.

3 was unpolluted.

4 had a pollution level between 61 and 120 units.

4.7.3.2 Waste management

Question 01 · continued

9D Pollution levels can be measured using digital meters. A digital meter was used to test a sample of water six times. The meter gave readings of 67, 69, 75, 73, 62 and 71.

The differences in the readings are most likely to have been caused by . . .

1 an anomaly.

2 human error.

3 random error.

4 using the wrong instrument.

END OF TEST

4.7.3.2 Waste management

Question 02

June 2007 | BLY1B | Original Q2 | Legacy

QUESTION TWO

This question is about pollution and greenhouse gases.

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

A trees

B cattle

C lichens

D invertebrates

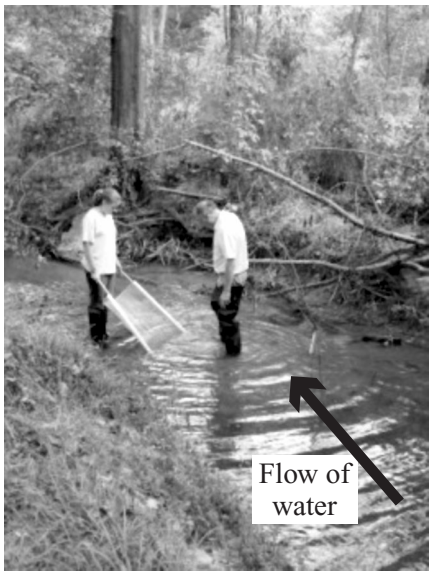
	The organisms can . . .
1	be used as an indicator of air pollution.
2	be used as an indicator of water pollution.
3	'lock-up' carbon dioxide.
4	release methane into the atmosphere.

4.7.3.2 Waste management

Question 03

June 2007 | BLY1H | Original Q2 | Legacy

2 Invertebrate animals are used to monitor pollution in streams. The photograph shows scientists collecting a sample of invertebrates from a stream.



This is the method that they use.

- A 1 m^2 area of the bed of the stream is marked out.
- A net 1 m wide is held by one person on the downstream side of the marked-out area.
- The other person uses their boots to gently move stones in this area of the stream bed. They do this for three minutes. This dislodges invertebrates which are then caught in the net.
- The invertebrates are then identified and counted.

(a) Name **two** control variables (variables which must be kept the same) in this investigation.

1 .....

2 .....

(2 marks)

Question 2 continues on the next page

Question 03 · continued

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(b) Suggest **two** reasons why the results from a sample might not be accurate.

1 .....

.....

2 .....

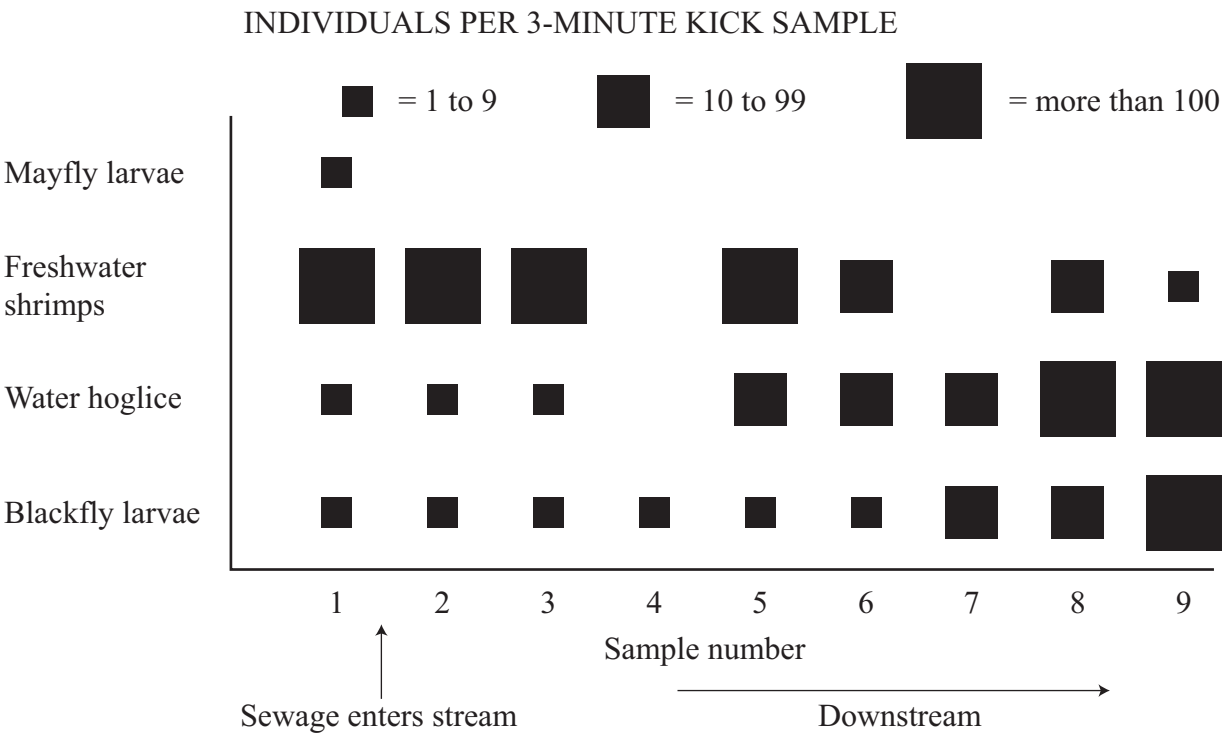
.....

(2 marks)

The technique described on the previous page was used to investigate the effect of sewage on stream invertebrates.

- Sample 1 was taken upstream of the point where the sewage entered the stream.
- Samples 2–9 were taken at regular intervals downstream of the sewage inflow.

The graph shows the results.



(c) What was the range of the number of blackfly larvae that could be found in sample 7?

.....

(1 mark)

4.7.3.2 Waste management

Question 03 · continued

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(d) Describe, as fully as you can, how the number of water hoglice changed downstream from where sewage entered the stream.

.....

.....

.....

.....

(2 marks)

(e) Which of the four invertebrates is the best indicator species for water which is **not** polluted by sewage?

.....

Give the reason for your answer.

.....

.....

(2 marks)

9

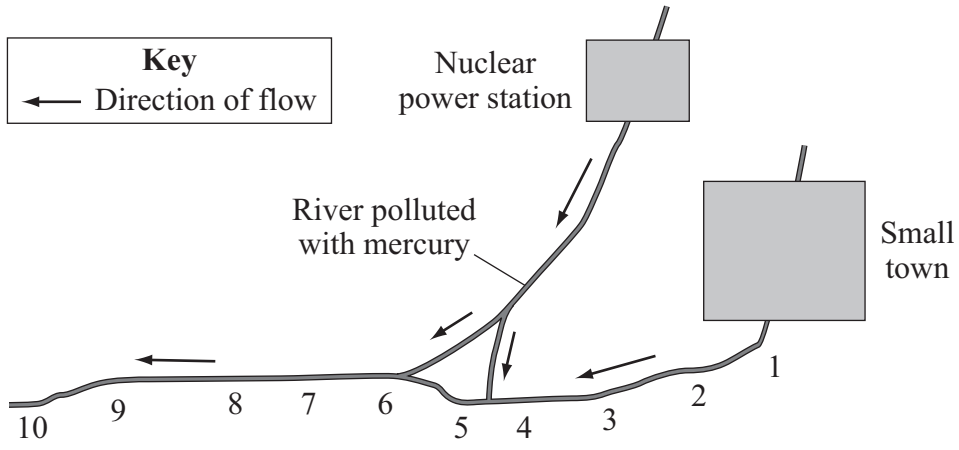
4.7.3.2 Waste management

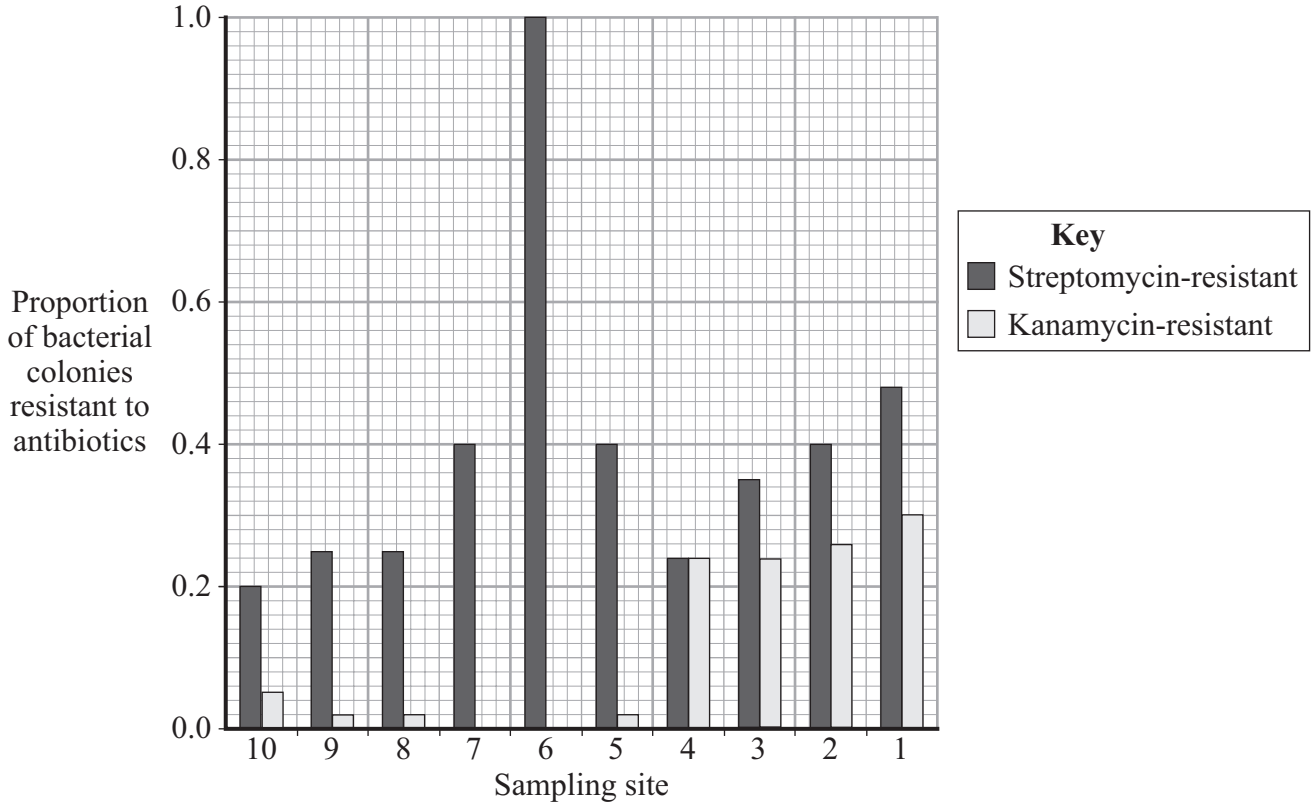
Question 04

November 2007 | BLY1A | Original Q9 | Legacy

QUESTION NINE

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





Question 04 · continued

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

How many of these colonies were resistant to streptomycin?

1 0.4

2 15

3 24

4 40

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

These differences are affected most by . . .

1 the volume of water in the river.

2 the mercury concentration in the water.

3 the antibiotic concentration in the water.

4 the distance downstream from sampling site 1.

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

1 streptomycin-resistant bacteria are also resistant to mercury.

2 mercury increases antibiotic resistance in bacteria.

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

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

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

1 over-prescription of antibiotics.

2 toxins.

3 natural selection.

4 vaccination.

END OF TEST

4.7.3.2 Waste management

Question 05

November 2007 | BLY1B | Original Q5 | Legacy

QUESTION FIVE

This question is about indicator species.

5A Which one of the following is **not** a definition of an indicator species?

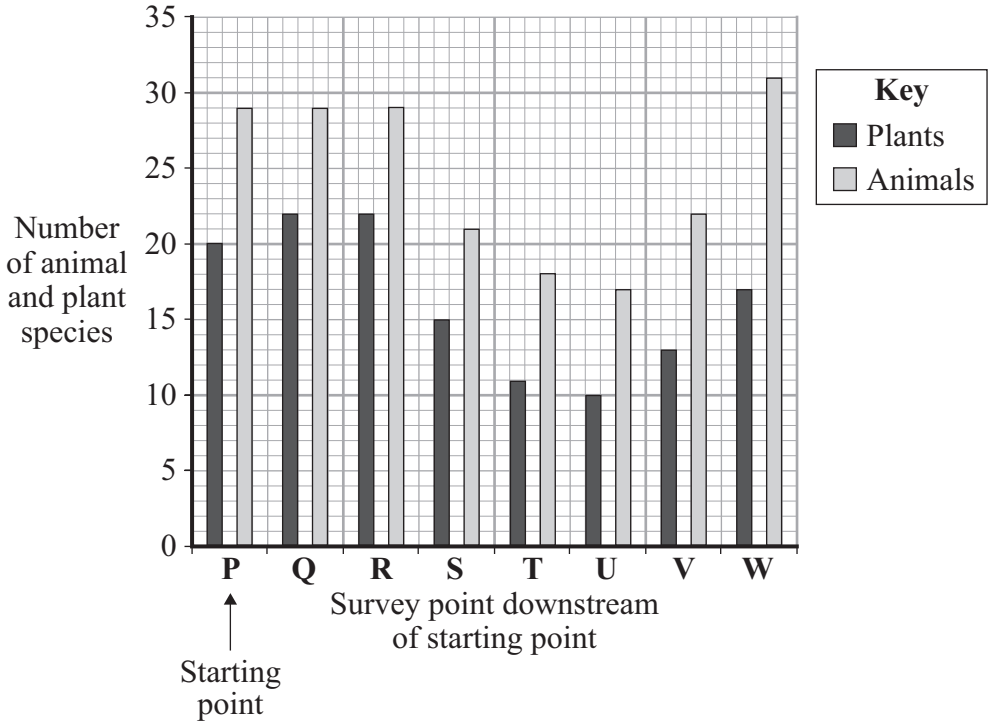
1 a species of animal or plant that may show a change in population due to environmental change

2 a species of animal or plant that may show a change in population due to pollution

3 a species whose population may fall in response to damage to the environment

4 a species of animal or plant whose population is affected only by changes in the population of another species

The bar chart shows the results of a survey into the water quality of a river.



5B Which part of the river is most likely to contain a source of pollution?

1 at **R**

2 between **R** and **S**

3 at **S**

4 between **S** and **T**

4.7.3.2 Waste management

Question 05 · continued

5C Which row in the table is correct?

	Change in the number of plant species between points P and W	Change in the number of animal species between points P and W
1	–2	–2
2	+2	–3
3	–3	+2
4	+3	–3

5D How could the results have been made more reliable?

1 repeating the survey at each point on the river

2 sampling more points on the river above starting point **P**

3 calculating the mean number of plants and animals at each point on the river

4 increasing the distance between each point

4.7.3.2 Waste management

Question 06

March 2008 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

Farms may pollute the environment in several ways.

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

A carbon dioxide

B pesticide

C fertiliser

D sewage

	Feature
1	chemical spread on land to help crop growth
2	solid and liquid waste produced by cows
3	produced by tractors
4	chemical sprayed on crops to kill insects

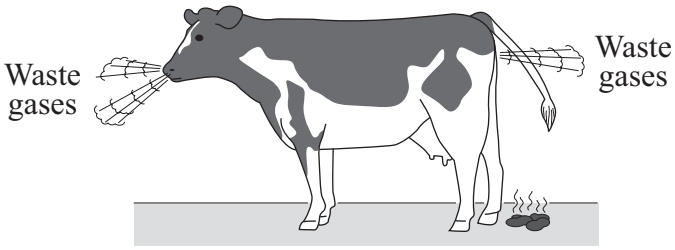
4.7.3.2 Waste management

Question 07

March 2008 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

Rearing cattle affects the environment.



5A In addition to methane, which other greenhouse gas do cattle release into the atmosphere?

1 carbon dioxide

2 carbon monoxide

3 nitrogen dioxide

4 sulfur dioxide

5B Cattle rearing can lead to sewage and farm chemicals entering streams and lakes.

The level of pollution of these water systems can be estimated most reliably by examining the . . .

1 colour of the water.

2 range of lichens living near the water.

3 range of invertebrates living in the water.

4 temperature of the water at regular intervals.

5C Greenhouse gases keep the Earth warm because . . .

1 they are good insulators.

2 they trap energy as it enters the Earth's atmosphere from the Sun.

3 they allow more radiation to pass through.

4 they re-radiate energy back to the Earth.

4.7.3.2 Waste management

5D Forests help to reduce the greenhouse effect mainly by . . .

1 ‘locking-up’ carbon dioxide as wood.

2 giving out oxygen.

3 taking in methane.

4 absorbing radiation from the Sun.

Turn over for the next question

4.7.3.2 Waste management

Question 08

June 2008 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

This question is about pollution.

8A Which one of the following is **not** part of the greenhouse effect?

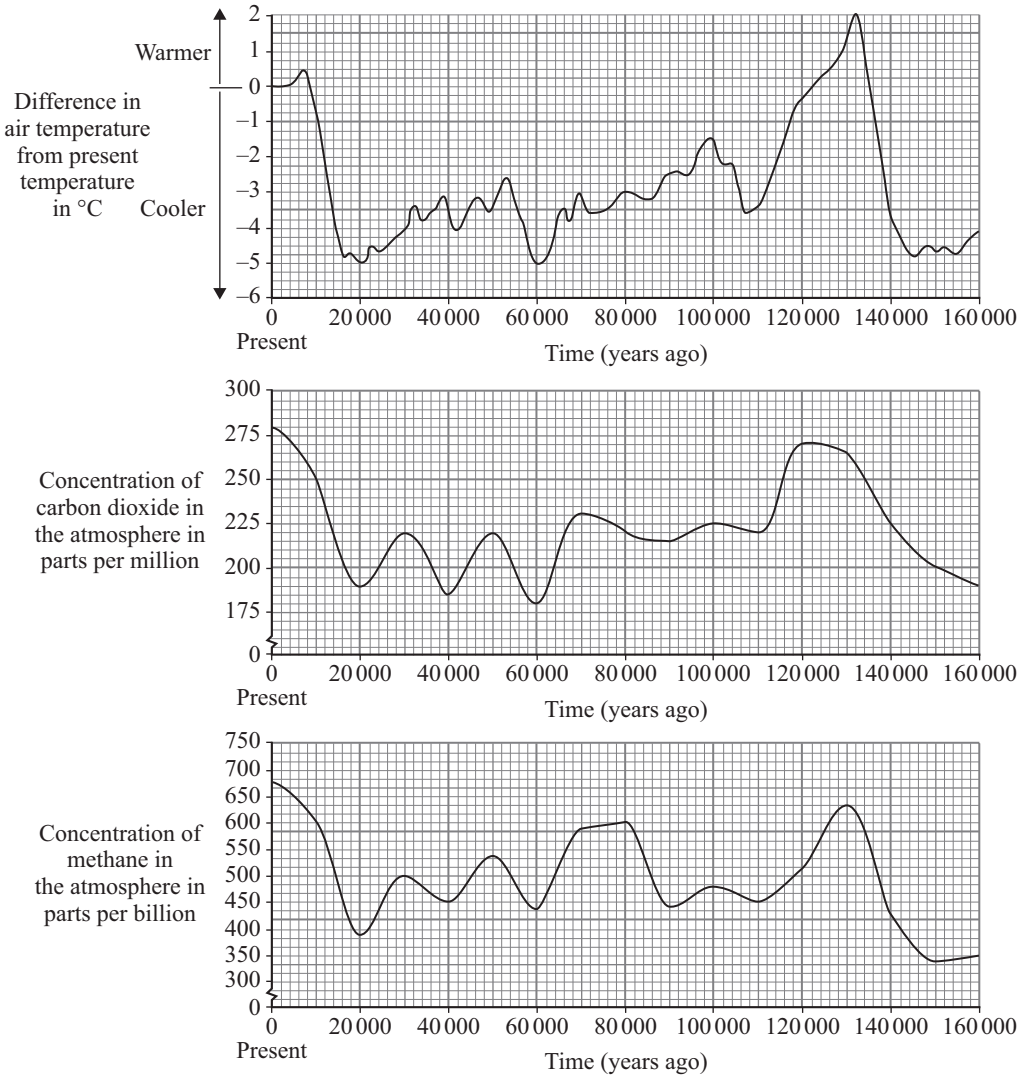
1 Greenhouse gases in the atmosphere trap some of the energy radiated by the Earth.

2 Most of the Sun's energy entering the Earth's atmosphere is trapped by greenhouse gases.

3 Some energy from the Earth's surface is radiated into the atmosphere.

4 Some of the radiation from the Sun is absorbed by the Earth's surface.

The graph shows the changes in the temperature of the Earth's atmosphere and the concentration of carbon dioxide and methane in the atmosphere over the last 160 000 years.



4.7.3.2 Waste management

Question 08 · continued

8B Which of the following is true of this data?

1 Every 20 000 years the concentration of carbon dioxide in the atmosphere increases by more than 50 parts per million.

2 Air temperature changed by 2 °C between 60 000 and 80 000 years ago.

3 The air temperature rose between 0 and 20 000 years ago.

4 Between 120 000 and 130 000 years ago the concentration of methane fell by more than 50 parts per billion.

8C Which of the following conclusions can be drawn from this data?

1 An increase in carbon dioxide concentration causes an increase in the air temperature.

2 An increase in the air temperature causes an increase in the concentration of methane in the atmosphere.

3 There may be a link between air temperature and the concentration of carbon dioxide in the atmosphere.

4 There is no link between air temperature and the concentration of methane in the atmosphere.

8D Some scientists disagree about the causes of global warming.

What is the most likely reason for this?

1 They have not compared their data with that of other scientists.

2 They disagree about where in the world the data has been collected.

3 They have interpreted the data differently.

4 The instruments used to collect the data are not accurate enough.

4.7.3.2 Waste management

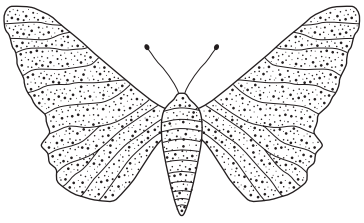
Question 09

June 2008 | BLY1BP | Original Q9 | Legacy

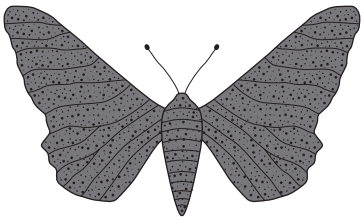
QUESTION NINE

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.

Question 09 · continued

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

4.7.3.2 Waste management

Question 10

November 2008 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

Lichens are indicators of pollution.

4A Lichens are sensitive to . . .

1 carbon dioxide.

2 methane.

3 oxygen.

4 sulfur dioxide.

The table shows the heights of different types of lichen.

Type of lichen	Height in mm
crusty	1
scaly	3
leafy	10
fluffy	10–50

A survey of lichens found at various distances from a city centre gave the results in the table below.

Distance from city centre (km)	Main type of lichen found
0.3	none found
0.4	crusty
1.2	crusty
2.7	scaly
3.2	crusty
4.0	scaly
6.0	leafy
6.9	leafy

4.7.3.2 Waste management

4B Which of the following best describes the relationship between the type of lichen found and the distance from the city centre?

1 Only crusty lichens are found within 3 km of the city centre.

2 The further away from the city centre, the taller the lichens.

3 Leafy lichens are found over the greatest range of distances.

4 Scaly lichens are found over the smallest range of distances.

4C The survey was carried out by two students who travelled by bus. They got off at each stop to check the lichens growing nearby.

Which of the following might explain why there were no fluffy lichens?

1 The survey sites were all near the road.

2 The survey sites were not chosen at random.

3 The bus stops were not at equal distances from the city centre.

4 The students were not expecting to find fluffy lichens.

4D The students also used a meter to measure the level of pollutants in the air near to each bus stop.

Their lichen survey could be a better indicator of pollution than the meter survey because . . .

1 the lichens were not affected by the pollution they had absorbed.

2 the lichens had sampled the air over a long period of time.

3 meters are difficult to read.

4 meters cannot detect low levels of pollutants.

4.7.3.2 Waste management

Question 11

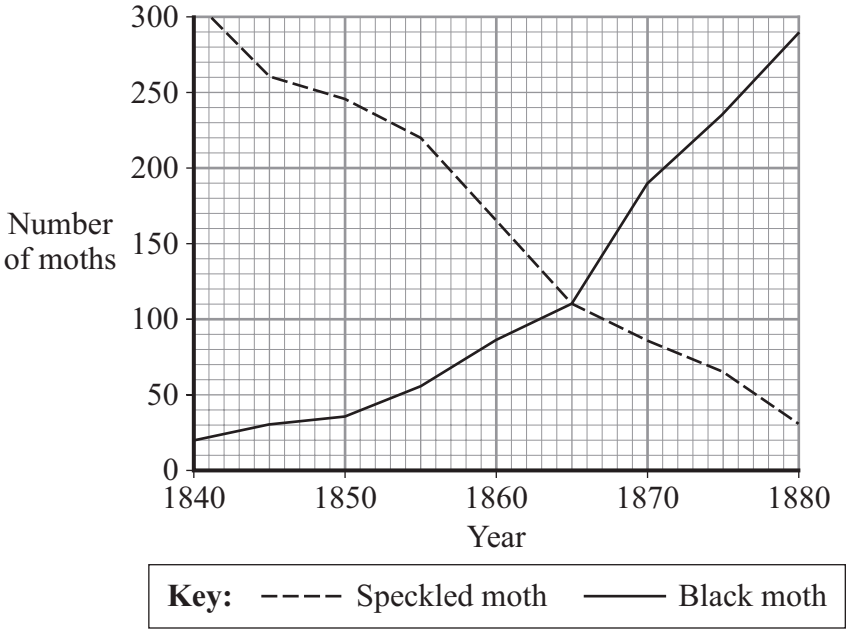
November 2008 | BLY1BP | Original Q7 | Legacy

QUESTION SEVEN

The peppered moth exists in two forms – a speckled form and a black form. Both forms are found on tree bark. They are eaten by birds which pick them off the tree.

From 1840 onwards, the colour of the tree bark changed from light grey-green to black as a result of pollution in the air.

The graph shows the changes in the populations of speckled and black moths in a wood from 1840 to 1880.



7A What proportion of the moths in the wood were speckled in 1865?

1 0.02

2 0.1

3 0.3

4 0.5

4.7.3.2 Waste management

Question 11 · continued

7B What conclusion can be drawn from this data?

1 The number of black moths was directly proportional to time.

2 The rate of increase in the black moth population was approximately equal to the rate of decrease in the speckled moth population.

3 Air pollution was the direct cause of the fall in the speckled moth population.

4 The peppered moth population would be wiped out by 1890.

The Clean Air Act was passed in 1950. This resulted in a large decrease in air pollution.

7C How might the proportions of the two types of moth in the wood change between 1950 and 1980?

	Speckled moth	Black moth
1	increase	increase
2	increase	decrease
3	decrease	increase
4	decrease	decrease

7D Which of the following is a likely reason for the change in the numbers of speckled and black moths in the 50 years after the Clean Air Act?

1 The colour of the tree bark changed so that the speckled moth was less easily seen by birds.

2 Pollution in the air changed the colour of the moths.

3 Speckled moths were killed by a new disease.

4 Black moths moved into the wood from other areas.

4.7.3.2 Waste management

Question 12

January 2009 | BLY3H | Original Q8 | Legacy

8 Read the following passage carefully.

> Petrol is a mixture which includes small amounts of nitrogen and sulfur compounds. Gasohol, a blend of ethanol with petrol, can be used in most car engines.
>
> Brazil is the world's leading producer of gasohol, using mainly ethanol from sugar cane. Other countries make use of maize or various crop wastes, such as shoots and leaves. Ethanol evaporates more readily than petrol. It releases 23.5 megajoules of energy per litre compared with 34.8 megajoules for petrol. Burning either petrol or ethanol releases carbon dioxide and water vapour into the air. But using gasohol reduces emissions of carbon monoxide and hydrocarbons. The hydrocarbons from exhaust fumes sometimes react with sunlight to form 'photochemical smog'.
>
> Opponents of the use of ethanol in motor fuel claim that it increases emissions of oxides of nitrogen from cars, but this effect has not been observed by air quality monitoring. Opponents also claim that ethanol takes more energy to produce than it releases. But other scientists report that making ethanol from sugar cane yields 8 units of energy for each unit used in production, while ethanol from maize gives 1.34 units.

Evaluate the scientific basis for and against the blending of ethanol with petrol.
Use information from the passage and your own knowledge of biology.
Remember to give a conclusion to your evaluation.

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(5 marks)

5

4.7.3.2 Waste management

Question 13

March 2009 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

Sulfur dioxide is a pollutant gas.

3A Which environmental problem is caused by sulfur dioxide?

1 global warming

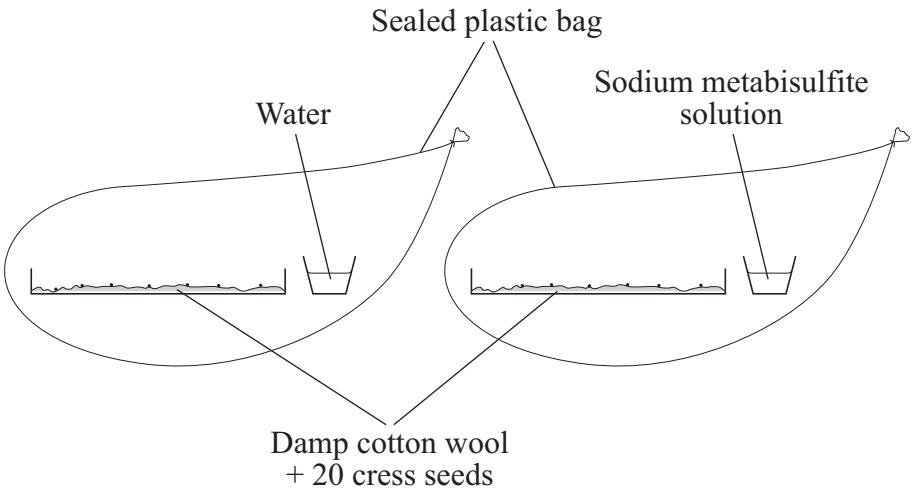
2 acid rain

3 deforestation

4 traffic congestion

A student investigated the effect of sulfur dioxide on the germination of cress seeds.

The diagram shows her apparatus.



- Sodium metabisulfite solution gives off sulfur dioxide.
- Both bags were left in a warm laboratory for 5 days.
- The student then counted the number of seeds that had germinated.

Question 13 · continued

3B The independent variable in this investigation was . . .

1 the number of seeds that germinated.

2 the number of seeds put into each bag.

3 the presence of water or sodium metabisulfite.

4 the temperature in the laboratory.

3C The main reason for using the plastic bags was . . .

1 to keep the seeds warm.

2 to keep the seeds dry.

3 to keep gases inside.

4 to let light in.

3D The student carried out the investigation five times. The table shows the student's results.

Number of seeds that germinated	
Bag containing water	**Bag containing sodium metabisulfite solution**
17	5
15	8
15	5
16	8
17	9

What conclusion can be drawn from these results?

1 Sodium metabisulfite poisons cress seeds.

2 Sulfur dioxide affects the germination of cress seeds.

3 There is 100% germination of cress seeds when sulfur dioxide is **not** present.

4 Water is toxic to a small number of cress seeds.

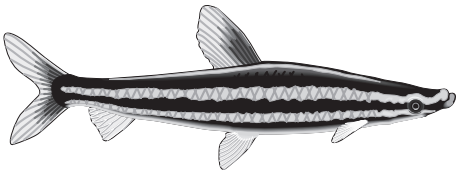
4.7.3.2 Waste management

Question 14

June 2009 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

Zebra fish are small freshwater fish that can tolerate a wide range of environmental conditions. Scientists want to use zebra fish as an indicator species for different types of water pollution.



4A Scientists have extracted 'glow' genes from a jellyfish and transferred them into the eggs of a zebra fish.

What term describes this process?

1 cloning

2 genetic engineering

3 tissue culture

4 embryo transplant

4B Genes from jellyfish are transferred into zebra fish eggs by . . .

1 using a small pair of sharp scissors.

2 using enzymes.

3 mixing the gametes of jellyfish and zebra fish.

4 taking cytoplasm from a jellyfish egg and placing it into a zebra fish egg.

4.7.3.2 Waste management

Question 14 · continued

Zebra fish created by this process would glow with different colours, depending on the type of chemical pollution in the water. The table shows how this would work.

Colour	Type of chemical pollution			
	Pesticides	Fertilisers	Acidity	Herbicides
Red	✓			
Green			✓	
Yellow		✓		
Orange				✓

4C Zebra fish would glow green because of . . .

1 an increase in the sulfur dioxide content of the atmosphere.

2 a reduction in the carbon dioxide content of the atmosphere.

3 an increase in the methane content of the atmosphere.

4 an increase in the amount of chemicals used in agriculture.

4D In one river, different zebra fish glow red and orange.

This indicates that the river is polluted by . . .

1 chemicals released from industry.

2 smoke released from power stations.

3 chemicals washed off farmland.

4 sewage leaking from drains.

4.7.3.2 Waste management

Question 15

June 2009 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Organic foods have become popular in recent years. They are grown without the use of pesticides and artificial fertilisers. But a government report in 2007 showed that the production of some organic foods is more damaging to the environment than their non-organic equivalents. However, supporters of organic farming claim that it is better than non-organic farming in conserving biodiversity and is better for the soil.

9A Biodiversity is . . .

1 the ability of plants and animals to adapt to a wide variety of different environments.

2 the ability of two plants or animals to live alongside each other for their mutual benefit.

3 the existence of a wide variety of plants and animals.

4 the existence of two different environmental adaptations of the same species of plant.

The table compares some of the effects of non-organic and organic food production on the environment.

Environmental effect and units	Amount in kg of production on farm					
	Sheep meat		Chicken		Milk	
	Non-organic	Organic	Non-organic	Organic	Non-organic	Organic
Energy used in MJ	23	18	12	16	2.5	1.6
Global warming potential in grams of CO_2 equivalent	17 400	10 100	4750	6680	1060	1230
Freshwater pollution by fertiliser potential in grams of phosphate equivalent	200	584	49	86	6.3	10.3
Acidification potential in grams of sulfur dioxide equivalent	380	1510	173	264	16.2	26.4
Land use in hectares	0.0014	0.003	0.64	1.4	0.001	0.002

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9B The information in the table indicates that . . .

1 all organic food production uses more energy than non-organic farming methods.

2 changing completely to organic methods will at least double the amount of land used for food production.

3 organic food production improves the environment.

4 organic farming reduces the amount of pollution resulting from sulfur dioxide.

4.7.3.2 Waste management

Question 15 · continued

9C A change from non-organic farming methods to the organic production of chicken and milk may . . .

1 contribute to an increase in acid rain.

2 help to reduce pollution of freshwater.

3 help to reduce global warming.

4 reduce the amount of energy consumed in the production of the food.

9D Which of the foods in the table is responsible for the greatest increase in environmental pollution when it is produced organically rather than non-organically?

1 sheep meat

2 chicken

3 milk

4 it is impossible to tell from this data

END OF TEST

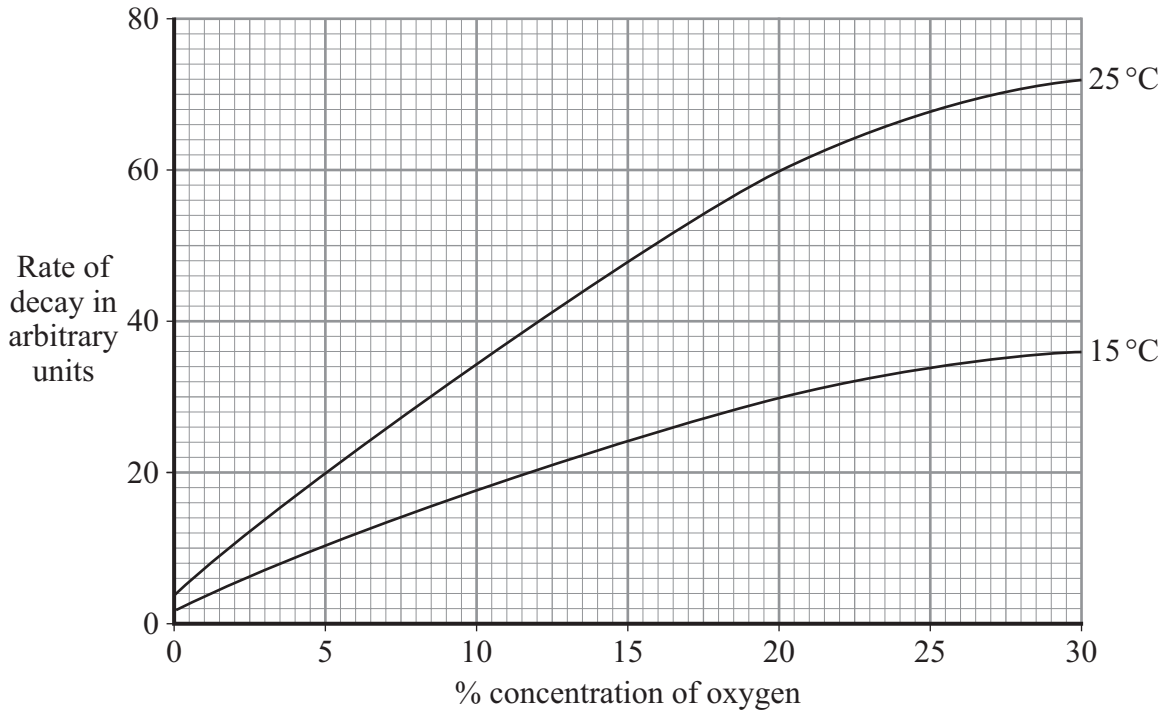
4.7.3.2 Waste management

Question 16

June 2009 | BLY2H | Original Q2 | Legacy

2 Gardeners often put waste materials onto compost heaps.

The graph shows how the conditions in a compost heap affect how quickly waste materials in the heap decay.



2 (a) (i) Describe the effect of increasing the temperature from 15 °C to 25 °C on the rate of decay at 20 % oxygen concentration.

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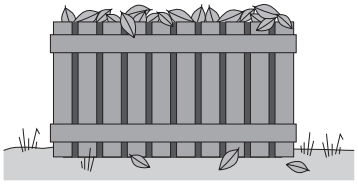
(2 marks)

4.7.3.2 Waste management

Question 16 · continued

for mark

2 (a) (ii) Gardeners are advised to put waste materials into special compost bins.
These bins have holes in their sides.



Holes in the sides of the compost bin help the waste materials to decay faster.

Explain why.

.....

.....

.....

.....

.....

(2 marks)

2 (b) A gardener noticed that some of his plants were growing poorly.

He put some decayed compost onto the soil, around the plants.
Six months later the plants were growing well.

Explain why.

.....

.....

(1 mark)

5

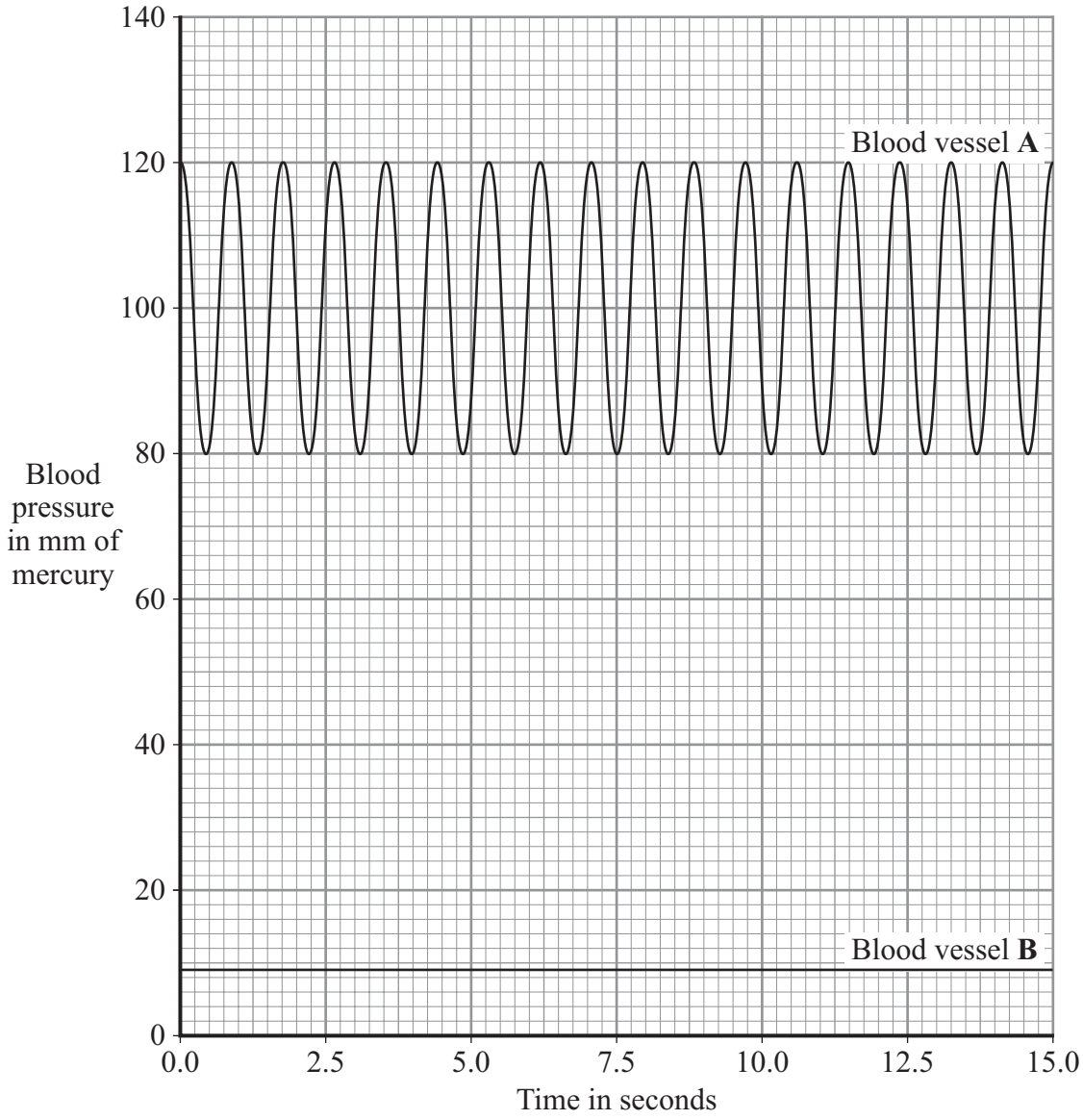
4.7.3.2 Waste management

Question 17

June 2009 | BLY3H | Original Q1 | Legacy

1 The heart pumps blood around the body. This causes blood to leave the heart at high pressure.

The graph shows blood pressure measurements for a person at rest.
The blood pressure was measured in an artery and in a vein.



4.7.3.2 Waste management

Question 17 · continued June 2009 | BLY3H | Original Q1 | Legacy

for mark

1 (a) Which blood vessel, **A** or **B**, is the artery?

Blood vessel .....

Give **two** reasons for your answer.

Reason 1 .....

.....

Reason 2 .....

.....

(2 marks)

1 (b) Use information from the graph to answer these questions.

1 (b) (i) How many times did the heart beat in 15 seconds? .....

(1 mark)

1 (b) (ii) Use your answer from part (b)(i) to calculate the person's heart rate per minute.

.....

.....

Heart rate = ... beats per minute

(1 mark)

1 (c) During exercise, the heart rate increases. This supplies useful substances to the muscles and removes waste materials from the muscles at a faster rate.

1 (c) (i) Name **two** useful substances that must be supplied to the muscles at a faster rate during exercise.

1 .....

2 .....

(2 marks)

1 (c) (ii) Name **one** waste substance that must be removed from the muscles at a faster rate during exercise.

.....

(1 mark)

7

4.7.3.2 Waste management

Question 18

June 2009 | BLY3H | Original Q3 | Legacy

3 **Photograph 1** shows a biogas generator on a farm in India.

Photograph 1



3 (a) Name the fuel gas present in biogas.

.....

(1 mark)

3 (b) Name the process that produces biogas.

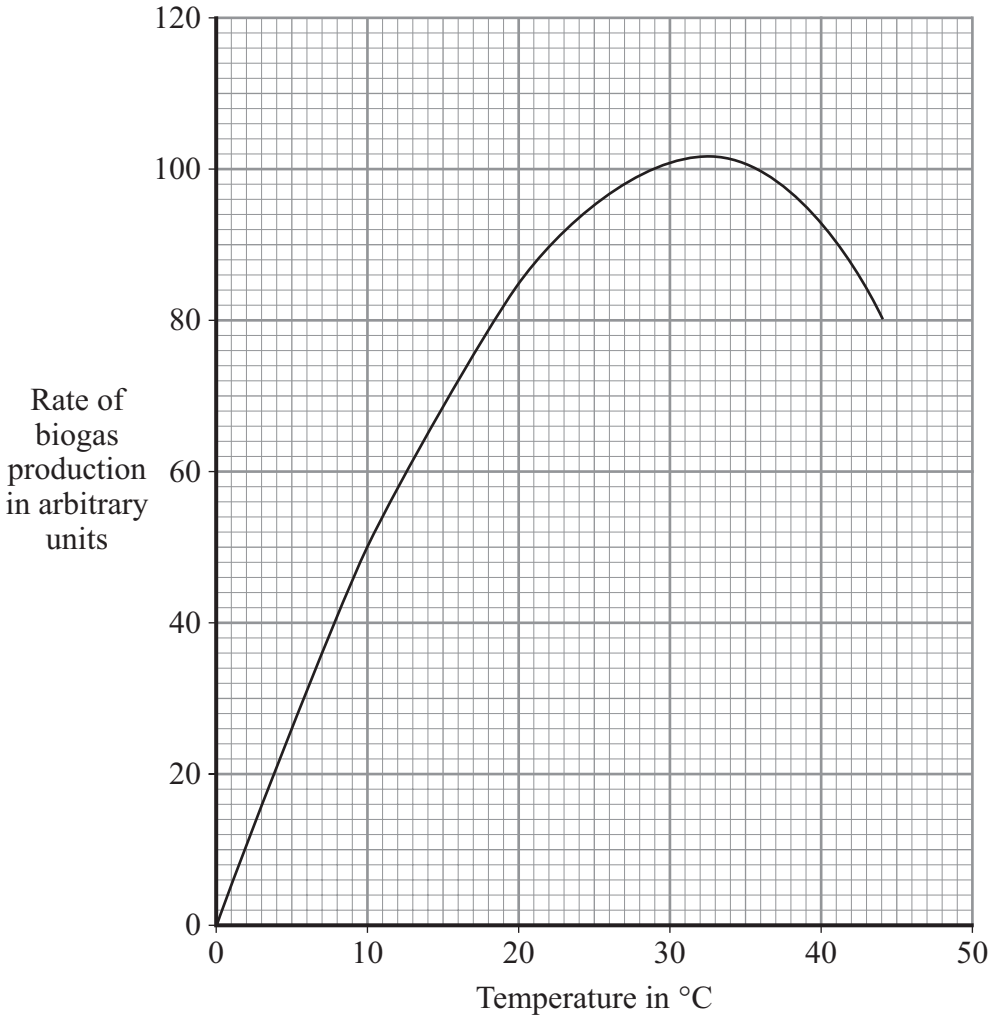
.....

(1 mark)

Question 18 · continued

for mark

3 (c) The graph shows the effect of temperature on the rate of biogas production.



3 (c) (i) What is the best temperature for biogas production? .....°C

(1 mark)

3 (c) (ii) In India, daytime temperatures can sometimes be higher than 40 °C.
It is useful to place the biogas generator underground.

Use information from the graph to suggest why.

.....

.....

.....

.....

(2 marks)

Question 3 continues on the next page

Question 18 · continued

for mark

3 (d) **Photograph 2** shows a set of three biogas generators built at a sewage works in the UK in 2004.

Photograph 2



Temperatures at the UK sewage works vary between 0 °C and 25 °C.
The UK biogas generator has concrete walls, 60 cm thick.

How does the thickness of the walls affect the rate of biogas production?

Give a reason for your answer.

.....

.....

.....

.....

(2 marks)

(Extra space) .....

7

4.7.3.2 Waste management

Question 19

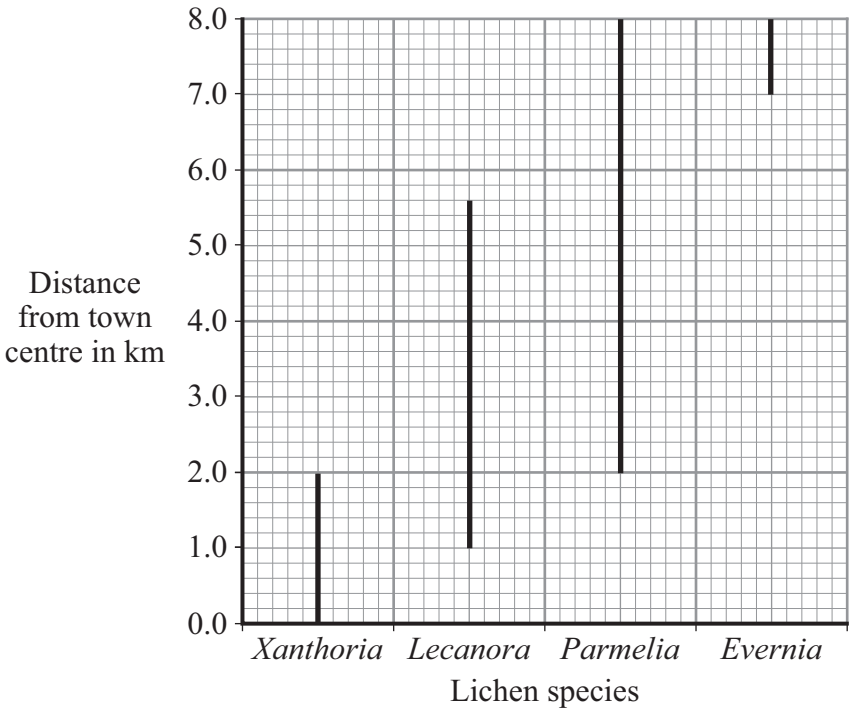
January 2010 | BLY1H | Original Q3 | Legacy

3 Lichens are sensitive to the amount of sulfur dioxide in the atmosphere. They are used as indicator species for the amount of air pollution. Air pollution is generally higher in town centres than in the countryside.

Students investigated the relationship between lichen species and distance from a town centre.

- On a map, they drew a transect (line) from the centre of the town to the countryside.
- They examined sites every 200 metres along the transect (line).
- At each site, they recorded the lichen species growing on trees and walls up to a height of 2 metres.

The graph shows their results.
The lines on the graph indicate the range of each lichen species.



3 (a) Give **one** way in which the students could have obtained more accurate results.

.....

.....

(1 mark)

4.7.3.2 Waste management

Question 19 · continued

for mark

3 (b) (i) Which lichen species was found over the greatest range?

.....

(1 mark)

3 (b) (ii) Which lichen species grows only in the least polluted air?

.....

(1 mark)

3 (c) One student concluded 'You can tell how much sulfur dioxide there is in the air by the amount of *Lecanora* growing'.

Give **two** reasons why this is **not** a valid conclusion.

1 .....

.....

2 .....

.....

(2 marks)

5

4.7.3.2 Waste management

Question 20

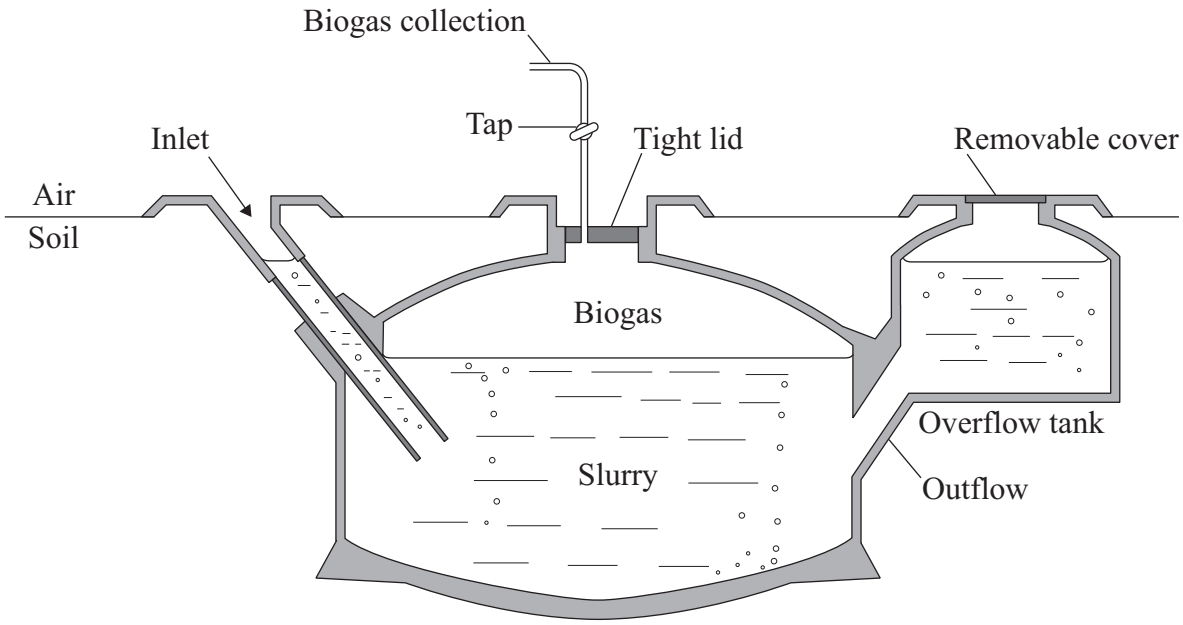
4 Biogas can be produced from waste materials that contain carbohydrates.

4 (a) Complete the sentence.

The main fuel gas present in biogas is ..... .

(1 mark)

4 (b) The diagram shows one type of biogas generator.



4 (b) (i) Suggest **two** advantages of having the biogas generator underground.

1 .....

.....

2 .....

.....

(2 marks)

4.7.3.2 Waste management

Question 20 · continued

for mark

4 (b) (ii) It is important that the level of liquid in the inlet and in the overflow tank is above that of the slurry.

Explain why.

.....

.....

.....

(1 mark)

4 (c) Temperatures in the UK are usually between 0°C and 25°C.

At a sewage works in the UK, some of the biogas produced from sewage sludge is burned and is used to heat water. The hot water is then pumped through metal pipes which pass back through the biogas generator.

Explain why this would be helpful in biogas production.

.....

.....

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.....

.....

(2 marks)

6

4.7.3.2 Waste management

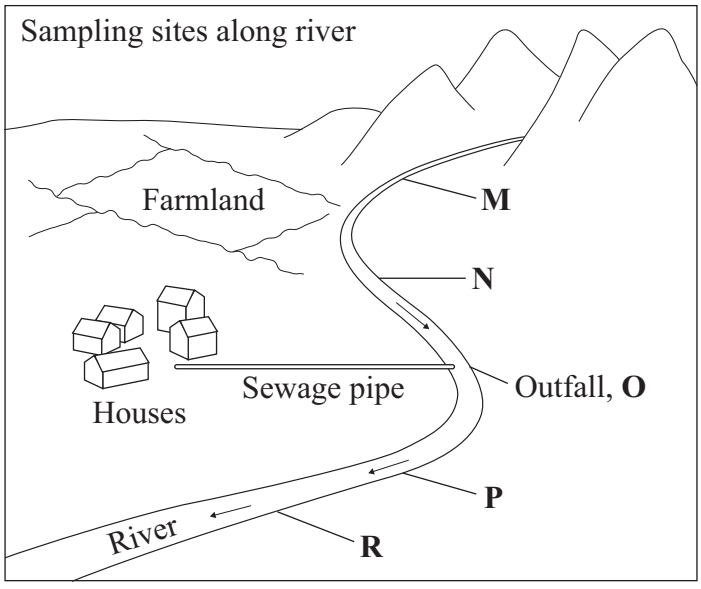
Question 21

March 2010 | BLY1BP | Original Q7 | Legacy

QUESTION SEVEN

Oxygen is used in respiration by organisms. The amount of oxygen in a river can give information about the health of a river.

The oxygen content of a river was measured by scientists at a series of locations, **M** to **R**, including where sewage entered the river.



7A The oxygen meter that the scientists used gave values in whole numbers. The readings at each location were all the same.

The most likely explanation for this is that . . .

1 the meter was not reliable.

2 any differences in the oxygen content were less than the sensitivity of the meter.

3 the oxygen content does not matter to the health of the river.

4 there was no difference in the oxygen content of the water at the different locations.

7B A different type of oxygen meter was then used.

The oxygen content of the river just below the sewage outfall was found to be lower than that above the outfall.

The most likely reason for this is that . . .

1 the river was running faster just below the sewage outfall.

2 less oxygen was dissolving from the air just below the sewage outfall.

3 dissolved oxygen was used up for respiration by microorganisms from the sewage.

4 toxic chemicals from the sewage outfall were polluting the river.

Question 21 · continued

There was a change in the species of animal that lived in the river further downstream past the sewage outfall.

The table shows the relative numbers of each type of organism from each sampling point along the river.

	Upstream		Sewage outfall	Downstream	
Sample position along river	**M**	**N**	**O**	**P**	**R**
Stonefly larvae	5	6	0	0	2
Water snail	20	15	10	12	12
Caddisfly larvae	7	8	1	2	6
Bloodworms	4	3	30	25	12

7C Which organism was found in greatest numbers in water with low oxygen levels?

1 stonefly larvae

2 water snails

3 caddisfly larvae

4 bloodworms

7D In the past year, the concentration of oxygen in the river downstream past the sewage outfall has decreased.

This is most likely to have been caused by . . .

1 a decrease in water temperature all along the river.

2 increased use of toxic chemicals in the surrounding farms that drain into the river.

3 an increase in the human population in the area.

4 fewer fish inhabiting the river.

4.7.3.2 Waste management

Question 22

June 2010 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

This question is about pollution and greenhouse gases.

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

A trees

B rice plants

C lichens

D invertebrates

	These organisms can . . .
1	be used as an indicator of air pollution.
2	be used as an indicator of water pollution.
3	‘lock up’ carbon dioxide for many years.
4	release methane into the atmosphere.

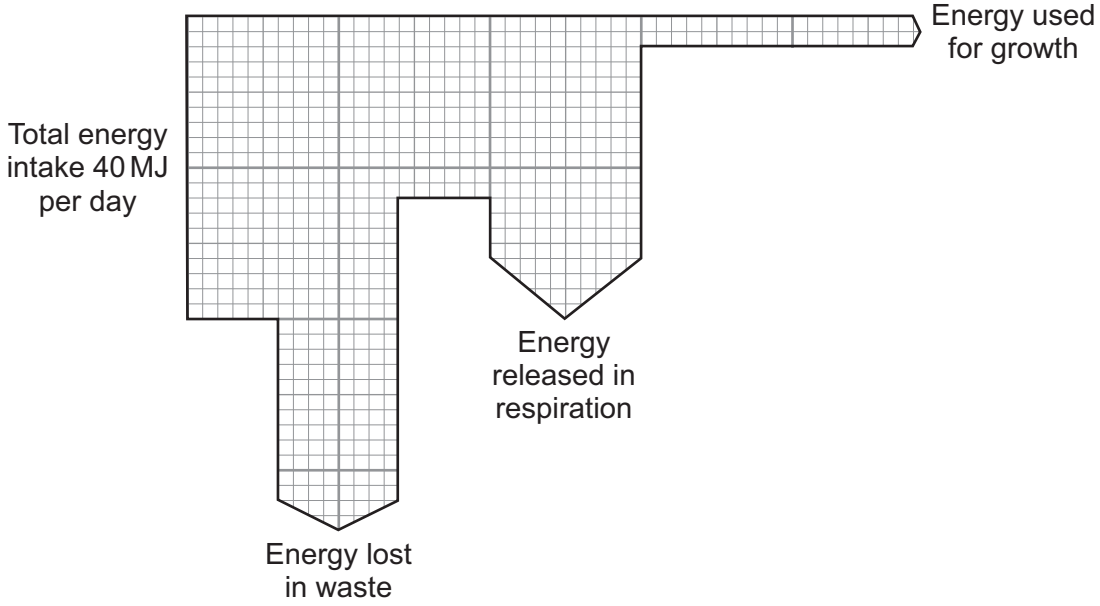
4.7.3.2 Waste management

Question 23

June 2010 | BLY2H | Original Q2 | Legacy

2 (a) **Diagram 1** represents what happens to the energy in the food eaten by a herbivore (an animal that eats plants).

Diagram 1



2 (a) (i) How much energy is released in respiration by the herbivore?

.....

.....

Answer ..... MJ per day
(1 mark)

2 (a) (ii) What proportion of the total energy intake of the herbivore is used for growth?

Show clearly how you work out your answer.

.....

.....

.....

Proportion .....
(2 marks)

2 (b) Give **two** ways in which the energy, released in respiration, is used by a herbivore.

1 .....

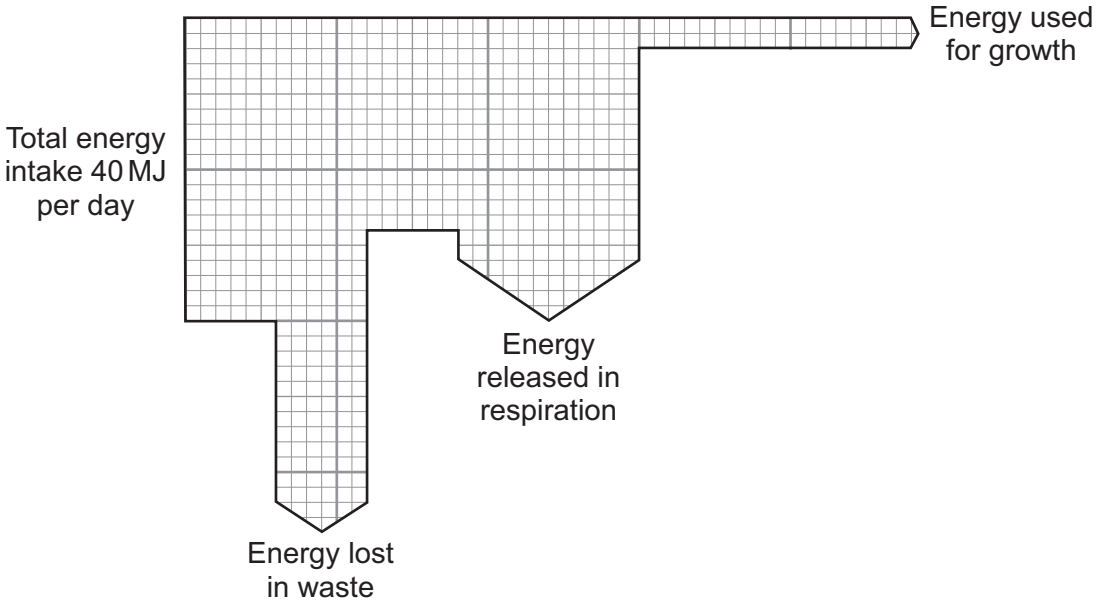
2 .....
(2 marks)

4.7.3.2 Waste management

Question 23 · continued

2 (c) **Diagram 2** represents what happens to the energy in the food eaten by a carnivore (an animal that eats other animals).

Diagram 2



The carnivore releases a greater proportion of energy in respiration than the herbivore.

Suggest **one** reason for this.

.....

.....

(1 mark)

2 (d) Some farmers keep their animals outdoors. Other farmers keep their animals indoors.

Keeping farm animals indoors increases the proportion of energy in their food that is converted into growth.

Give **two** reasons why.

1 .....

.....

2 .....

.....

(2 marks)

8

4.7.3.2 Waste management

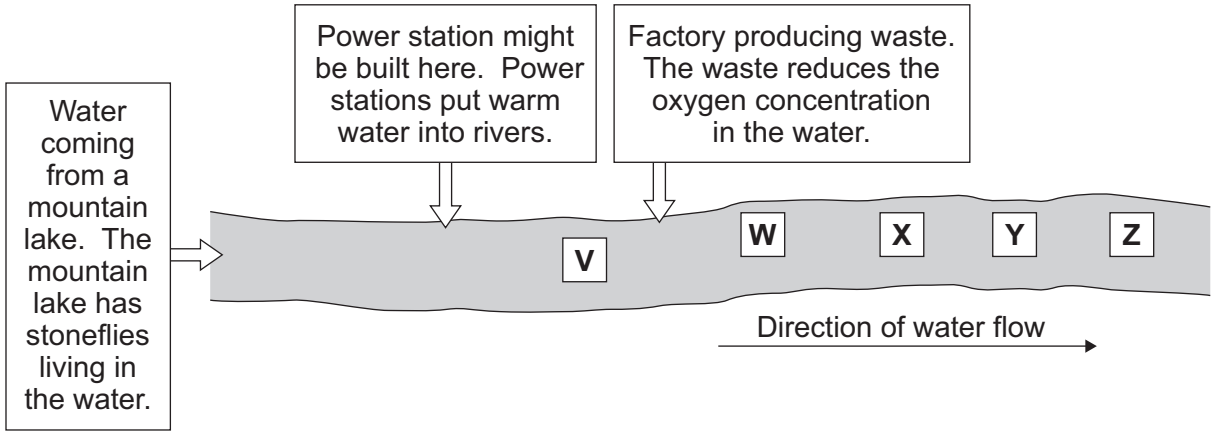
Question 24

November 2010 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

Scientists surveyed the invertebrate species found downstream from the place where a power station might be built.

They took samples from five sites, **V–Z**.



This table shows the species surveyed and the oxygen concentration which the species need to survive.

Oxygen concentration needed	Invertebrate indicator species
Low ↓ High	blood worms
	midge larvae
	hoglice
	shrimps
	stoneflies
	mayflies

4A Which row in the table shows the species most commonly found at each of the sites.

	V	W	X	Y	Z
1	stoneflies	blood worms	midge larvae	hoglice	shrimps
2	stoneflies	midge larvae	hoglice	shrimps	blood worms
3	stoneflies	hoglice	blood worms	midge larvae	shrimps
4	stoneflies	shrimps	hoglice	midge larvae	blood worms

4.7.3.2 Waste management

Question 24 · continued

A student used a thermometer and an oxygen meter to analyse four samples of river water.

Temperature of water in °C	23	15	6	15
Oxygen dissolved in water in mg per dm^3	1.9	6.5	8.0	6.1

4B Which of the following best describes the relationship between the temperature of the water and the amount of oxygen dissolved in the water?

1 The higher the temperature, the more oxygen is dissolved.

2 Oxygen concentration is directly proportional to temperature.

3 The higher the temperature, the less oxygen is dissolved.

4 There is no relationship between temperature and the oxygen dissolved in the water.

4C The new power station will release water into the river at a temperature of 23 °C.

If the new power station is built, stoneflies near to this warm water would probably. . .

1 increase in numbers.

2 be replaced by mayflies.

3 be replaced by shrimps.

4 not be affected.

4D The survey carried out using indicator species was more useful than the survey carried out using oxygen meters.

This is because the meters . . .

1 only sampled the water once at each site.

2 are not very accurate.

3 are not very reliable.

4 cannot be calibrated.

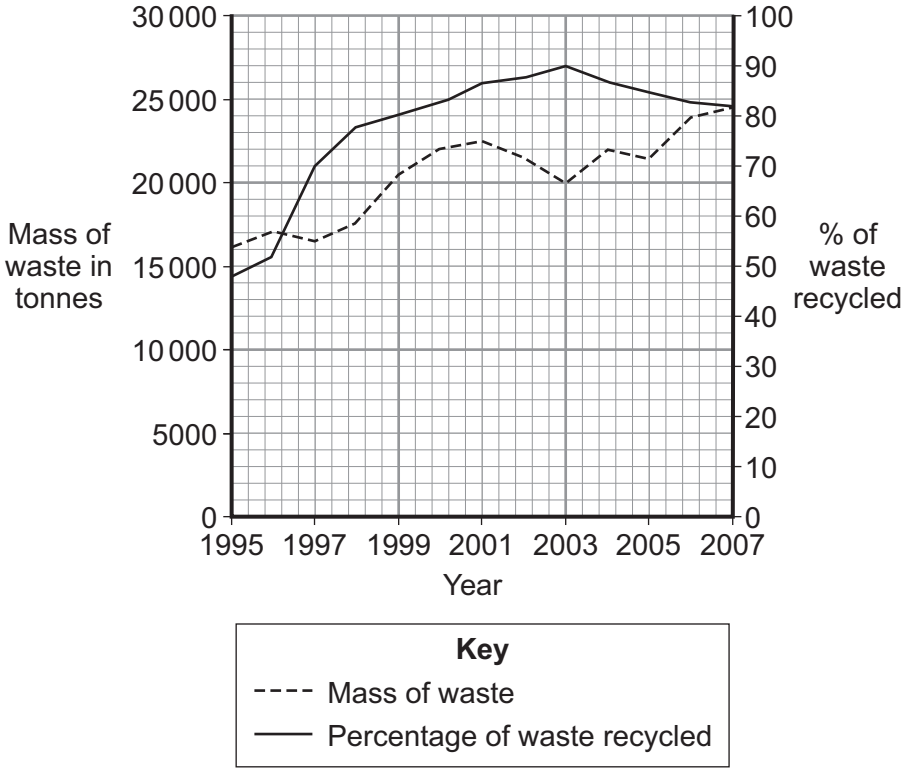
4.7.3.2 Waste management

Question 25

November 2010 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

The graph shows how waste is managed at an airport.



5A What mass of waste was **recycled** in 2003?

1 2 000 tonnes

2 18 000 tonnes

3 20 000 tonnes

4 22 000 tonnes

5B Which were the most successful years at this airport for waste prevention and recycling?

1 1995 to 1997

2 1998 to 2000

3 2001 to 2003

4 2004 to 2006

4.7.3.2 Waste management

Question 25 · continued

5C Some waste can be burned.

One **disadvantage** of this method is that the sulfur dioxide produced will add to . . .

1 global warming.

2 the greenhouse effect.

3 climate change.

4 acid rain.

5D There are advantages in burning waste.

Burning the waste could . . .

1 reduce the use of fossil fuels.

2 reduce air pollution.

3 increase the amount of carbon dioxide in the air.

4 increase the amount of landfill.

4.7.3.2 Waste management

Question 26

January 2011 | BLY1H | Original Q8 | Legacy

8 Scientists have brought an extinct species of mountain goat, the Pyrenean ibex, 'back to life'. These scientists used skin cells from preserved Pyrenean ibex in cloning experiments.

The Scientists:
- removed the nuclei from domestic goat egg cells
- transferred cell nuclei from the skin cells of the Pyrenean ibex into domestic goat egg cells
- used the domestic goats as surrogate mothers for the embryos that developed.

The scientists made 439 cloned embryos, but only 57 were suitable for transfer into the surrogate goat mothers. Only seven of the goats got pregnant and only one live offspring was born.

Some biologists are very worried about using cloning to preserve endangered animals, because cloned animals often have developmental problems. Some endangered animals are difficult to breed in captivity. For these animals cloning is another way to continue the genetic line.

The biggest threats to endangered animals today are habitat loss, illegal hunting, pollution and climate change. Many scientists say that cloning is not as important as trying to preserve the wild places on Earth. The wild places are being lost very quickly and the animals and plants living in the wild places are dying out.

8 (a) The Pyrenean ibex was 'brought back to life'.

How is this process different from using adult cell cloning to clone a pet animal?

.....

.....

(1 mark)

4.7.3.2 Waste management

Question 26 · continued

8 (b) Evaluate the use of adult cell cloning to conserve endangered species.

Use the information given and your own knowledge and understanding.

Remember to give a conclusion to your evaluation.

.....

.....

.....

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.....

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(4 marks)

5

4.7.3.2 Waste management

Question 27

March 2011 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

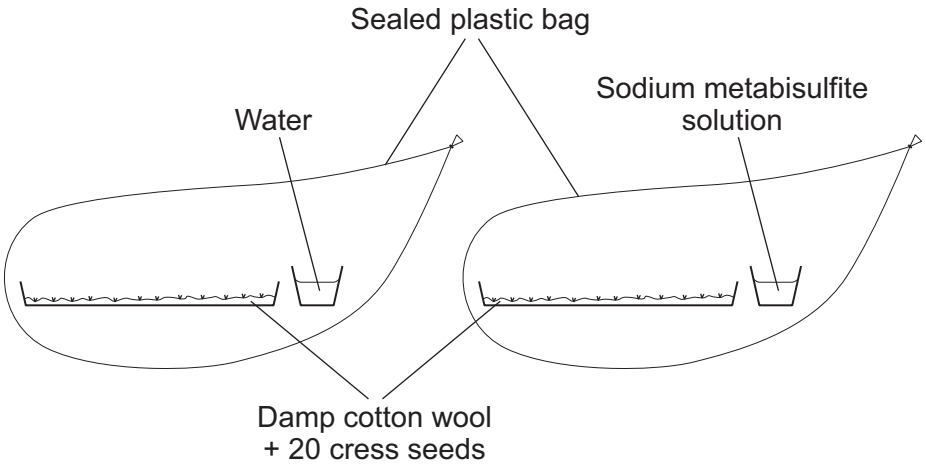
Sulfur dioxide is a pollutant gas.

5A Which row in the table shows activities that can release sulfur dioxide into the atmosphere?

	Burning coal	Planting rice	Farming cattle	Driving cars
1	✓	✓	✓	
2	✓	✓		✓
3	✓		✓	
4	✓			✓

The diagram shows an experiment to investigate the effect of sulfur dioxide gas on the germination of cress seeds.

Sodium metabisulfite solution gives off sulfur dioxide gas.



Both bags were left in the same warm laboratory for several days. Then the number of seeds that germinated was counted.

Five different groups of students did the experiment.

Question 27 · continued

5B Which row in the table shows the correct variables?

	Number of cress seeds in dish	Number of cress seeds that germinated	Sodium metabisulfite solution
1	dependent	control	independent
2	independent	dependent	control
3	control	dependent	independent
4	control	independent	dependent

The table shows the results for the five groups of students **R**–**V**.

Group	Number of seeds that germinated	
	Bag containing water	Bag containing sodium metabisulfite solution
R	17	5
S	15	8
T	15	5
U	16	8
V	17	9

5C What is the best conclusion that can be drawn from these results?

1 Sodium metabisulfite solution kills cress seeds.

2 Sulfur dioxide stops the germination of cress seeds.

3 Sulfur dioxide has a negative effect on the germination of cress seeds.

4 Water is toxic to a small number of cress seeds.

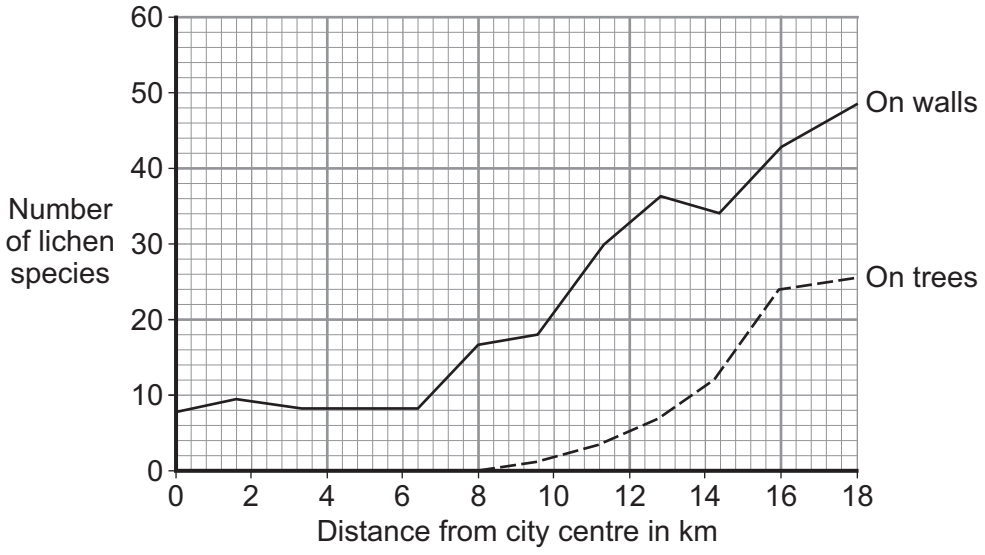
Question 5 continues on the next page

Question 27 · continued

5D Scientists counted the lichen species found on the walls and the trees in a city.

The table and graph show the effect of sulfur dioxide on the number of lichen.

Distance from city centre in km	Sulfur dioxide concentration in the air in g per m^3
0	200
2.5	160
8	65
90	65



What is the best conclusion that can be drawn from this information?

1 No lichens can survive at concentrations between 160 and 200 g per m^3.

2 Lichens growing on walls are less tolerant of sulfur dioxide than lichens growing on trees.

3 Lichens that grow on trees cannot tolerate sulfur dioxide concentrations above 65 g per m^3.

4 Lichens that grow on walls cannot tolerate sulfur dioxide concentrations above 200 g per m^3.

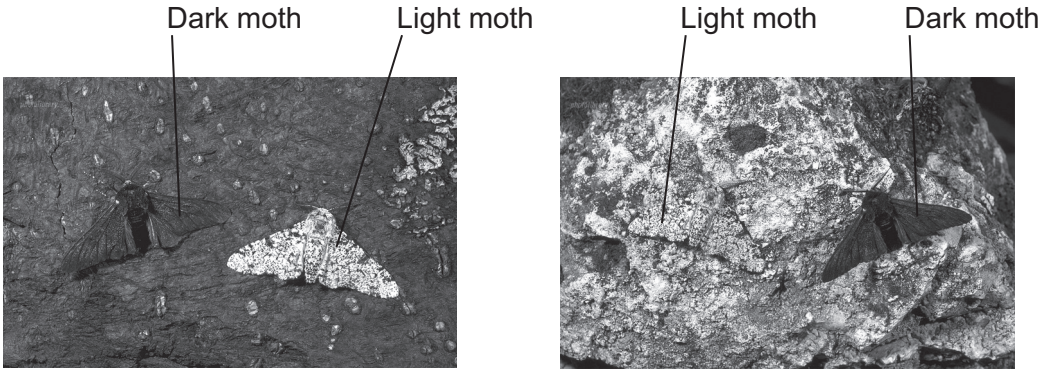
4.7.3.2 Waste management

Question 28

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 28 · 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

4.7.3.2 Waste management

Question 29

June 2011 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

Some living organisms are used as indicators of pollution.

5A A river with very few species of invertebrates is likely to have a low concentration of dissolved . . .

1 carbon dioxide.

2 fertiliser.

3 oxygen.

4 pesticide.

5B An area with very few lichen species is most likely to be polluted by . . .

1 carbon dioxide.

2 fertiliser.

3 methane.

4 sulfur dioxide.

Lichens grow on rocks at the top of the seashore. Waves often cover some of the lichens.

In an investigation on a rocky seashore, scientists recorded each type of lichen they found in a 25 cm quadrat, from low-tide level upwards. The same quadrats were used to repeat the investigation on a similar area of the shore nearby.

It was important to complete the investigation in one week so that climatic conditions were as similar as possible. This meant that the scientists needed the help of students to complete the work on time.

5C The investigation might have produced unreliable results because . . .

1 the investigation was carried out in different climatic conditions.

2 the investigation was not repeated.

3 the quadrats were different sizes.

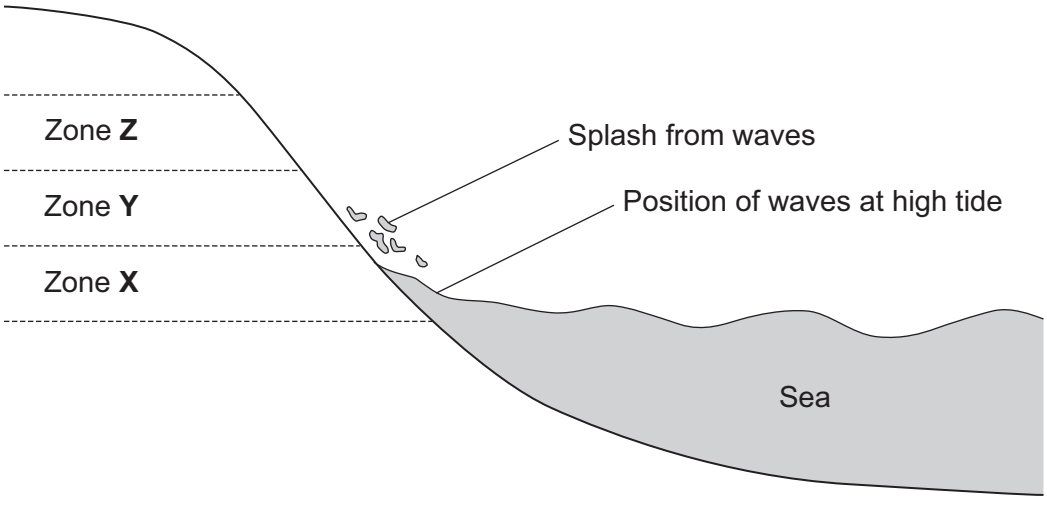
4 the students may not have been experts at identifying lichens.

Question 29 · continued

5D The table shows the results of the investigation.

Zone	Colour of lichens	Number of types of lichen	Description of lichens
X	black	2	crusty
Y	orange	3	leafy
Z	grey	6	tufted

The diagram shows the positions of the lichen zones on the rocks.



The results suggest that . . .

1 grey lichens are able to tolerate being covered by sea water.

2 orange lichens grow at the lowest level on the shore.

3 tufted lichens grow on the highest parts of the shore.

4 crusty lichens get washed off the rocks by the tide.

4.7.3.2 Waste management

Question 30

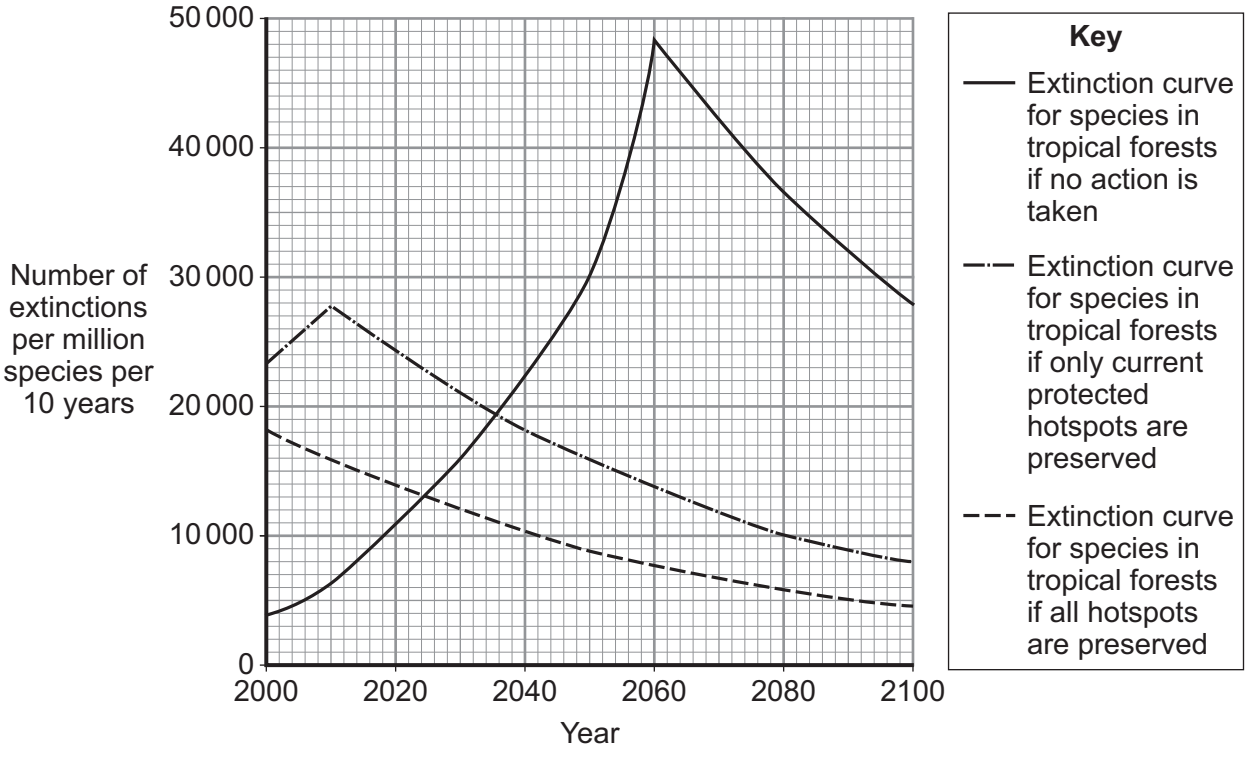
June 2011 | BLY1BP | Original Q6 | Legacy

QUESTION SIX

The graph shows the predicted number of extinctions of species in tropical forests in the 21st century.

A decade is 10 years.

Hotspots are areas with a very large biodiversity.



Scientists estimate that now there are about 10 000 000 species in the tropical forests.

6A How many of these species are likely to become extinct in the decade beginning 2010 if only current protected hotspots are preserved?

1 80 000

2 180 000

3 280 000

4 480 000

4.7.3.2 Waste management

Question 30 · continued

6B If no action is taken, the number of extinctions in tropical forests will begin to drop after 2060.

This is because . . .

1 Earth is warming up.

2 there will be less pollution.

3 we will have found new sources of energy.

4 most of the hotspots will have been destroyed by 2060.

6C Disease has little effect as a cause of organisms becoming extinct.

This is probably because . . .

1 new diseases do not have much effect.

2 immunity to disease is inherited.

3 diseases cannot spread from one species to another.

4 organisms have developed resistance to most diseases.

6D Alien species are plants and animals that have been introduced to a new environment.

Alien species may cause extinction of organisms in tropical forests because alien species . . .

1 have the same distribution in the forests.

2 are similar to existing predators in the forests.

3 are similar to existing competitors in the forests.

4 may be better adapted to the forests.

4.7.3.2 Waste management

Question 31

June 2012 | BL1HP | Original Q6 | Legacy

6 The picture shows a zebra fish.



Illustration © Emily S. Damstra

Zebra fish are small freshwater fish that usually have black and silver stripes.
Zebra fish can tolerate a wide range of environmental conditions.

6 (a) Scientists have genetically modified zebra fish to act as pollution indicators.
The genetically modified zebra fish have a gene transferred from a jellyfish.
The gene allows the stripes of the zebra fish to change colour.

Describe how the scientists produced the genetically modified zebra fish.

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(3 marks)

6 (b) Some scientists are worried about the production of genetically modified zebra fish.

Suggest reasons why.

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(2 marks)

5

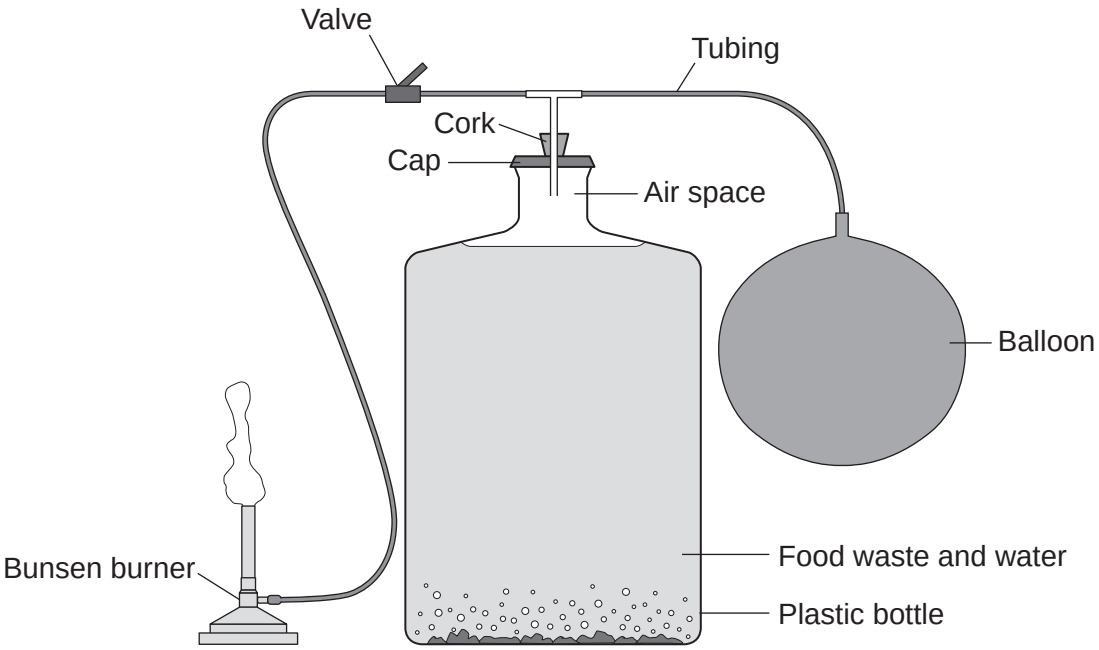
4.7.3.2 Waste management

Question 32

June 2014 | BL3HP | Original Q7 | Legacy

7 **Figure 7** shows a model biogas generator.

Figure 7



Students used the model biogas generator to investigate which type of food waste produces the greatest yield of biogas.

Gas collects in the balloon. The gas is then released through the valve and is burned at the Bunsen burner.

The students:

- put 500 g of potato peelings in the plastic bottle with some water and sealed the apparatus
- released the gas from the balloon after day two and timed how long the gas burned for
- released the gas that had collected in the balloon from day two to day four and timed how long the gas burned for
- repeated the investigation using 500 g of cooked rice, then 500 g of cabbage leaves and then 500 g of cooked pasta.

4.7.3.2 Waste management

Question 32 · continued

7 (a) **Table 3** shows the students' results.

Table 3

Type of food waste	Length of time the gas burned in seconds	
	After day two	From day two to day four
Potato peelings	0	175
Cooked rice	0	100
Cabbage leaves	0	150
Cooked pasta	0	160

7 (a) (i) Suggest why the gas collected in the balloon and released after day two did not burn.

[3 marks]

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7 (a) (ii) Suggest why potato peelings produced the most biogas.

[1 mark]

.....

.....

Question 7 continues on the next page

4.7.3.2 Waste management

Question 32 · continued

7 (b) Scientists investigated the production of biogas from different types of animal manure.

Table 4 shows the scientists' results.

Table 4

Type of manure	Volume of biogas produced in m^3 per kg of manure	Methane in the biogas as % of total volume
Cow	0.34	65
Pig	0.58	68
Hen	0.62	60
Horse	0.30	66
Sheep	0.61	67

7 (b) (i) Calculate the volume of methane produced from 1 kg of cow manure.

[2 marks]

.....

.....

Volume of methane = ... m^3

7 (b) (ii) One scientist concluded that it would be better to use sheep manure in a biogas generator than to use cow manure.

What is the evidence for this conclusion?

Use information from **Table 4** in your answer.

[2 marks]

.....

.....

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8

4.7.3.2 Waste management

Question 33

June 2015 | BL3HP | Original Q1 | Legacy

1 The world population is increasing and the need for food is increasing.

Mycoprotein is a high-protein food made in fermenters using the organism *Fusarium*.

The process takes only a few weeks to produce a large amount of food.

1 (a) (i) What type of organism is *Fusarium*?

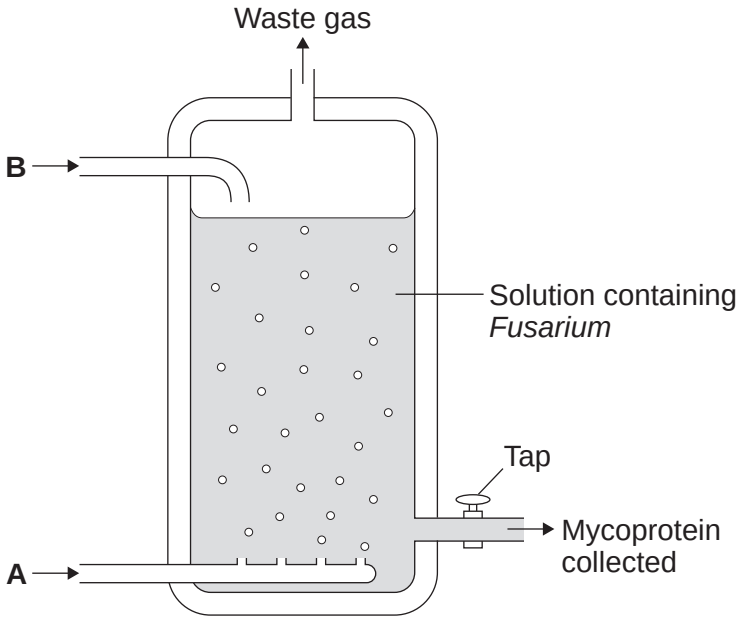
Draw a ring around the correct answer.

[1 mark]

bacterium **fungus** **virus**

Figure 1 shows a fermenter used in mycoprotein production.

Figure 1



1 (a) (ii) *Fusarium* makes mycoprotein. *Fusarium* respires aerobically.

Suggest which gas is added to the fermenter at point **A**.

[1 mark]

.....

4.7.3.2 Waste management

Question 33 · continued

1 (a) (iii) Another substance is added to the fermenter at point **B**. This substance is used in aerobic respiration.

Name this substance.

[1 mark]

.....

1 (b) People need to eat protein to grow and to be healthy.

Some people think that it would be an advantage to get more food from mycoprotein and less from farming animals.

Suggest **two** possible advantages of getting more food from mycoprotein.

[2 marks]

1 .....

.....

2 .....

.....

5

4.7.3.2 Waste management

Question 34

June 2015 | BL3HP | Original Q4 | Legacy

4 In many areas of the world the mass of household waste produced each year is increasing.

4 (a) Give **two** reasons why the mass of household waste is increasing each year.

[2 marks]

1 .....

.....

2 .....

.....

4 (b) **Table 1** shows how the mass of household waste in the UK has changed from 2004 to 2012.

Table 1

Year	Total mass of household waste in thousands of tonnes (including total household recycling)	Total mass of household recycling in thousands of tonnes	Percentage of household waste recycled
2004	25 658	5785	22.5
2006	25 775	7976	30.9
2008	24 334	9398	38.6
2010	23 454	9733	
2012	22 643	9782	43.2

4 (b) (i) Calculate the percentage of household waste recycled in 2010.

[2 marks]

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..... %

4.7.3.2 Waste management

Question 34 · continued

4 (b) (ii) The UK government has been encouraging a 'zero waste economy'.

In a 'zero waste economy', we reduce, reuse and recycle as much waste as possible.

A newspaper concluded that: **'The government's 'zero waste economy' has been successful.'**

Use information from **Table 1** to describe the reasons for and against the newspaper's conclusion.

[4 marks]

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4 (c) (i) Some waste releases carbon dioxide and methane into the atmosphere.
An increase in carbon dioxide and methane contributes to global warming.

Global warming can cause sea levels to rise.

Describe **two** other possible effects of global warming on our environment.

[2 marks]

1 .....

.....

2 .....

.....

4 (c) (ii) Storing the carbon dioxide helps to prevent more global warming.
Carbon dioxide can be stored (sequestered) in trees when they photosynthesise.

Give **one** different way in which carbon dioxide is sequestered in our environment.

[1 mark]

.....

.....

11

4.7.3.2 Waste management

Question 35

June 2015 | BL3HP | Original Q7 | Legacy

7 It is important to remove waste products from our bodies.

Healthy kidneys help to keep our internal environment constant.

7 (a) Describe how a healthy kidney produces urine.

[5 marks]

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7 (b) A child has kidney failure and is treated with dialysis.

Before the dialysis starts, the doctor measures the concentration of urea and glucose in the child's blood.

Table 3 shows the results.

Table 3

	Concentration in the blood before dialysis starts in mmol per dm^3
Urea	28
Glucose	6

The child has a normal blood glucose concentration.

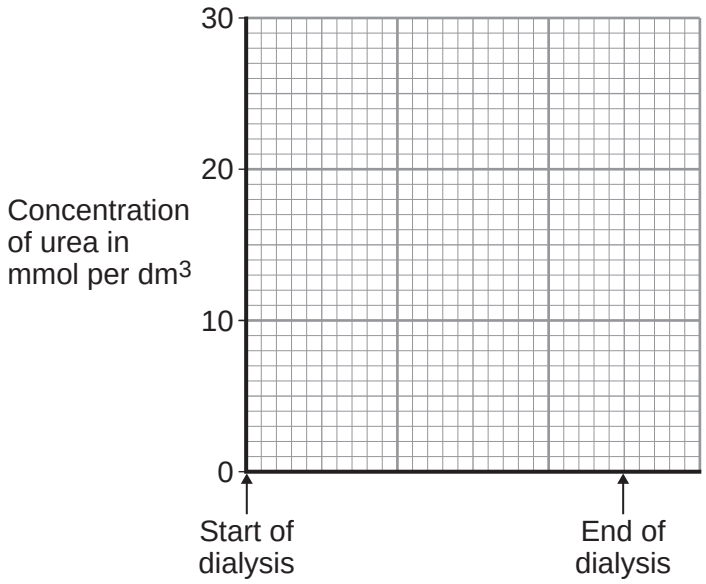
4.7.3.2 Waste management

Question 35 · continued

7 (b) (i) Sketch a graph on **Figure 7** to suggest what will happen to the concentration of urea in the blood during dialysis.

[1 mark]

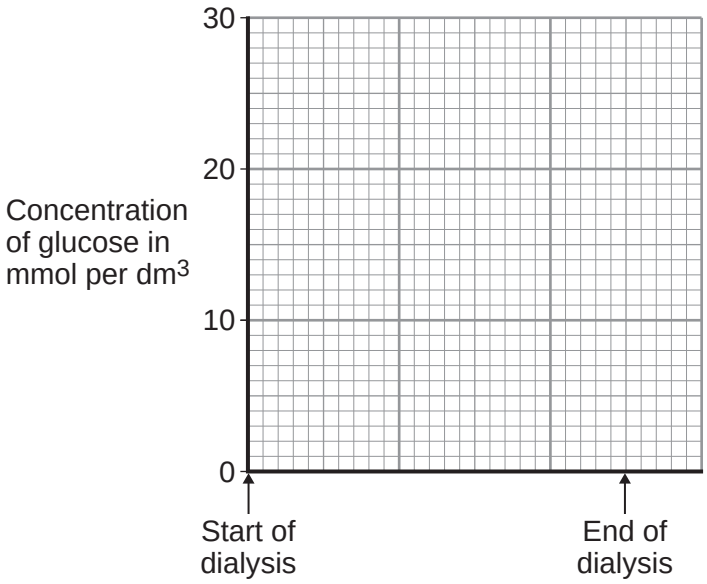
Figure 7



7 (b) (ii) Sketch a graph on **Figure 8** to suggest what will happen to the concentration of glucose in the blood during dialysis.

[1 mark]

Figure 8



Question 7 continues on the next page

4.7.3.2 Waste management

Question 35 · continued

7 (c) (i) Another way of treating kidney failure is with a kidney transplant.

A transplanted kidney can be rejected.

Explain why the new kidney may be rejected.

[3 marks]

.....

.....

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.....

.....

.....

7 (c) (ii) Describe **one** way in which doctors try to prevent kidney rejection.

[1 mark]

.....

.....

11

4.7.3.2 Waste management

Question 36

June 2016 | BL1HP | Original Q7 | Legacy

7 Students investigated a food chain in a garden.

lettuce ⟶ **snail** ⟶ **thrush (bird)**

The students:

- estimated the number of lettuce plants in the garden
- estimated the number of snails feeding on the lettuces
- counted two thrushes in the garden in 5 hours.

Table 2 shows the students' results and calculations.

Table 2

Organism	Population size	Mean mass of each organism in g	Biomass of population in g	Biomass from previous organism that is lost in g	Percentage of biomass lost
Lettuce	50	120.0	6000		
Snail	200	2.5	500	5500	91
Thrush	2	85.0	170	330	66

7 (a) (i) Give **two** ways that biomass is lost along a food chain.

[2 marks]

7 (a) (ii) Scientists estimate that about 90% of the biomass in food is lost at each step in a food chain.

Suggest **one** reason why the students' value for the percentage of biomass lost between the snails and the thrushes is only 66%.

[1 mark]

Question 7 continues on the next page

Question 36 · continued

7 (b) European banded snails have shells with different colours (light or dark) and with stripes or with no stripes.

Figure 6 shows two examples of European banded snails.

Figure 6



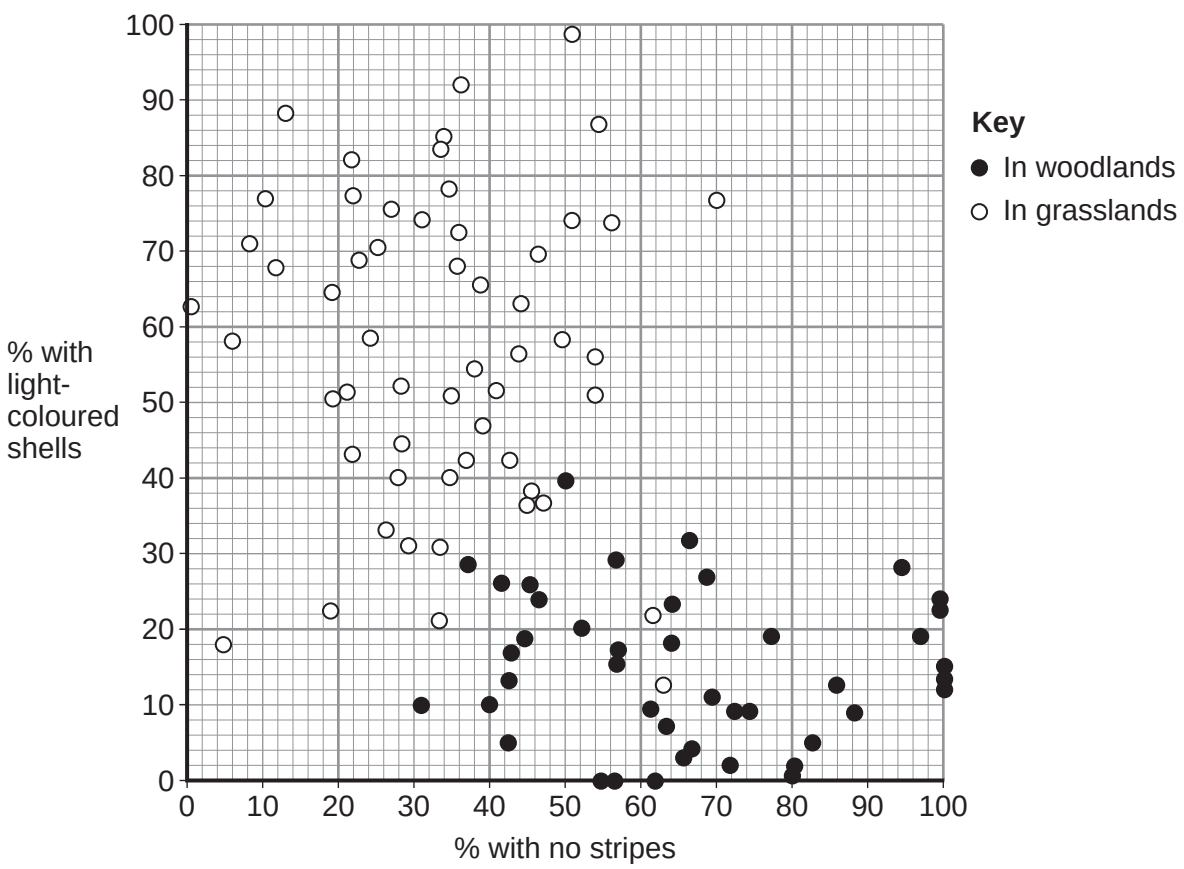
Dark-coloured shell, with stripes

Light-coloured shell, with no stripes

Figure 7 shows results from surveys in woodlands and in grasslands of the percentage of snails with light-coloured shells and the percentage of snails with no stripes.

Each point on **Figure 7** represents the results of one survey in one habitat.

Figure 7



4.7.3.2 Waste management

Question 36 · continued

7 (b) (i) **Figure 7** is a scatter graph.

Why is a scatter graph used for this data?

[1 mark]

_____

_____

7 (b) (ii) Compare the general appearance of snails that live in woodlands with the general appearance of snails that live in grasslands.

[2 marks]

_____

_____

_____

_____

7 (b) (iii) Suggest a reason for the general appearance of snails that live in woodlands.

[1 mark]

_____

_____

7 (c) Snails are **not** used as indicator species as they cannot give us information about pollution levels.

7 (c) (i) Name **one** type of animal that can be used as an indicator species.
State the environmental factor that the animal indicates.

[1 mark]

Indicator species _____

Environmental factor _____

7 (c) (ii) Give **one** different method of measuring the environmental factor you gave in part **(c)(i)**.

[1 mark]

_____

_____

9

4.7.3.2 Waste management

Question 37

June 2016 | BL3HP | Original Q9 | Legacy

9 **Figure 8** shows some information about 'stem cell burgers'.

Figure 8

The first laboratory burger has now been cooked

In July 2013 the first burger grown from cow stem cells was cooked.

Muscle stem cells from cows were grown into strands of beef in a laboratory. About 20 000 strands of beef were then made into a burger. The burger can be cooked and eaten by humans. This type of meat is called cultured meat.

The cultured meat is exactly the same as normal cow muscle tissue and the cells are not genetically modified.

9 (a) (i) Some scientists think using cultured meat instead of traditionally-produced meat will help reduce global warming.

Suggest **two** reasons why using cultured meat may slow down the rate of global warming.

[2 marks]

1 _____

_____

2 _____

_____

9 (a) (ii) Suggest **two** other possible advantages of producing cultured meat instead of farmed meat.

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

[2 marks]

1 _____

_____

2 _____

_____

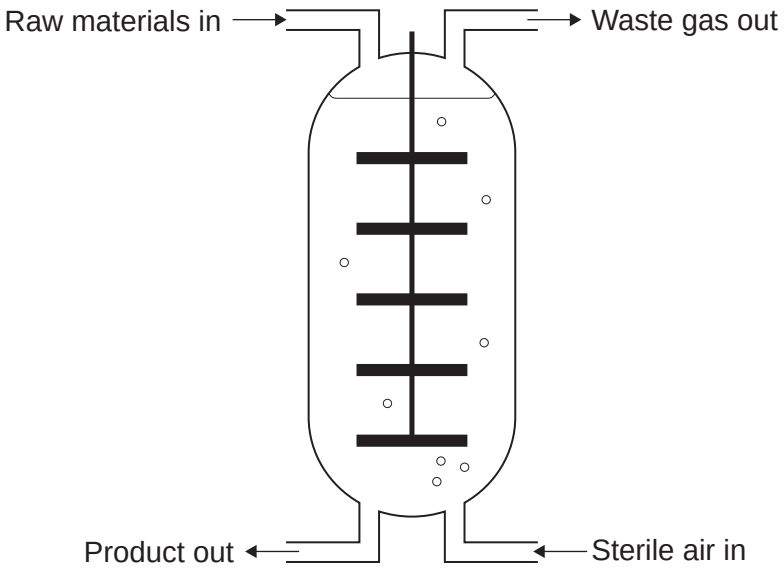
4.7.3.2 Waste management

Question 37 · continued

9 (b) Mycoprotein is one type of food that is mass-produced.

Figure 9 shows a fermenter used to produce mycoprotein.

Figure 9



Describe how mycoprotein is produced.

[4 marks]

8

4.7.3.2 Waste management

Question 38

June 2017 | BL3HP | Original Q3 | Legacy

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

Humans need to remove (excrete) waste products from the bloodstream.

Describe the processes that produce waste products **and** how the products are removed from the body.

In your answer you should include the names of the organs involved in producing waste products and those involved in removing the waste products.

You should **not** refer to faeces in your answer.

[6 marks]

Extra space

6

4.7.3.2 Waste management

Question 39

June 2017 | BL3HP | Original Q4 | Legacy

4 Human activities pollute the air with smoke and gases.

One of these gases is sulfur dioxide.

4 (a) What effect does sulfur dioxide have on our environment?

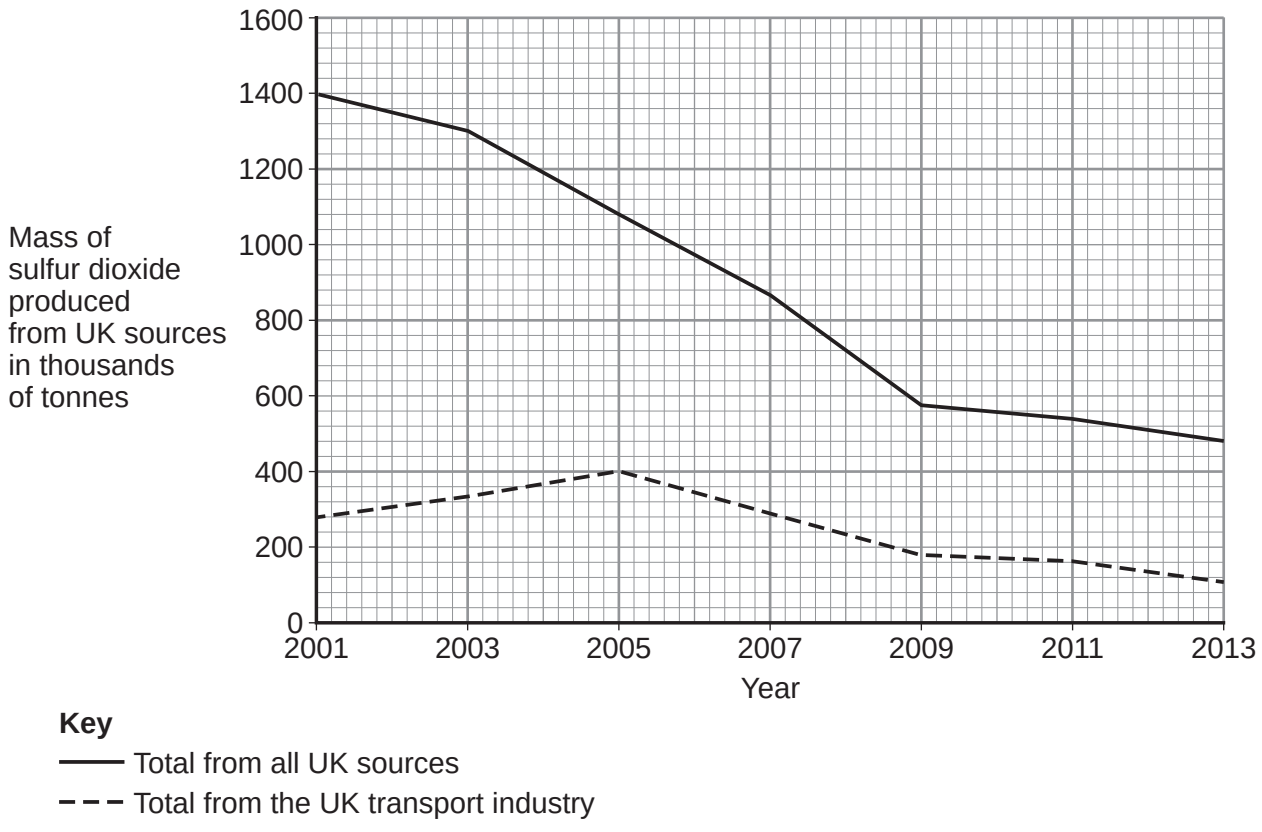
[1 mark]

Tick (✓) **one** box.

- Causes acid rain ☐
- Causes global warming ☐
- Causes more carbon sequestering ☐
- Causes sea levels to rise ☐

4 (b) **Figure 3** shows how the mass of sulfur dioxide produced from UK sources changed from 2001 to 2013.

Figure 3



4.7.3.2 Waste management

Question 39 · continued

4 (b) (i) The mass of sulfur dioxide produced from all UK sources has decreased.

Use information from **Figure 3** to complete the following calculation of the percentage decrease in the mass of sulfur dioxide produced.

[2 marks]

Total mass of sulfur dioxide produced in 2001 = _____ thousand tonnes

Total mass of sulfur dioxide produced in 2013 = 480 thousand tonnes

Decrease in mass of sulfur dioxide produced = _____ thousand tonnes

Percentage decrease working out: _____

_____

_____

Percentage decrease = _____

4 (b) (ii) Use data from **Figure 3** to describe the pattern in the mass of sulfur dioxide produced from the UK transport industry from 2001 to 2013.

[2 marks]

_____

_____

_____

_____

5

4.7.3.2 Waste management

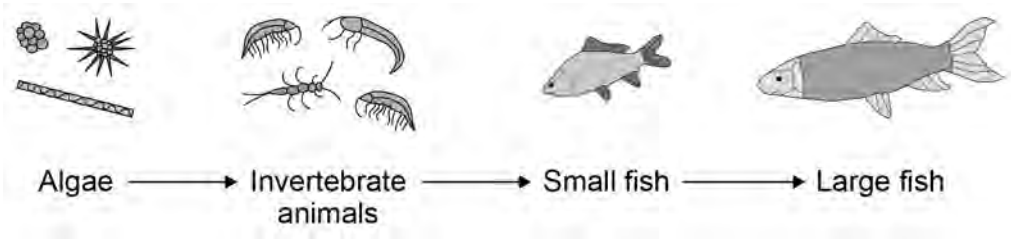
Question 40

June 2018 | 8461/2H | Original Q7

0 7 **Figure 8** shows:

- a food chain for organisms in a river
- the biomass of the organisms at each trophic level.

Figure 8



	Algae	Invertebrate animals	Small fish	Large fish
Biomass in g/m^2:	840	200	40	10

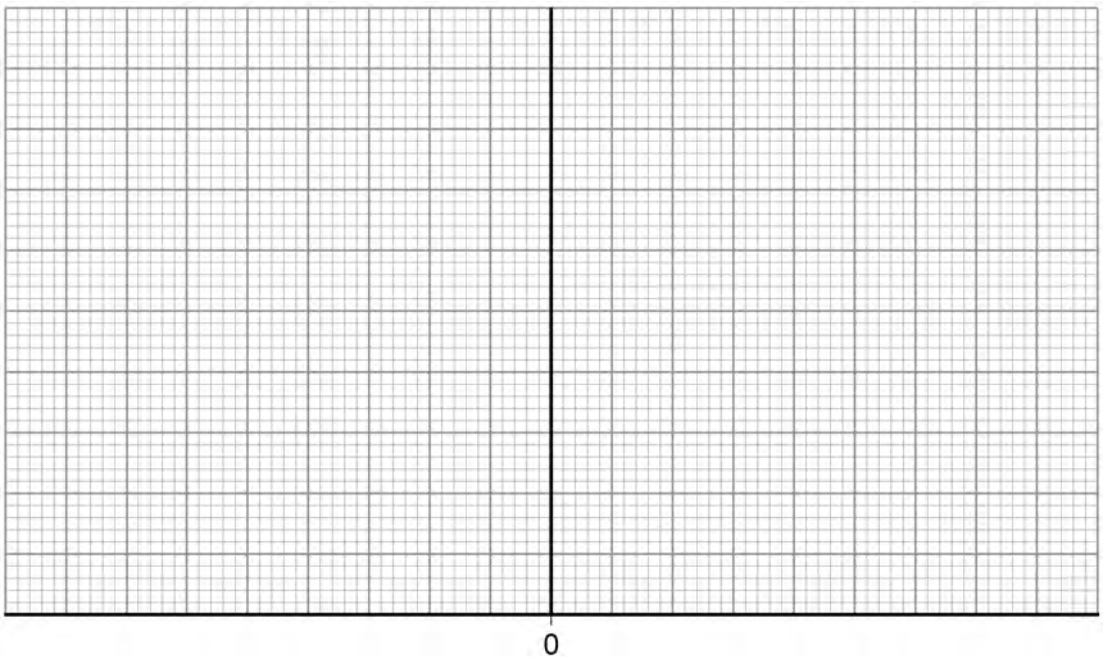
0 7 . 1 Draw a pyramid of biomass for the food chain in **Figure 8** on **Figure 9**.

You should:

- use a suitable scale
- label the x-axis
- label each trophic level.

[4 marks]

Figure 9



4.7.3.2 Waste management

Question 40 · continued

0 7 . 2 Calculate the percentage of the biomass lost between the algae and the large fish.

Give your answer to 2 significant figures.

[3 marks]

Percentage loss = _____

0 7 . 3 Give **one** way that biomass is lost between trophic levels.

[1 mark]

Question 7 continues on the next page

4.7.3.2 Waste management

Question 40 · continued

0 7 . 4 A large amount of untreated sewage entered the river. Many fish died.

Untreated sewage contains organic matter and bacteria.

Explain why many fish died.

[5 marks]

13

4.7.3.2 Waste management

Question 41

November 2020 | 8461/2H | Original Q7

0 7 A new dog food has been developed that does **not** contain meat from cows, sheep or chickens.

The new dog food contains insects.

The insects in the dog food factory are fed on waste vegetables.

0 7 . 1 Sketch the pyramid of biomass for the food chain that produces food for dogs from insects.

Label the pyramid.

[2 marks]

0 7 . 2 Describe **two** reasons why the biomass of the insects eaten by dogs does **not** all become biomass of the dogs.

[2 marks]

1 _____

_____

2 _____

_____

4.7.3.2 Waste management

Question 41 · continued

0 7 . 3 Explain how making dog food from insects could improve **human** food security in the future.

[4 marks]

8

4.7.3.2 Waste management

Question 42

June 2022 | 8461/2H | Original Q4

0 4 The rapid growth in human population means that more waste substances are released into the environment.

The release of substances into the environment can cause pollution.

0 4 . 1 Name **one** harmful substance that could cause air pollution.

[1 mark]

_____

0 4 . 2 Name **three** harmful substances that could cause water pollution.

Do **not** refer to plastic or to litter in your answer.

[3 marks]

1 _____

2 _____

3 _____

4.7.3.2 Waste management

Question 42 · continued

0 4 . 3 Describe how substances that pollute air and water could be harmful to humans and other living organisms.

[6 marks]

10

4.7.3.2 Waste management

Question 43

June 2022 | 8461/2H | Original Q7

0 7 A scientist found a polluted pond which had a new type of blue algae in the water.

The blue colour of the algae was caused by a mutation.

0 7 . 1 What is a mutation?

[1 mark]

Question 7 continues on the next page

Question 43 · continued

The scientist measured the number of blue algal cells in a sample of the pond water.

The scientist used a special slide which has a counting grid.

This is the method used.

1. Dilute 2.5 cm^3 of pond water to a volume of 10 cm^3 with distilled water.
2. Place a drop of the diluted pond water on the special slide, as shown in **Figure 8**.
3. Place a thick coverslip over the diluted pond water to give a depth of 0.1 mm of pond water.
4. Use a microscope to count the number of algal cells in a 0.2 mm × 0.2 mm square on the counting grid.

Figure 8 shows a side view of the special slide.

Figure 8

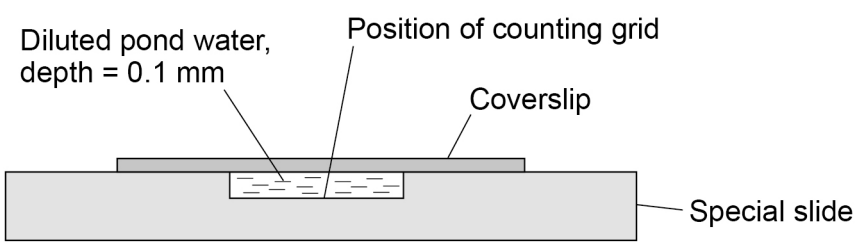
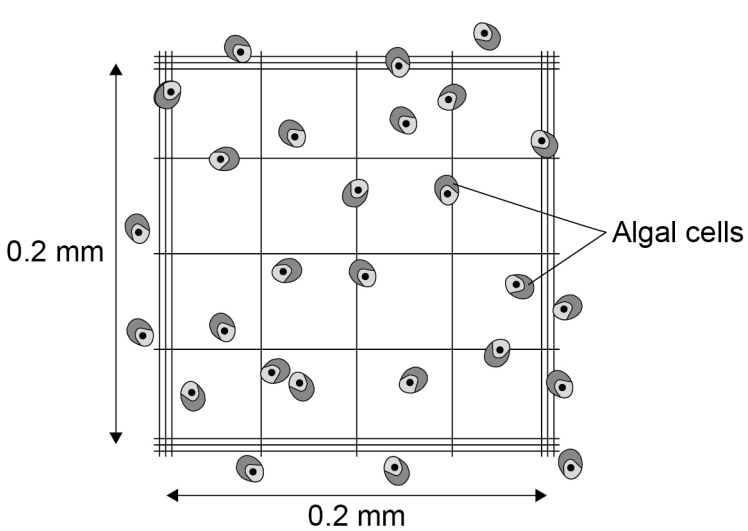


Figure 9 shows the view of the counting grid through a microscope.

Figure 9



Question 43 · continued

0 7 . 2 How many algal cells are in the 0.2 mm × 0.2 mm square in **Figure 9**?

Use the following procedure:

- Count all cells that are completely within the 0.2 mm × 0.2 mm square in the counting grid.
- Count cells that are touching the left side or the lower side of the square.
- Do **not** count cells that are touching the right side or the top side of the square.

[1 mark]

Number of algal cells in the 0.2 mm × 0.2 mm square = _____

0 7 . 3 One week later the scientist repeated the test and counted 14 cells on the 0.2 mm × 0.2 mm counting grid.

Calculate the number of algal cells in 1.0 mm^3 of **undiluted** pond water.

Use the scientist's second count of 14 cells.

[6 marks]

Number of algal cells in 1.0 mm^3 of undiluted pond water = _____

Question 7 continues on the next page

4.7.3.2 Waste management

Question 43 · continued

0 7 . 4 Suggest why the scientist diluted the pond water before placing it on the special slide.

[1 mark]

0 7 . 5 A student repeated the scientist's method.

The student used a thin coverslip over the diluted pond water instead of the thick coverslip.

The liquid pulled the thin coverslip downwards slightly.

Explain how the use of the thin coverslip would affect the results for the cell count.

[2 marks]

11