AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.2.3

Decomposition (biology only)

Past-paper questions

Tier	**Foundation**
Question groups	**33**
Available paper years	**2008–2025**

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.

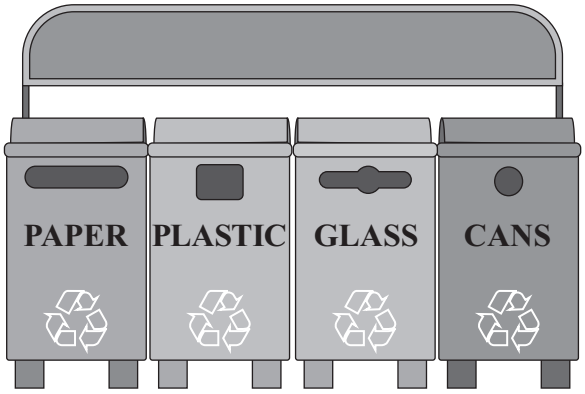
4.7.2.3 Decomposition (biology only)

Question 01

January 2008 | BLY1F | Original Q1 | Legacy

1 There are many ways in which we can help to protect the environment.

The drawing shows recycling bins.



(a) (i) Give **one** way in which recycling paper helps to protect the environment.

.....

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(1 mark)

(ii) Give **one** way in which recycling cans helps to protect the environment.

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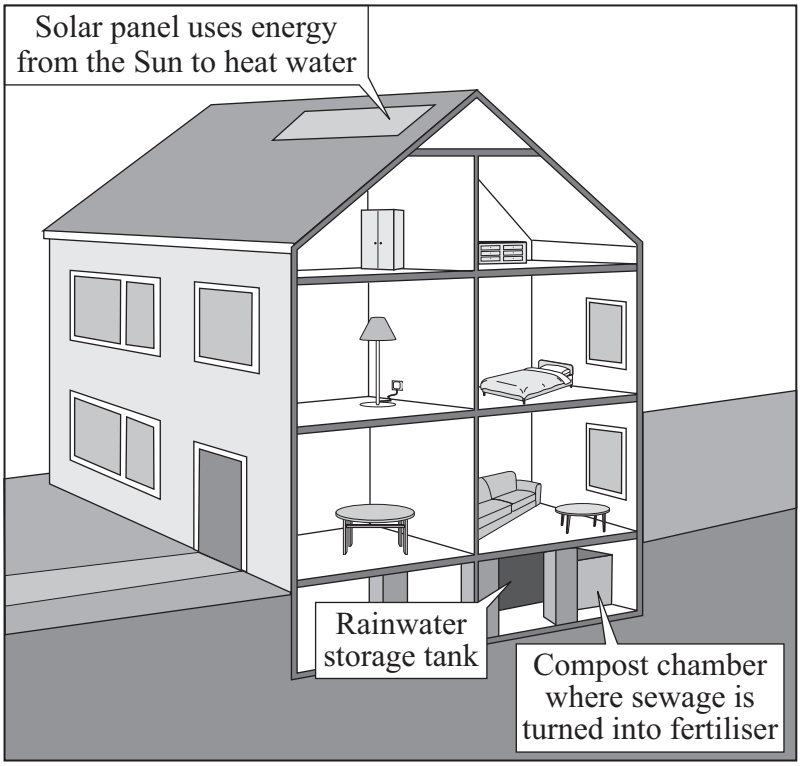
(1 mark)

4.7.2.3 Decomposition (biology only)

Question 01 · continued

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(b) The drawing shows an 'ecohouse'. This house has been designed to help to protect the environment.



How do the following features of the 'ecohouse' help to protect the environment?

(i) The solar panel

.....

.....

(1 mark)

(ii) The rainwater storage tank

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(1 mark)

(iii) The compost chamber

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(1 mark)

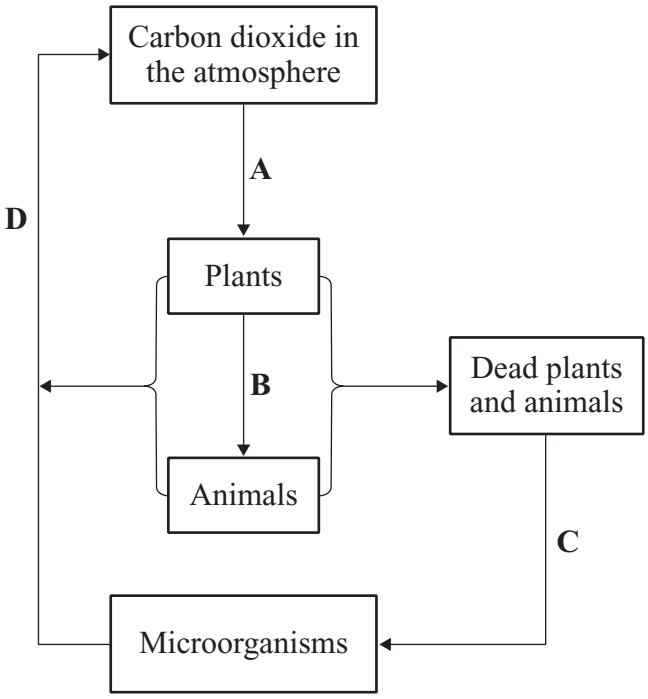
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4.7.2.3 Decomposition (biology only)

Question 02

January 2008 | BLY2F | Original Q7 | Legacy

7 The diagram shows part of the carbon cycle.



(a) Which letter, **A**, **B**, **C** or **D**, represents:

(i) respiration .....

(1 mark)

(ii) photosynthesis? .....

(1 mark)

4.7.2.3 Decomposition (biology only)

Question 02 · continued

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(b) Local authorities are encouraging people to recycle vegetable waste by converting it into compost.

Compost is made by mixing the vegetable waste with soil in a large container.

(i) Decay occurs more quickly if the container has holes in the sides.

Explain why.

.....

.....

.....

.....

(2 marks)

(ii) Spreading compost on the soil between plants leads to better growth of the plants.

Explain why.

.....

.....

(1 mark)

5

4.7.2.3 Decomposition (biology only)

Question 03

January 2008 | BLY3F | Original Q9 | Legacy

9 Read the passage below about biogas production in Sri Lanka, which is a country with a much warmer climate than the UK.

> Mr Ratnayake is a farmer. Using nothing more than cow dung, he has enough power to cook and provide heat and light for his home without using a single piece of wood. He collects the manure from his cows in their cattle shed. He then mixes the manure with water and leaves it to ferment in a large concrete pit. The gas produced is collected in a simple storage tank and is piped into his house for use.
>
> The dried manure left after this biogas is generated is richer than ordinary manure. It makes a good organic fertiliser for Mr Ratnayake's crops. He can then sell his crops at a higher price as they are organic produce.

(a) (i) What is the fuel gas present in biogas?

.....

(1 mark)

(ii) Name the process which produces biogas.

.....

(1 mark)

(b) (i) Give **two** ways in which Mr Ratnayake benefits from making biogas as described in the passage.

1 .....

.....

2 .....

.....

(2 marks)

4.7.2.3 Decomposition (biology only)

Question 03 · continued

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(ii) This design of biogas generator works well in Sri Lanka. It would not work so well in the UK.

Explain why.

.....

.....

.....

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(2 marks)

6

4.7.2.3 Decomposition (biology only)

Question 04

June 2008 | BLY2F | Original Q3 | Legacy

3 Gardeners often collect fallen leaves in autumn and place them on compost heaps.



3 (a) Over the next year the leaves decay.

Which living things cause leaves to decay?

.....

(1 mark)

3 (b) The leaves decay more quickly in summer than in winter.

Give **one** reason why.

.....

.....

(1 mark)

3 (c) The compost heap has holes in its sides to allow gases to enter.

Which gas is needed for decay?

Put a tick (✓) in the box next to your choice.

Carbon dioxide ☐

Nitrogen ☐

Oxygen ☐

(1 mark)

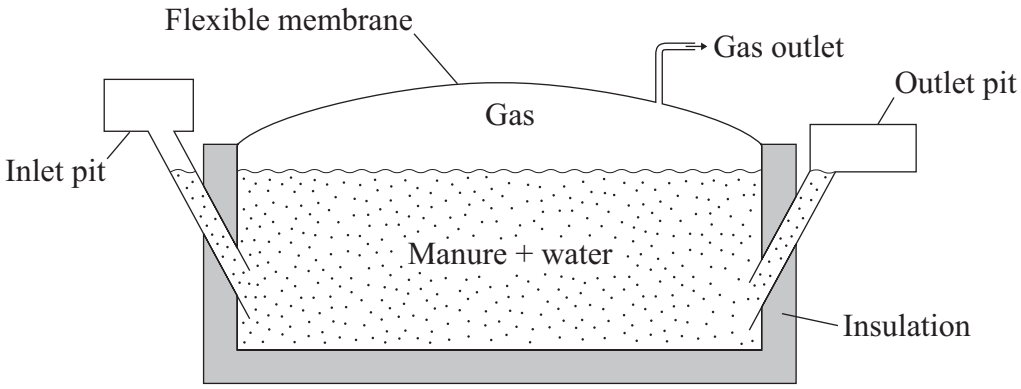
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4.7.2.3 Decomposition (biology only)

Question 05

June 2008 | BLY3F | Original Q3 | Legacy

3 The diagram shows one design of biogas generator used on a large dairy farm in the USA.



3 (a) What is the main, useful gas in biogas?

Draw a ring around **one** answer.

carbon dioxide **hydrogen** **methane**

(1 mark)

4.7.2.3 Decomposition (biology only)

Question 05 · continued

for mark

3 (b) The insulation is installed so that biogas is produced at a faster rate.

Why is biogas produced at a faster rate?

.....

.....

(1 mark)

3 (c) The table shows costs and income for this generator.

Item	Yearly costs in dollars	Yearly income in dollars
Electricity generated from biogas		22 800
Heating from burning biogas		4 200
Sale of fibre after biogas production		8 000
Operation and maintenance costs	10 000	

3 (c) (i) Calculate the yearly profit from the biogas generator.

Show your working.

.....

.....

.....

(2 marks)

3 (c) (ii) It cost 200 000 dollars to build the generator. Use your answer to part (c)(i) to calculate how many years it would take to pay back this cost.

.....

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(2 marks)

6

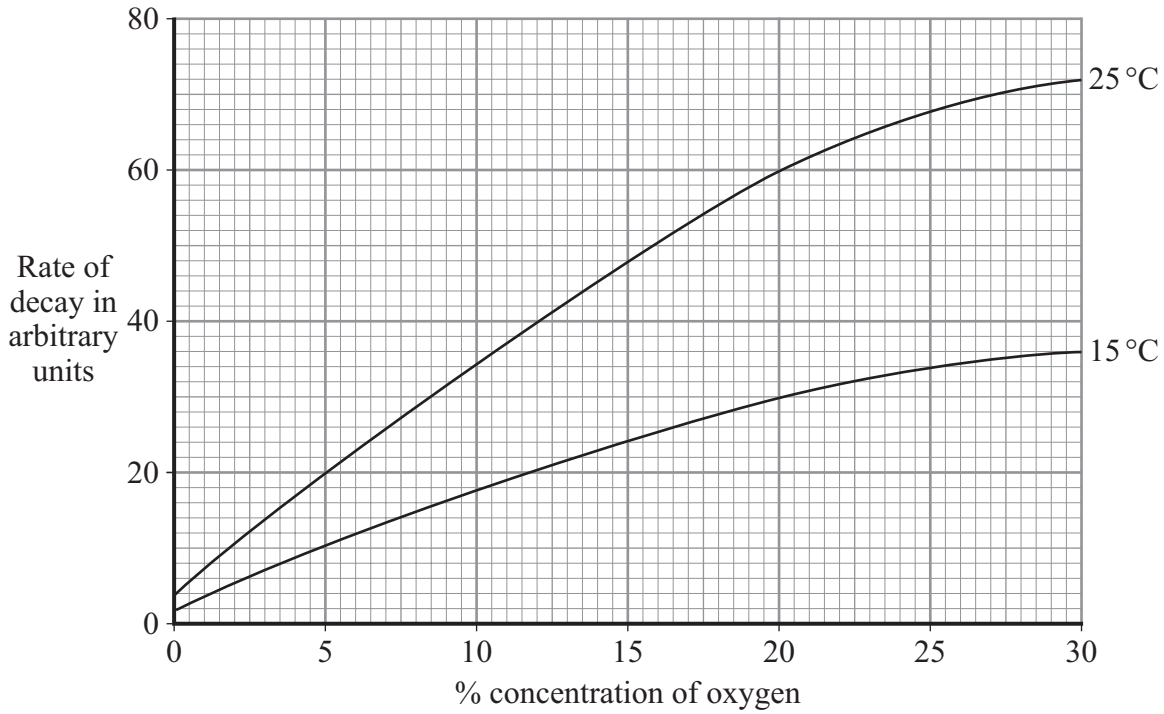
4.7.2.3 Decomposition (biology only)

Question 06

June 2009 | BLY2F | Original Q8 | Legacy

8 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.



8 (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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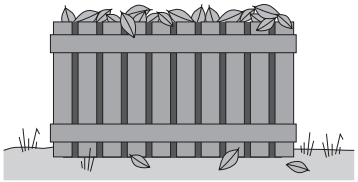
(2 marks)

4.7.2.3 Decomposition (biology only)

Question 06 · continued

for mark

8 (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.

.....

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.....

(2 marks)

8 (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

4.7.2.3 Decomposition (biology only)

Question 07

3 (a) Why did the students set up three flasks like **Flask A** rather than just one?

.....

.....

(1 mark)

3 (b) After one week, the students looked at one drop of liquid from each flask under a microscope.

Their results are given in the table.

Repeat number	Flask A	Flask B
1	No bacteria	Bacteria visible
2	No bacteria	Bacteria visible
3	No bacteria	Bacteria visible

4.7.2.3 Decomposition (biology only)

Question 07 · continued

for mark

Explain the results for **Flask A** and **Flask B**.

Flask A

.....

.....

.....

.....

Flask B

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.....

.....

.....

(3 marks)

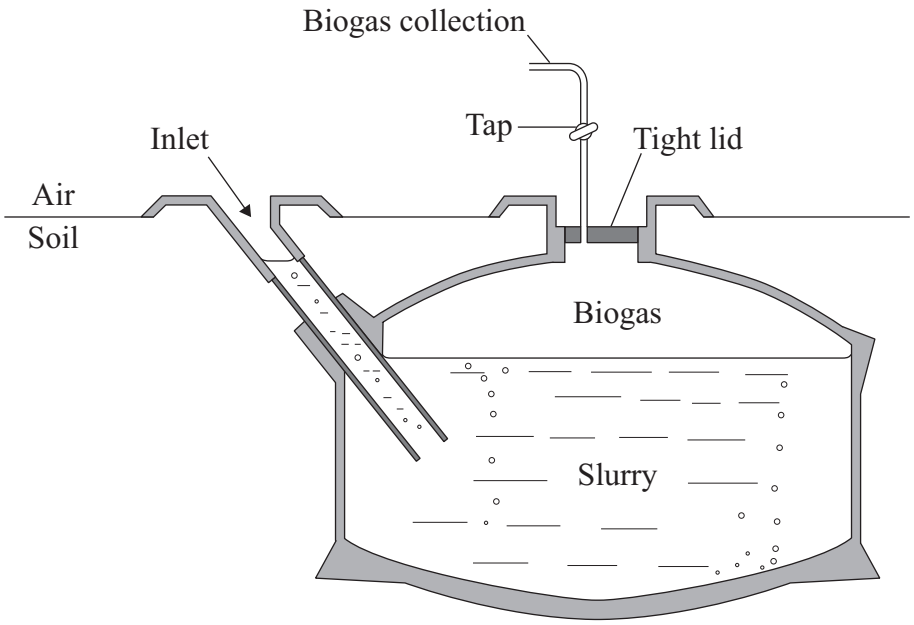
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4.7.2.3 Decomposition (biology only)

Question 07 · continued

for mark

4 The diagram shows one type of biogas generator.



4.7.2.3 Decomposition (biology only)

Question 08

January 2010 | BLY3F | Original Q4 | Legacy

4 (a) Give **two** advantages of having the biogas generator underground.

Tick (✓) **two** boxes.

It allows the digested slurry to soak into the soil. ☐

The biogas produced will be at a lower pressure. ☐

Very little of the biogas generator will be seen. ☐

It prevents unpleasant smells escaping. ☐

The temperature inside will not change much. ☐

(2 marks)

4.7.2.3 Decomposition (biology only)

Question 08 · continued

for mark

4 (b) The table shows the percentages of the different gases found in this biogas.

Gas	Percentage
Carbon dioxide	35.0
Hydrogen sulfide	1.5
Ammonia	1.5
Water vapour	2.0
Gas **X**	

Gas **X** is the main fuel gas found in biogas.

4 (b) (i) What is the name of gas **X**?

Draw a ring around **one** answer.

hydrogen **methane** **oxygen**

(1 mark)

4 (b) (ii) What is the percentage of gas **X** in the biogas?

Show clearly how you work out your answer.

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.....

.....

Percentage of gas **X** = ...

(2 marks)

5

4.7.2.3 Decomposition (biology only)

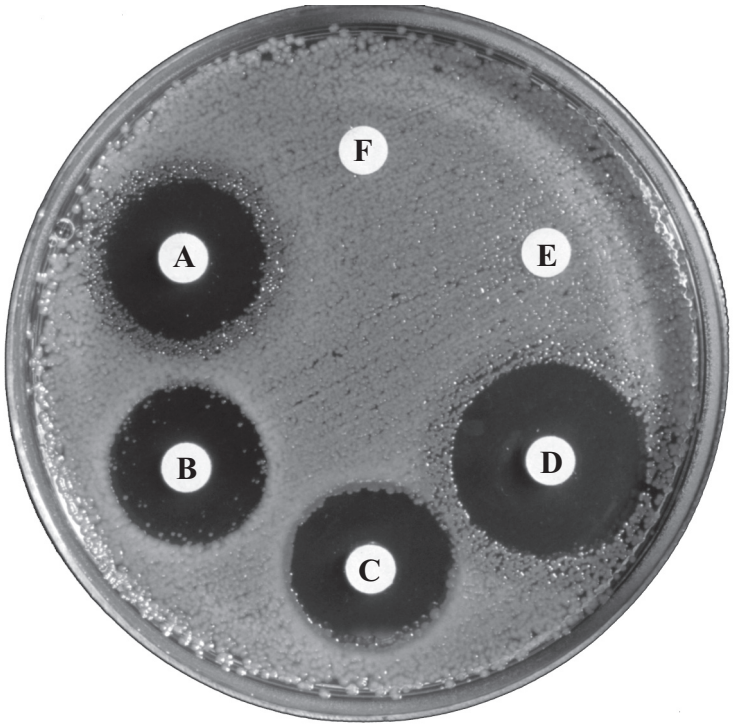
Question 08 · continued

for mark

5 Some scientists tested the effectiveness of six new antibiotics, **A**, **B**, **C**, **D**, **E** and **F**.

- They mixed a culture of one species of bacterium with nutrient agar in a Petri dish.
- They then prepared separate discs of filter paper, each soaked in a different antibiotic.
- They placed the filter paper discs on the surface of the agar.
- The Petri dish was kept at 35 °C for 2 days.

The results are shown in the photograph.



4.7.2.3 Decomposition (biology only)

Question 09

June 2010 | BLY2F | Original Q2 | Legacy

2 This question is about what happens during decay.

Draw a ring around the correct word to complete each sentence.

2 (a) After living things die, they are decayed by

animals.
microorganisms.
plants.

(1 mark)

2 (b) Decay happens faster when there is plenty of oxygen and conditions are

cold.
dry.
moist.

(1 mark)

2 (c) During decay carbon dioxide is produced by

osmosis.
respiration.
photosynthesis.

(1 mark)

2 (d) Decay releases mineral salts into the soil.

These mineral salts are absorbed by plant

leaves.
roots.
stems.

(1 mark)

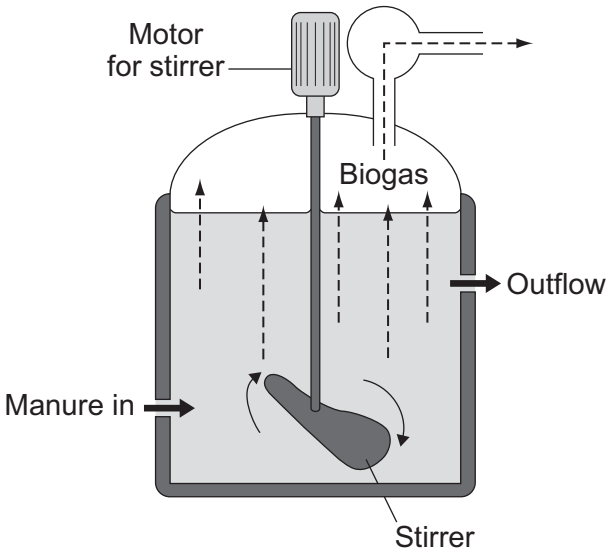
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4.7.2.3 Decomposition (biology only)

Question 10

June 2019 | BLY3F | Original Q5 | Legacy

5 The diagram shows one type of biogas generator.



5 (a) With this type of biogas generator, the concentration of solids fed into the reactor must be kept very low.

Suggest **one** reason for this.

Tick (✓) **one** box.

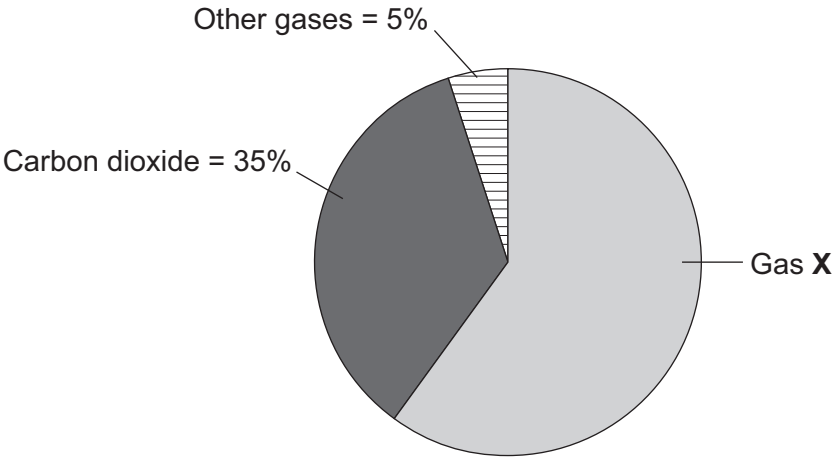
A higher concentration contains too little oxygen. ☐

A higher concentration would be difficult to stir. ☐

A higher concentration contains too much carbon dioxide. ☐

(1 mark)

5 (b) The pie chart shows the percentages of the different gases found in this biogas.



4.7.2.3 Decomposition (biology only)

Question 10 · continued

Gas **X** is the main fuel gas found in this biogas.

5 (b) (i) What is the name of gas **X**?

Draw a ring around **one** answer.

methane **nitrogen** **oxygen**

(1 mark)

5 (b) (ii) What is the percentage of gas **X** in the biogas?

Show clearly how you work out your answer.

.....

.....

.....

Percentage of gas **X** = ...

(2 marks)

5 (c) If the biogas generator is not airtight, the biogas will contain a much higher percentage of carbon dioxide.

Draw a ring around the correct answer to complete each sentence.

5 (c) (i) The air that leaks in will increase the rate of

aerobic respiration.

anaerobic respiration.

fermentation.

(1 mark)

5 (c) (ii) The process in part (c)(i) occurs because the air contains

ammonia.

nitrogen.

oxygen.

(1 mark)

6

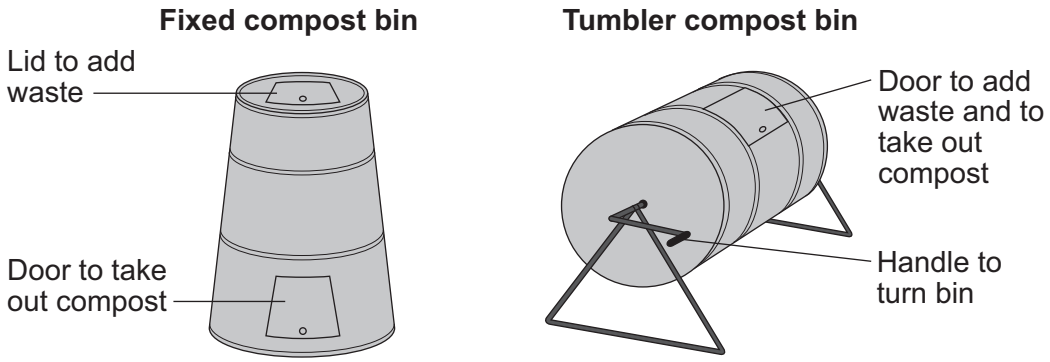
4.7.2.3 Decomposition (biology only)

Question 11

January 2012 | BL1FP | Original Q5 | Legacy

5 Garden waste can be recycled.
One way of recycling garden waste is to use a compost bin.

The diagram shows two types of compost bin.
Each bin can contain the same amount of waste.



Information about the compost bins is given below.

Fixed compost bin

- Compost can be taken out after two years.
- The bin costs about £40.
- The bin takes up an area of 1 m^2.

Tumbler compost bin

- The bin is turned twice a day using the handle.
- Six weeks later compost can be taken out.
- The bin costs about £80.
- The bin takes up an area of 2 m^2.

5 (a) A gardener is buying a compost bin.

5 (a) (i) Give **one** advantage to the gardener of buying a tumbler compost bin and not a fixed compost bin.

.....

.....

(1 mark)

5 (a) (ii) Give **two** advantages to the gardener of buying a fixed compost bin and not a tumbler compost bin.

1 .....

2 .....

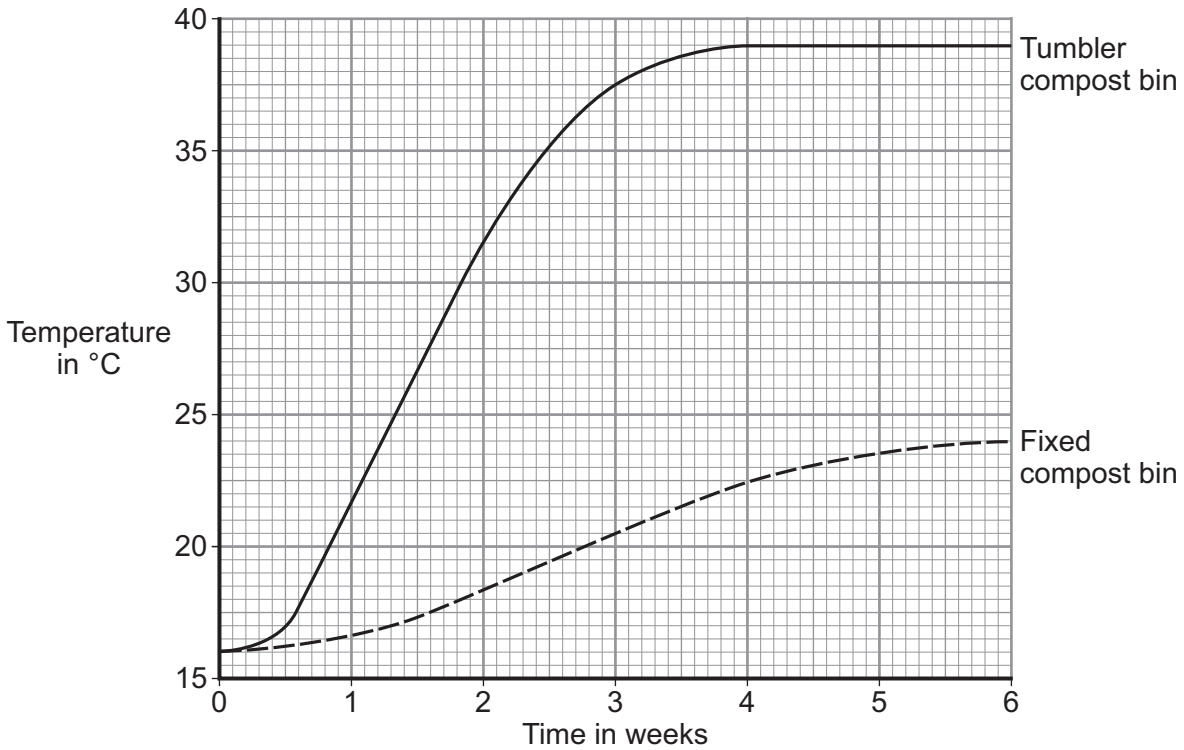
(2 marks)

Question 5 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 11 · continued

5 (b) The same amounts of waste were added to the two types of bin.
The graph shows the temperature in the bins in the first six weeks after the waste was added.



5 (b) (i) Give **two** differences between the results for the tumbler compost bin and the fixed compost bin.

1 .....

.....

2 .....

.....

(2 marks)

4.7.2.3 Decomposition (biology only)

Question 11 · continued

5 (b) (ii) Complete the sentences.

The waste is converted into compost by organisms

called ..... .

The conversion of waste into compost works best in warm, moist

and ..... conditions.

(2 marks)

5 (b) (iii) There was a big difference in the final temperatures in the two bins.

Suggest an explanation for this temperature difference.

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(2 marks)

9

4.7.2.3 Decomposition (biology only)

Question 12

June 2012 | BL1FP | Original Q4 | Legacy

4 When animals die, they usually fall to the ground and decay.
In 1977 the body of a baby mammoth was discovered.
The baby mammoth died 40 000 years ago and its body froze in ice.

The picture shows the mammoth.



© Ria Novosti/Science Photo Library

4 (a) Explain why the body of the baby mammoth did **not** decay.

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(2 marks)

4.7.2.3 Decomposition (biology only)

Question 12 · continued

4 (b) Mammoths are closely related to modern elephants.
The pictures show these two animals.

What scientists think a mammoth looked like



© Christian Darkin/Science Photo Library

Modern elephant



Mammoths are *extinct*. What does *extinct* mean?

.....

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(1 mark)

Question 4 continues on the next page

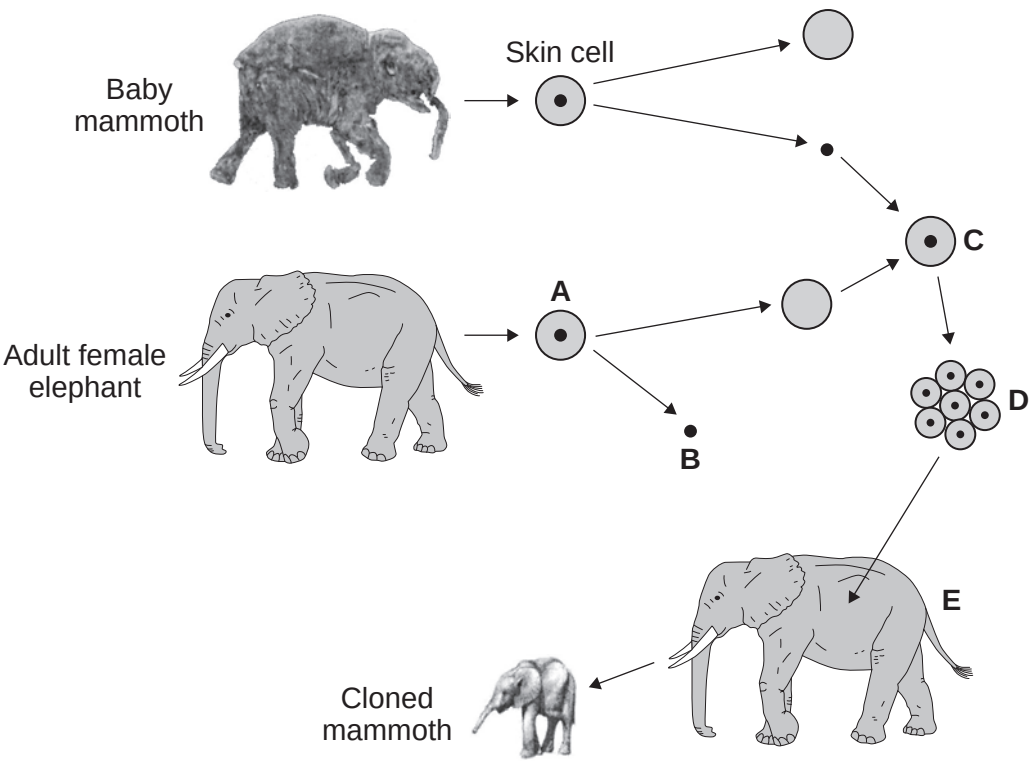
4.7.2.3 Decomposition (biology only)

Question 12 · continued

4 (c) Scientists believe they may be able to use adult cell cloning to recreate a living mammoth.

The scientists will use a skin cell from the baby mammoth.

The diagrams show how the skin cell will be used.



In each question, draw a ring around the correct answer.

4 (c) (i) What type of cell is cell **A**?

skin cell **egg cell** **sperm cell**

(1 mark)

4 (c) (ii) Part **B** is removed from cell **A**.

What part of the cell is part **B**?

nucleus **cytoplasm** **cell membrane**

(1 mark)

4.7.2.3 Decomposition (biology only)

Question 12 · continued

4 (c) (iii) After cell **C** is formed, it divides into embryo cells.

What is done to cell **C** to make it divide?

Cell **C** is

treated with enzymes.
mixed with sperm cells.
given an electric shock.

(1 mark)

4 (c) (iv) The embryo cells form a ball of cells. The ball of cells will be put into female elephant, **E**.

Which part of elephant **E** is the ball of cells put into?

womb **stomach** **ovary**

(1 mark)

4 (d) The scientists expect any offspring of the adult cell cloning to look like a mammoth and **not** like an elephant.

Why?

.....

.....

(1 mark)

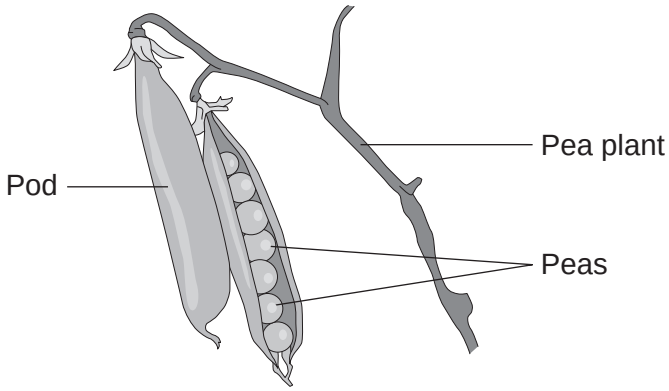
8

4.7.2.3 Decomposition (biology only)

Question 13

January 2013 | BL1FP | Original Q8 | Legacy

8 Peas grow in pods on pea plants.



A gardener grew four varieties of pea plants, **A**, **B**, **C** and **D**, in his garden.
The gardener counted the number of peas in each pod growing on each plant.

The table shows his results.

Variety	Range of number of peas in each pod	Mean number of peas in each pod
A	2–6	4
B	3–7	5
C	3–8	6
D	6–8	7

8 (a) Give **one** environmental factor and **one other** factor that might affect the number of peas in a pod.

Environmental factor .....

Other factor .....

(2 marks)

4.7.2.3 Decomposition (biology only)

Question 13 · continued

8 (b) The gardener thinks that he will get the largest mass of peas from his garden if he grows variety **D**.

Why is the gardener **not** correct?

Suggest **one** reason.

.....

.....

(1 mark)

8 (c) It is important that carbon is cycled through living things.

After he has picked the peas, the gardener puts the dead pea plants onto a compost heap.

Over the next few months, the carbon in the carbon compounds from the pea plants is returned to the air.

Describe how.

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(4 marks)

7

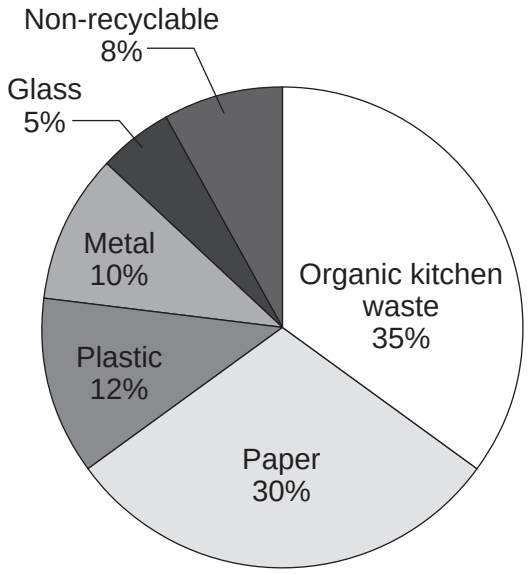
4.7.2.3 Decomposition (biology only)

Question 14

June 2013 | BL1FP | Original Q5 | Legacy

5 This question is about recycling.

The pie chart shows the different types of waste from an average household in England.



5 (a) In 2010, councils in England collected 23 million tonnes of waste from households.
Most of the waste was put into landfill sites.
Councils pay to use landfill sites.

Organic kitchen waste can be put onto compost heaps.

Calculate the mass of organic kitchen waste from households that could have been put onto compost heaps in 2010.

.....

.....

Answer = ... million tonnes
(2 marks)

5 (b) Some householders put organic kitchen waste onto their compost heaps.

5 (b) (i) Suggest **one** advantage of this to the council.

.....

.....
(1 mark)

5 (b) (ii) Suggest **one** advantage of this to the householder.

.....

.....
(1 mark)

4

4.7.2.3 Decomposition (biology only)

Question 15

June 2014 | BL1FP | Original Q10 | Legacy

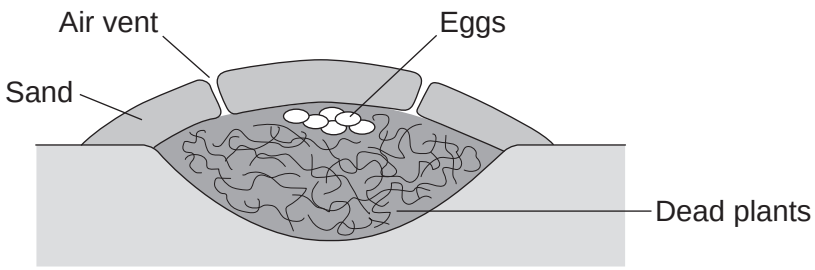
10 Most birds sit on their eggs to keep them warm until they hatch.

Megapode birds:

- dig a large hole in sand
- fill the hole with dead plants
- lay their eggs on top of the dead plants
- cover the surface with a thick layer of sand.

Figure 10 shows a megapode bird's nest.

Figure 10



10 (a) The dead plants in the nest decay. The decaying process helps to keep the eggs warm for many weeks.

Suggest how.

[3 marks]

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4.7.2.3 Decomposition (biology only)

Question 15 · continued

June 2014 | BL1FP | Original Q10 | Legacy

10 (b) (i) Megapode birds open and close the air vents of the nest at different times of the day.

Suggest reasons why it is necessary to open and close the air vents.

[3 marks]

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10 (b) (ii) The sex of a megapode bird that hatches from an egg depends on the temperature at which the egg was kept.

Use this information to suggest why it is important for megapode birds to control the temperature of their nests.

[1 mark]

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7

4.7.2.3 Decomposition (biology only)

Question 16

June 2015 | BL1FP | Original Q5 | Legacy

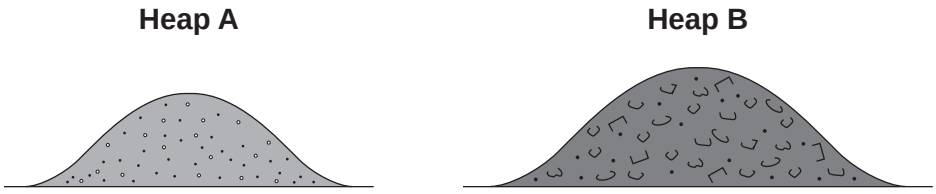
5 A gardener investigates if turning over the waste in a compost heap makes the waste decay more quickly.

The gardener:

- makes two separate heaps of garden waste, heap **A** and heap **B**
- turns over the material in heap **A** every 2 weeks
- does **not** turn over the material in heap **B**
- estimates the amount of decay in the two heaps after 6 months.

Figure 6 shows the two heaps of garden waste at the beginning of the investigation.

Figure 6



5 (a) Suggest **two** factors, other than time, the gardener should control to make the investigation fair.

[2 marks]

1 .....

.....

2 .....

.....

5 (b) Name **one** type of living thing that causes decay.

[1 mark]

.....

4.7.2.3 Decomposition (biology only)

Question 16 · continued

5 (c) **Table 3** shows the gardener's results.

Table 3

Compost heap	Estimated amount of decay
A	A lot
B	Very little

5 (c) (i) Why does turning over the material in heap **A** make the material decay more quickly?

[1 mark]

.....

.....

5 (c) (ii) The gardener puts decayed material around his plants to help them grow.

Suggest why the plants in a woodland grow well each year **without** material from compost heaps being added.

[2 marks]

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6

4.7.2.3 Decomposition (biology only)

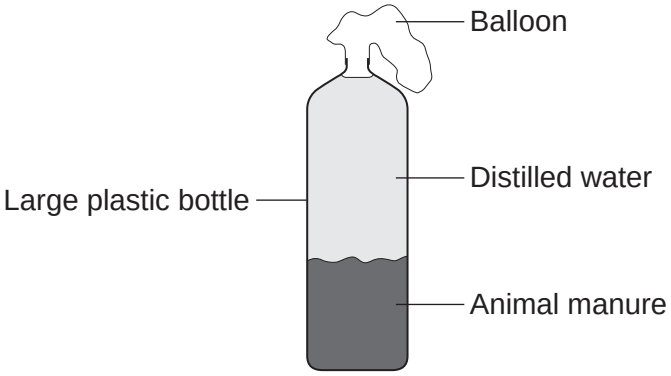
Question 17

June 2015 | BL3FP | Original Q4 | Legacy

4 Some students set up biogas generators to find out which type of animal manure produced the most biogas.

Figure 3 shows the apparatus they used.

Figure 3



The students:
Step 1: Put some cow manure into the plastic bottle
Step 2: Filled the bottle with distilled water
Step 3: Attached a balloon over the top of the bottle
Step 4: Put the bottle in a warm room for 10 days
Step 5: Measured the diameter of the balloon on day 10
Step 6: Repeated steps 1 to 5 using each type of animal manure.

The students' results are shown in **Table 2**.

Table 2

Type of animal manure	Diameter of balloon on day 10 in cm
Cow	29
Horse	26
Sheep	34
Pig	32

4.7.2.3 Decomposition (biology only)

Question 17 · continued

June 2015 | BL3FP | Original Q4 | Legacy

4 (a) What is the main gas found in biogas?

[1 mark]

.....

4 (b) The students concluded that sheep manure is the best type of manure to use in a biogas generator.

A teacher told the students that the design of their investigation meant that their conclusion might **not** be correct.

Suggest **two** reasons why.

[2 marks]

1 .....

.....

2 .....

.....

4 (c) Another student suggested that adding potato to the manure would increase the amount of biogas produced.

Why would adding potato increase the amount of biogas produced?

[1 mark]

Tick (✓) **one** box.

The potato contains a lot of carbohydrate. ☐

The potato contains a lot of protein. ☐

The potato contains a lot of water. ☐

4

4.7.2.3 Decomposition (biology only)

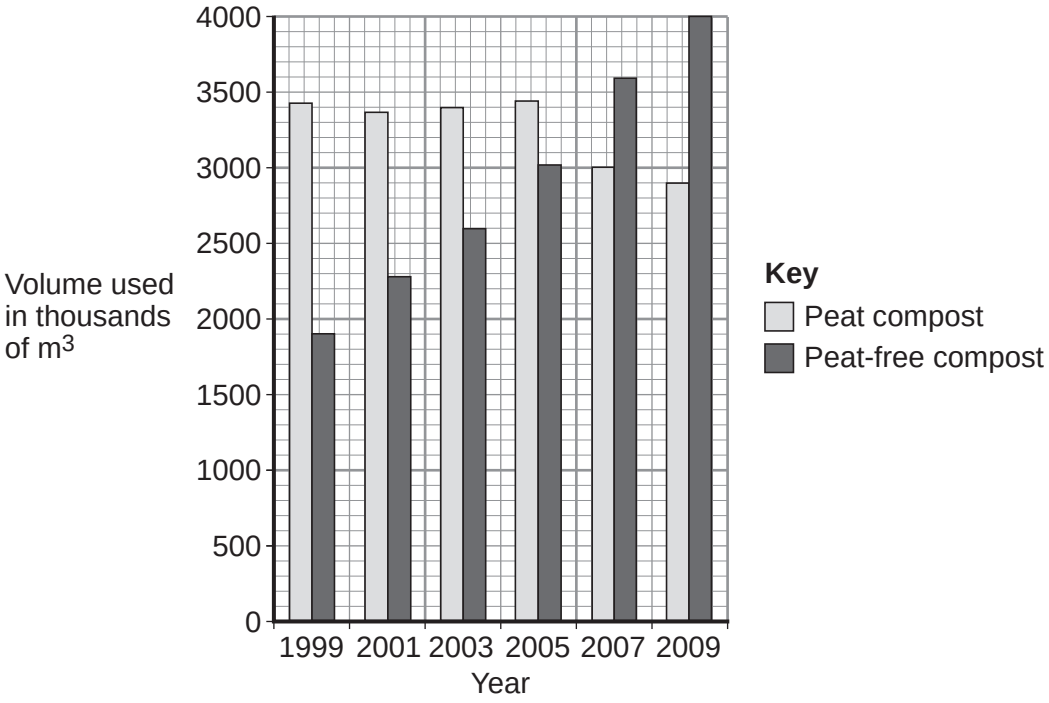
Question 18

June 2015 | BL3FP | Original Q9 | Legacy

9 Human activities have many effects on our ecosystem.

Figure 10 shows the volume of peat compost and peat-free compost used in gardening from 1999 to 2009.

Figure 10



9 (a) Describe the trends shown in **Figure 10**.

[2 marks]

.....

.....

.....

.....

.....

4.7.2.3 Decomposition (biology only)

Question 18 · continued

June 2015 | BL3FP | Original Q9 | Legacy

9 (b) What effect does the destruction of peat bogs have on the gases in the atmosphere?

[1 mark]

.....

.....

9 (c) Deforestation is also damaging ecosystems.

Describe **one** effect of deforestation on ecosystems.

[1 mark]

.....

.....

4

4.7.2.3 Decomposition (biology only)

Question 19

June 2016 | BL1FP | Original Q9 | Legacy

9 Students investigated decomposition.

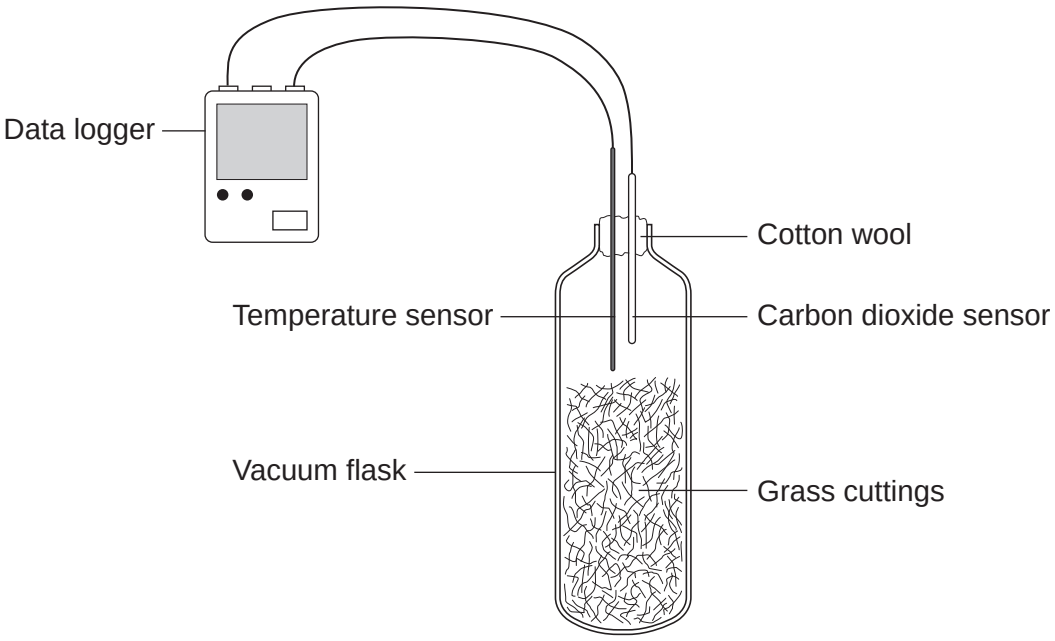
The students:

- put some decaying grass cuttings into a vacuum flask
- put a carbon dioxide sensor and a temperature sensor in the flask
- attached the sensors to a data logger
- closed the flask with cotton wool.

A vacuum flask was used to reduce the loss of thermal energy.

Figure 9 shows the investigation.

Figure 9



9 (a) Give **one** advantage of using a temperature sensor attached to a data logger instead of a thermometer.

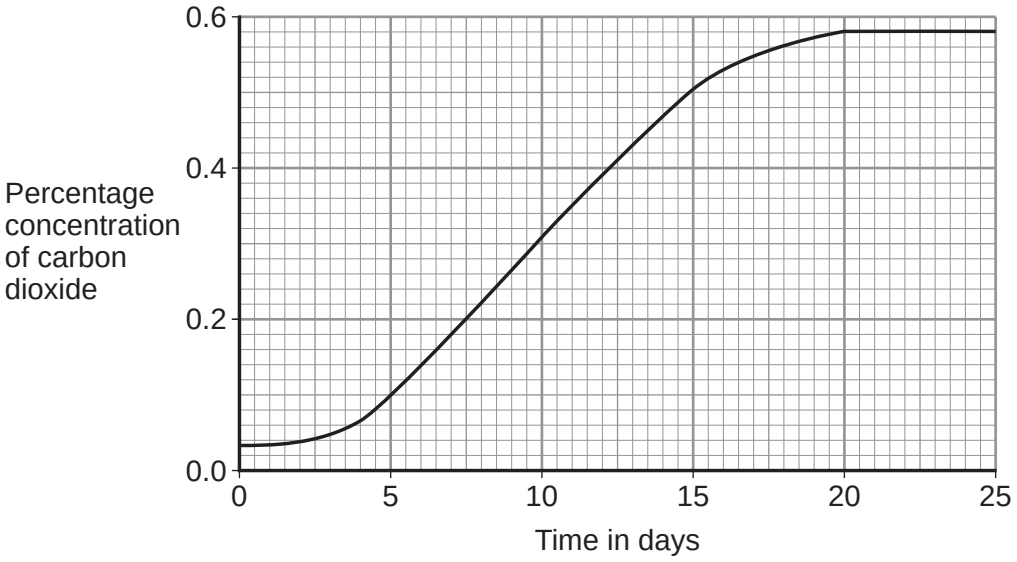
[1 mark]

4.7.2.3 Decomposition (biology only)

Question 19 · continued

9 (b) **Figure 10** shows the results from the data logger for carbon dioxide concentration in the flask for the next 25 days.

Figure 10



9 (b) (i) Why did the concentration of carbon dioxide in the flask increase?

[3 marks]

9 (b) (ii) Suggest what has happened in the flask to cause the carbon dioxide concentration to level off after 20 days.

[1 mark]

5

4.7.2.3 Decomposition (biology only)

Question 20

June 2016 | BL2FP | Original Q9 | Legacy

9 Enzymes are made and used in all living organisms.

9 (a) What is an enzyme?

[2 marks]

_____

_____

_____

_____

9 (b) Many enzymes work inside cells.

In which part of a cell will most enzymes work?

[1 mark]

Draw a ring around the correct answer.

cell membrane **cytoplasm** **nucleus**

4.7.2.3 Decomposition (biology only)

Question 20 · continued

9 (c) We can also use enzymes in industry.

Hydrogen peroxide is a chemical that can be used to preserve milk.

Adding a small amount of hydrogen peroxide to the milk kills the bacteria that cause decay. Hydrogen peroxide does not kill all disease-causing bacteria.

The enzyme catalase can be added later to break down the hydrogen peroxide to oxygen and water.

A different way of preserving the milk is by heating it in large machines to 138 °C for a few seconds.

Suggest **one** advantage and **one** disadvantage of using hydrogen peroxide and catalase to preserve milk instead of using heat treatment.

[2 marks]

Advantage of hydrogen peroxide and catalase _____

_____

_____

Disadvantage of hydrogen peroxide and catalase _____

_____

_____

5

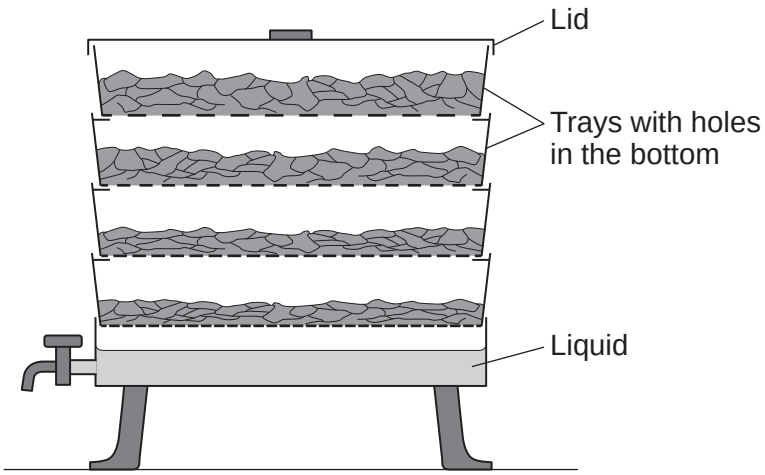
4.7.2.3 Decomposition (biology only)

Question 21

June 2017 | BL1FP | Original Q4 | Legacy

4 **Figure 5** shows a garden composter.

Figure 5



- The composter has four trays, with holes in the bottom of each tray.
- Material to be composted is put into the top tray.
- As the material breaks down it drops through the holes.
- The holes get smaller from the top tray to the bottom tray.

4 (a) (i) Suggest **one** type of material that could be put into the composter.

[1 mark]

_____

4 (a) (ii) How will the size of the pieces of material in the bottom tray compare with the size of the pieces of material in the top tray?

[1 mark]

Tick (✓) **one** box.

The material in the bottom tray will be in smaller pieces. ☐

The material in the bottom tray will be in larger pieces. ☐

The material in the bottom tray and the top tray will be in the same size pieces. ☐

4.7.2.3 Decomposition (biology only)

Question 21 · continued

June 2017 | BL1FP | Original Q4 | Legacy

4 (a) (iii) The material decomposes into soluble substances.

Name **one** type of organism that would decompose the material in the composter.

[1 mark]

_____

4 (b) Decomposition is more efficient if there is plenty of oxygen.

Suggest **one** way of changing the design of the composter to make sure that there is plenty of oxygen.

[1 mark]

_____

_____

Question 4 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 21 · continued

4 (c) A gardener has two greenhouses, with 20 tomato plants in each greenhouse.

The gardener gives tap water to the tomato plants in one greenhouse.

The gardener gives the liquid that collects in the bottom of the composter to the tomato plants in the other greenhouse.

Table 1 shows information about the tomatoes he picks from his tomato plants.

Table 1

What was given to the plants	Mean number of tomatoes per plant	Mean mass of each tomato in g	Mean yield per plant in g
Tap water	14	85	1190
Liquid from the composter	12	125	

4 (c) (i) Suggest **one** factor the gardener will need to control to make sure the results of the investigation are valid.

[1 mark]

_____

4 (c) (ii) Use data from **Table 1** to calculate the mean yield per plant of the tomatoes which were given the liquid from the composter.

[2 marks]

_____

_____

_____

Mean yield per plant = _____ g

4 (c) (iii) The plants given the liquid from the composter produced a greater yield of tomatoes than the plants given tap water.

Suggest why.

[1 mark]

_____

_____

8

4.7.2.3 Decomposition (biology only)

Question 22

June 2017 | BL3FP | Original Q4 | Legacy

4 Biogas is produced when bacteria break down some plant or animal materials.

4 (a) What is the main useful gas found in biogas?

[1 mark]

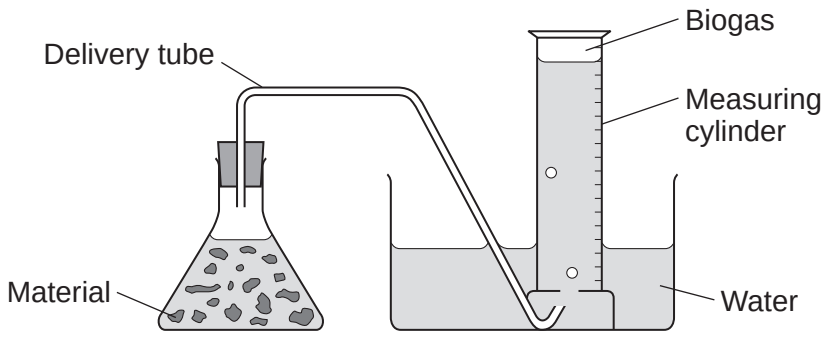
_____

4 (b) Some students investigated which of four types of material produced the most biogas.

The students:

- chopped the material into small pieces
- placed 200 g of each material into a different flask with 100 cm^3 of water
- set up the apparatus as shown in **Figure 5** to collect the biogas produced
- left each set of apparatus at 25 °C for 7 days
- repeated the investigation twice more.

Figure 5



Give **two** variables the students controlled in their investigation.

[2 marks]

1 _____

_____

2 _____

_____

4.7.2.3 Decomposition (biology only)

Question 22 · continued

4 (c) **Table 2** shows the students' results.

Table 2

Type of material	Volume of biogas collected in 7 days in cm^3			
	Test 1	Test 2	Test 3	Mean
Beans	12.0	12.4	12.2	12.2
Manure	15.0	15.2	8.2	15.1
Manure and beans	18.6	18.8	18.4	18.6
Sweet potato	14.3	14.1	14.5	

4 (c) (i) One of the results in **Table 2** is anomalous.

Draw a ring around the anomalous result shown in **Table 2**.

[1 mark]

4 (c) (ii) Calculate the mean volume of biogas collected, in 7 days, for sweet potato in **Table 2**.

[1 mark]

_____

_____

4 (c) (iii) Which type of material in **Table 2** would be the most effective to use in a biogas generator?

Give a reason for your answer.

[2 marks]

_____

_____

_____

_____

Question 4 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 22 · continued

4 (d) A farmer built a biogas generator on his cow farm.

Suggest **one** advantage and **one** disadvantage of having a biogas generator.

[2 marks]

Advantage _____

_____

Disadvantage _____

_____

9

4.7.2.3 Decomposition (biology only)

Question 23

June 2018 | 8461/1F | Original Q6

0 6 Earthworms are small animals that live in soil. Earthworms have no specialised gas exchange system and absorb oxygen through their skin.

0 6 . 1 What is the name of the process in which oxygen enters the skin cells?

[1 mark]

Tick **one** box.

- Active transport ☐
- Diffusion ☐
- Osmosis ☐
- Respiration ☐

Table 3 shows information about four skin cells of an earthworm.

Table 3

Cell	Percentage of oxygen	
	Outside cell	Inside cell
A	9	8
B	12	8
C	12	10
D	8	12

0 6 . 2 Which cell has the smallest difference in percentage of oxygen between the outside and the inside of the cell?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.7.2.3 Decomposition (biology only)

Question 23 · continued

0 6 . 3 Which cell will oxygen move **into** the fastest?

[1 mark]

Tick **one** box.

A		B		C		D	

0 6 . 4 Earthworms have a large surface area to volume ratio.

Suggest why a large surface area to volume ratio is an advantage to an earthworm.

[1 mark]

0 6 . 5 The earthworm uses enzymes to digest dead plants.

Many plants contain fats or oils.

Which type of enzyme would digest fats?

[1 mark]

Question 6 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 23 · continued

0 6 . 6 Earthworms move through the soil.

This movement brings air into the soil.

Dead plants decay faster in soil containing earthworms compared with soil containing **no** earthworms.

Explain why.

[3 marks]

0 6 . 7 When earthworms reproduce, a sperm cell from one earthworm fuses with an egg cell from a different earthworm.

Name the process when an egg cell and a sperm cell fuse.

[1 mark]

0 6 . 8 Some types of worm reproduce by a process called fragmentation.

In fragmentation, the worm separates into two or more parts. Each part grows into a new worm.

What type of reproduction is fragmentation?

[1 mark]

10

4.7.2.3 Decomposition (biology only)

Question 24

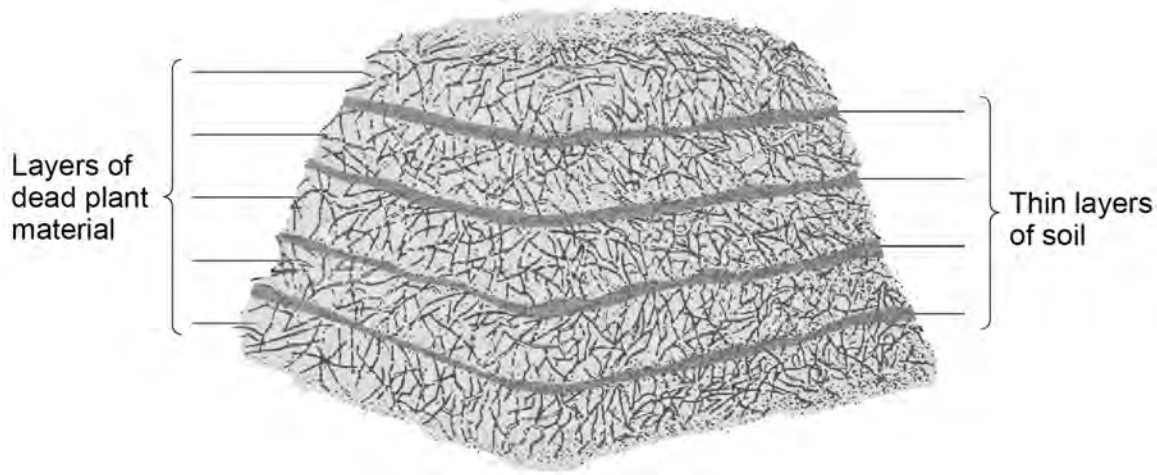
June 2019 | 8461/2F | Original Q4

0 4 Gardeners sometimes make compost heaps from dead plant material.

The dead plants decay in the compost heap.

Figure 8 shows a compost heap.

Figure 8



0 4 . 1 The thin layers of soil contain organisms that cause decay.

Which **two** types of organism cause decay?

[2 marks]

Tick (✓) **two** boxes.

- Bacteria ☐
- Fungi ☐
- Grass ☐
- Insects ☐
- Worms ☐

4.7.2.3 Decomposition (biology only)

Question 24 · continued

The rate of decay in the compost heap depends on several environmental factors.

0 4 . 2 Explain how the rate of decay would be affected by:

- an increase in oxygen concentration
- a temperature increase from 5 °C to 25 °C

[3 marks]

0 4 . 3 Give **one** environmental factor needed for decay.

Do **not** refer to oxygen or temperature in your answer.

[1 mark]

Question 4 continues on the next page

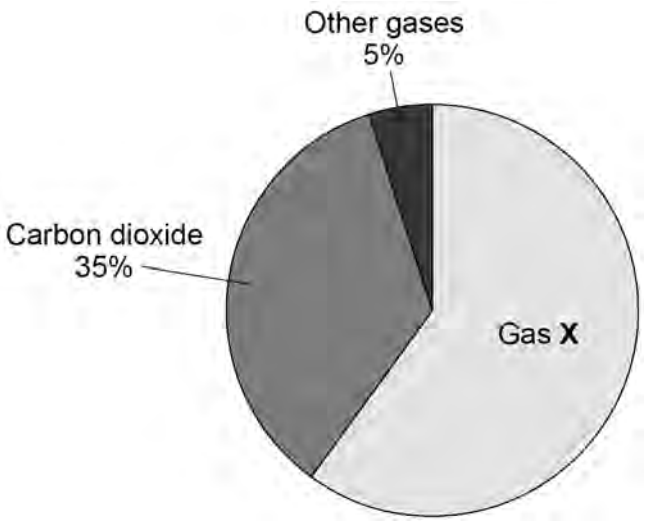
4.7.2.3 Decomposition (biology only)

Question 24 · continued

Dead plant material can also be decayed in a biogas generator.

Figure 9 shows the percentages of the gases found in a sample of biogas.

Figure 9



0 4 . 4 Gas **X** is the main fuel gas found in the biogas.

What is gas **X**?

[1 mark]

Tick (✓) **one** box.

- Carbon monoxide ☐
- Hydrogen ☐
- Methane ☐
- Nitrogen ☐

4.7.2.3 Decomposition (biology only)

Question 24 · continued

0 4 . 5 What is the percentage of gas **X** in the biogas?

[1 mark]

Percentage = _____ %

0 4 . 6 The dead plant material in the compost heap and biogas generator does **not** decay completely.

Explain why a farmer might spread the remaining dead plant material onto his fields.

[2 marks]

10

4.7.2.3 Decomposition (biology only)

Question 25

November 2020 | 8461/2F | Original Q8

0 8 This question is about the decay of milk.

0 8 . 1 Name **two** types of microorganism that cause decay.

[2 marks]

1 _____

2 _____

0 8 . 2 Cows' milk is pH 6.6.

As milk decays, lipids in the milk are broken down.

One of the products of the breakdown of lipids causes the pH of milk to decrease.

Name the product that causes the pH to decrease.

[1 mark]

_____

4.7.2.3 Decomposition (biology only)

Question 25 · continued

November 2020 | 8461/2F | Original Q8

A student investigated the effect of temperature on the time taken for different types of milk to decay.

This is the method used.

1. Put cows' milk in six test tubes.

2. Keep each test tube at a different temperature.

3. Measure the pH of the milk in each tube every day for 12 days.

4. Record the number of days taken to reach pH 5.

5. Repeat steps 1 to 4 with goats' milk and with almond milk.

0 8 . 3 Give **one** way the pH can be measured.

[1 mark]

_____

0 8 . 4 Give **two** control variables the student should have used in this investigation.

[2 marks]

1 _____

2 _____

Question 8 continues on the next page

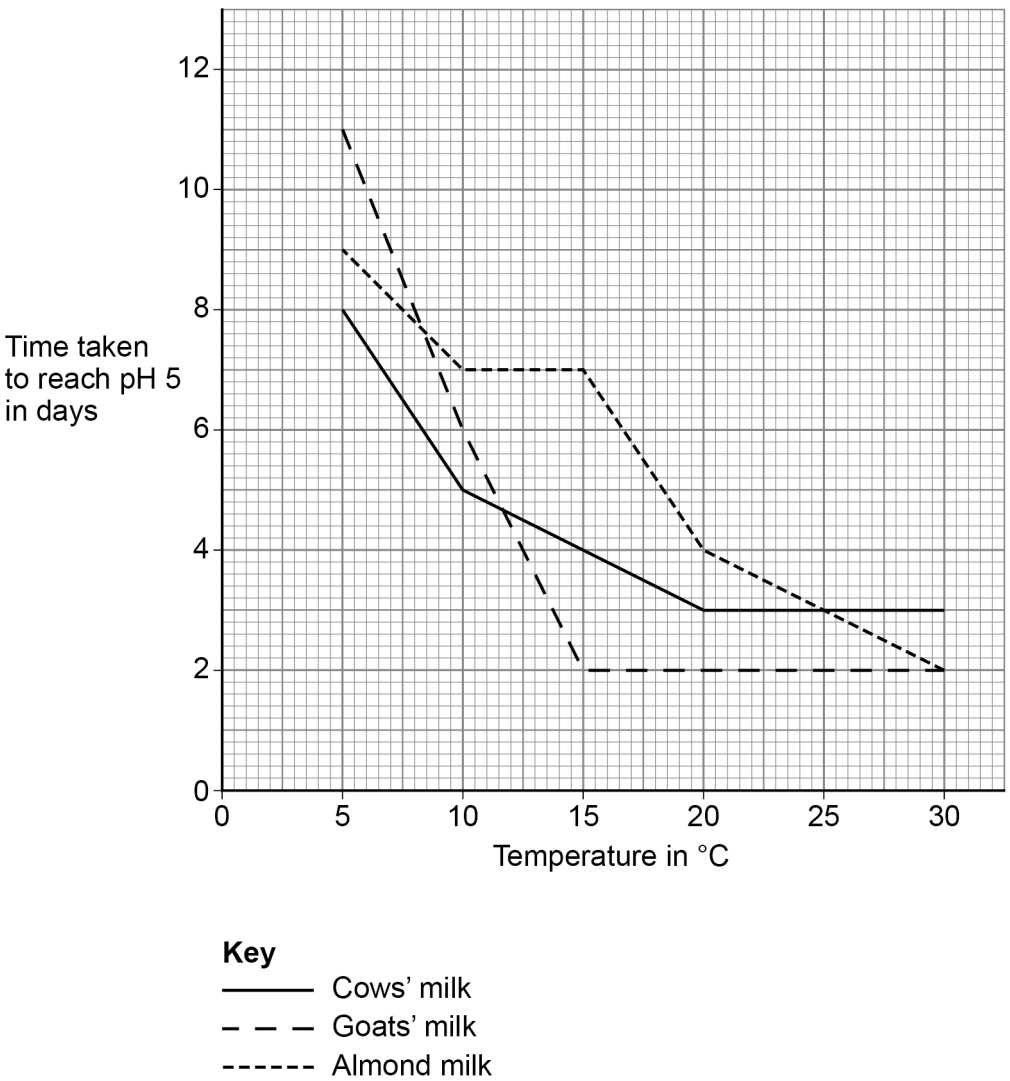
4.7.2.3 Decomposition (biology only)

Question 25 · continued

The student improved the investigation to produce valid results.

Figure 11 shows the results.

Figure 11



0 8 . 5 Which type of milk stays fresh the longest at 10 °C?

[1 mark]

4.7.2.3 Decomposition (biology only)

Question 25 · continued

0 8 . 6 Describe the effect of temperature on the time taken for **goats'** milk to reach pH 5.

Use data from **Figure 11** in your answer.

[2 marks]

0 8 . 7 The time taken for cows' milk to reach pH 5 at 10 °C is less than the time taken for cows' milk to reach pH 5 at 5 °C.

Suggest **one** reason why.

[1 mark]

0 8 . 8 Suggest **two** reasons why the different types of milk took different lengths of time to reach pH 5.

[2 marks]

1

2

Question 8 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 25 · continued

0 8 . 9 The student said:

'The temperature milk is stored at affects how likely the milk is to cause food poisoning.'

How can the investigation be developed to find out if the student is correct?

[1 mark]

Tick (✓) **one** box.

Determine the types of bacteria present in the milk ☐

Record the pH every 12 hours ☐

Use more than three different types of milk ☐

13

Question 9 starts on page 36

4.7.2.3 Decomposition (biology only)

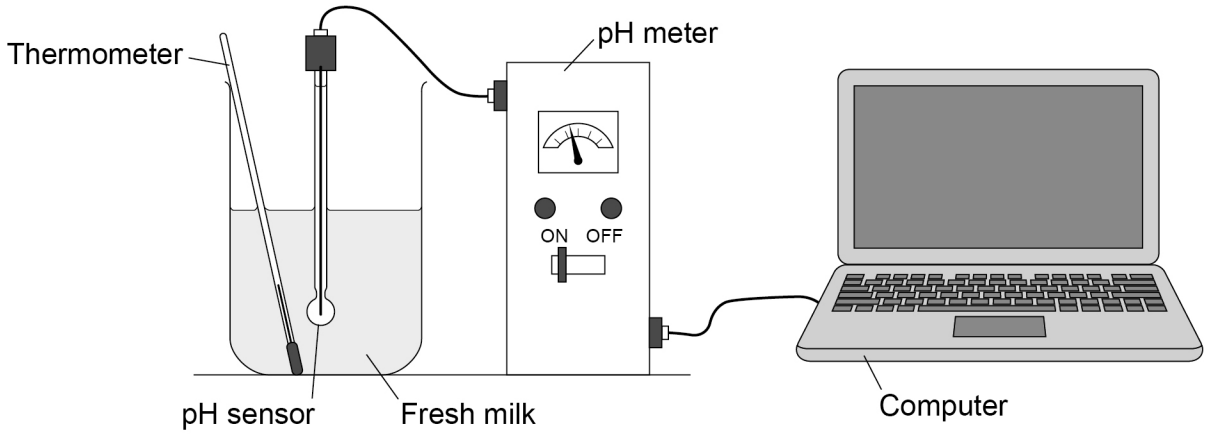
Question 26

November 2021 | 8461/2F | Original Q9

0 9 A student investigated the effect of temperature on the decay of milk.

Figure 15 shows the apparatus the student used.

Figure 15



This is the method used.

1. Set up the apparatus as shown in **Figure 15** with the milk at 20 °C.
2. Record the pH over 5 days using the computer.
3. Repeat with another batch of fresh milk at 25 °C.

0 9 . 1 How could the student keep the milk at a constant temperature for 5 days?

[1 mark]

0 9 . 2 Give **one** variable the student should keep constant.

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

[1 mark]

Question 9 continues on the next page

Question 26 · continued

Table 2 shows the student's results for the milk at 20 °C.

Table 2

Time in days	0	1	2	3	4	5
pH	6.7	6.7	6.3	5.3	4.6	4.4

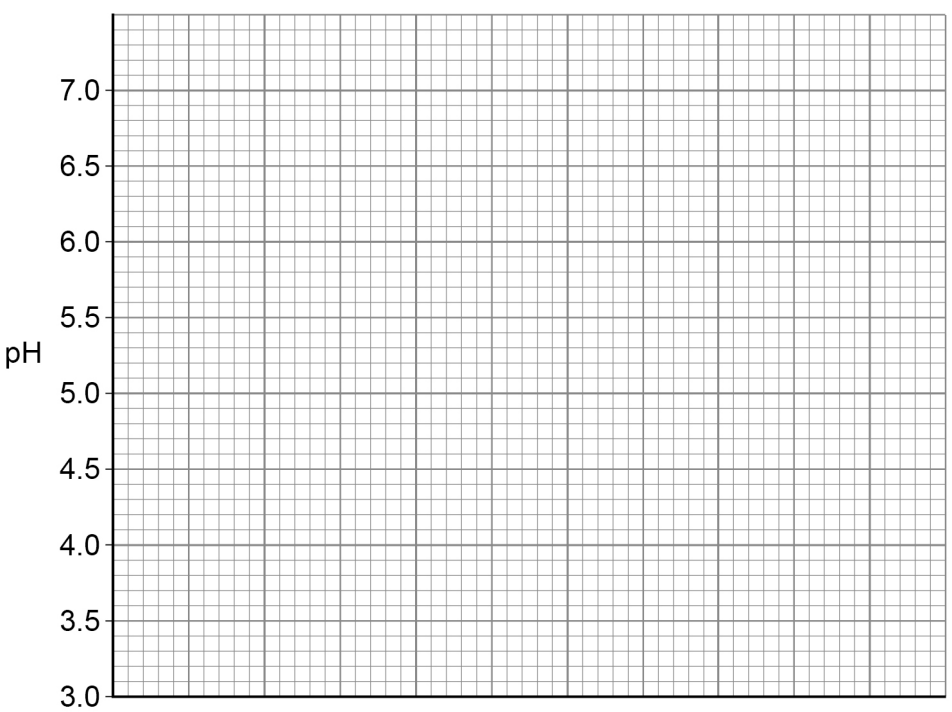
0 9 . 3 Complete **Figure 16**.

[4 marks]

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 2**
- draw a line of best fit.

Figure 16



0 9 . 4 The data you plotted in Question **09.3** were obtained at 20 °C.

Sketch a line on **Figure 16** to show the results you would expect at 25 °C.

Label this line '25 °C'.

[2 marks]

8

4.7.2.3 Decomposition (biology only)

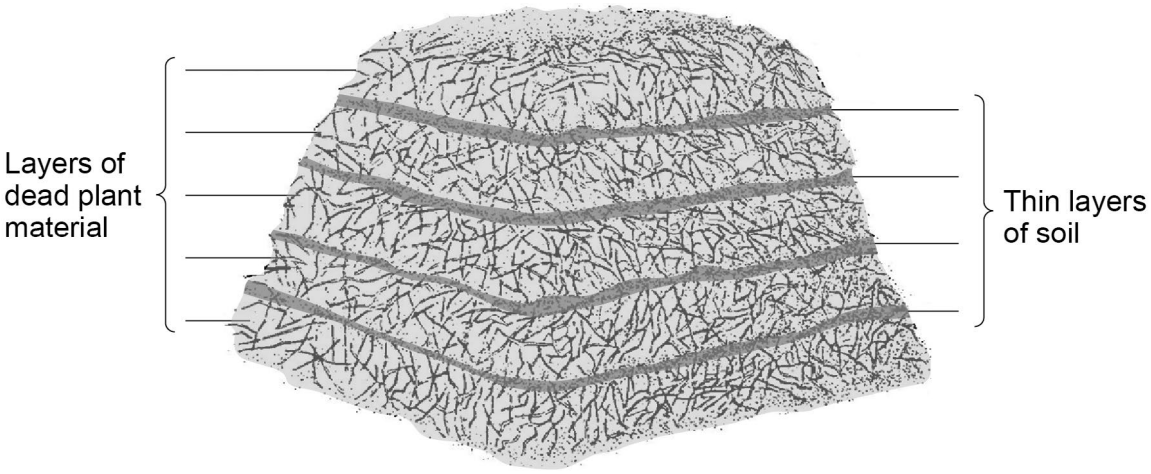
Question 27

November 2021 | 8461/2F | Original Q11

1 1 Decay occurs in a compost heap.

Figure 19 shows a compost heap.

Figure 19



Describe:

- how microorganisms in the layers of soil help to recycle chemicals in the dead plants
- how the chemicals are used again by living plants.

[6 marks]

4.7.2.3 Decomposition (biology only)

Question 27 · continued

November 2021 | 8461/2F | Original Q11

6

4.7.2.3 Decomposition (biology only)

Question 28

0 7 Living organisms can be classified into groups.

Trilobites are animals that lived in the sea 400 to 500 million years ago.

Table 3 gives the classification of two species of trilobite.

Table 3

Classification group	**Trilobite A**	**Trilobite B**
	Animalia	*Animalia*
Phylum	*Arthropoda*	*Arthropoda*
Class	*Trilobita*	*Trilobita*
Order	*Ptychopariida*	*Ptychopariida*
Family	*Alokistocaridae*	*Marjumiidae*
	Elrathia	*Modocia*
Species	*kingii*	*typicalis*

0 7 . 1 Complete **Table 3**.

[2 marks]

Choose answers from the box.

Community	**Genus**	**Kingdom**	**Mammal**	**Population**

4.7.2.3 Decomposition (biology only)

Question 28 · continued

0 7 . 2 Which scientist invented the classification system given in **Table 3**?

[1 mark]

Tick (✓) **one** box.

- Darwin ☐
- Lamarck ☐
- Linnaeus ☐
- Mendel ☐

0 7 . 3 What is the binomial name of trilobite **A**?

Use information from **Table 3**.

[1 mark]

Tick (✓) **one** box.

- *Arthropoda kingii* ☐
- *Elrathia kingii* ☐
- *Trilobita kingii* ☐

Question 7 continues on the next page

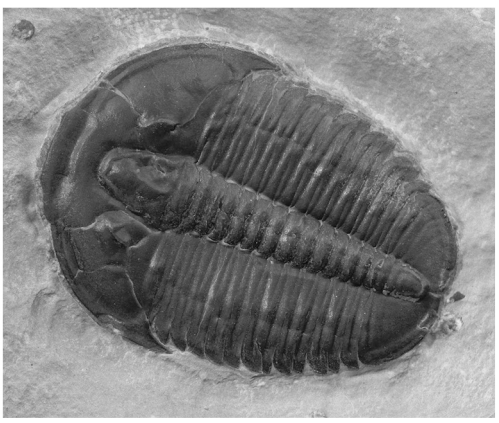
4.7.2.3 Decomposition (biology only)

Question 28 · continued

Figure 10 shows fossils of the two species of trilobite.

Figure 10

Trilobite A



Trilobite B

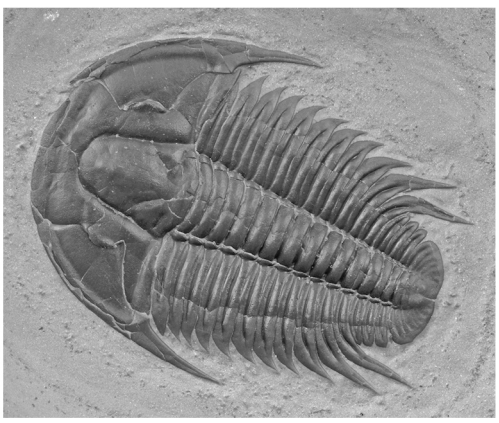
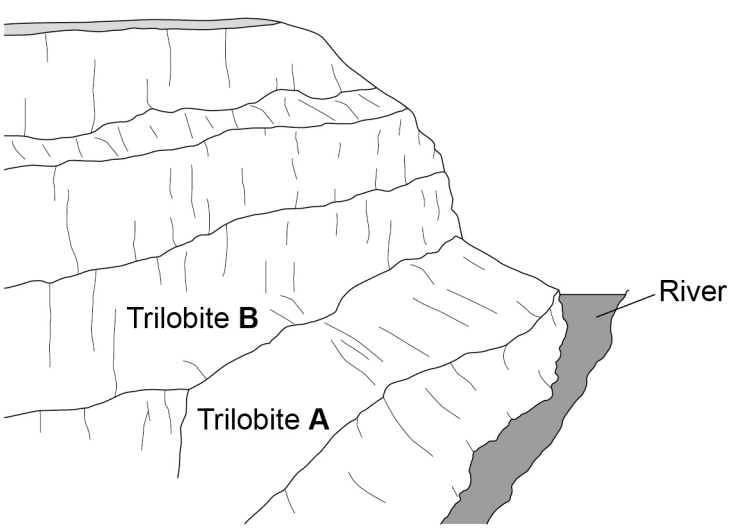


Figure 11 shows:

- layers of rock in a cliff
- where the trilobite fossils were found.

Figure 11



4.7.2.3 Decomposition (biology only)

Question 28 · continued

A scientist made the hypothesis:

'Trilobite **B** may have evolved from trilobite **A**.'

0 7 . 4 What **two** pieces of evidence from **Figure 10** and **Figure 11** support the scientist's hypothesis?

[2 marks]

Tick (✓) **two** boxes.

Trilobite **A** and trilobite **B** were in the same type of rock. ☐

Trilobite **A** was found in older rocks than trilobite **B**. ☐

Trilobite **B** has a smaller mass than trilobite **A**. ☐

Trilobite **B** is a different colour from trilobite **A**. ☐

Trilobite **B** is more complex than trilobite **A**. ☐

0 7 . 5 Trilobites are animals that lived in the sea.

Complete the sentences about how the fossils of trilobites **A** and **B** were formed.

Choose answers from the box.

[3 marks]

acids	**bones**	**hard parts**	**minerals**
rocks	**sediments**	**soft parts**	

The animal dies and falls to the sea bed.

The animal is buried in _____.

The _____ of the animal decay.

The remains which do **not** decay are replaced by _____.

4.7.2.3 Decomposition (biology only)

Question 28 · continued

0 7 . 6 Trilobites **A** and **B** are now extinct.

Give **three** possible causes of extinction.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

0 7 . 7 Suggest **one** reason why scientists **cannot** be sure what caused the trilobites to become extinct.

[1 mark]

_____

_____

13

4.7.2.3 Decomposition (biology only)

Question 29

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 _____

_____

4.7.2.3 Decomposition (biology only)

Question 29 · 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

4.7.2.3 Decomposition (biology only)

Question 30

0 5 Bacteria are one type of organism that cause decay.

0 5 . 1 Which other type of organism causes decay?

[1 mark]

Tick (✓) **one** box.

Fungi ☐

Plants ☐

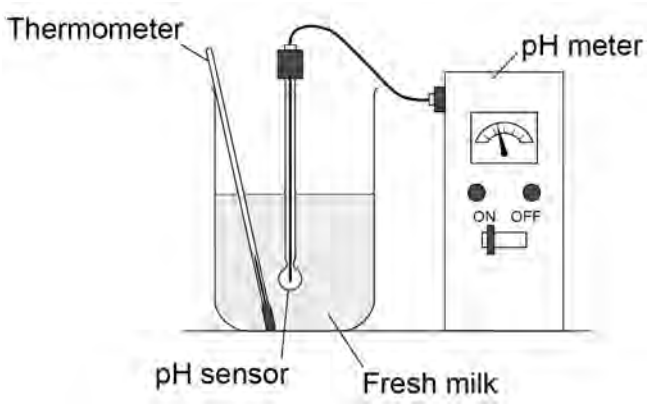
Viruses ☐

Students investigated the effect of temperature on the decay of milk.

The decay was caused by bacteria in the milk.

Figure 8 shows the apparatus used.

Figure 8



This is the method used.

1. Set up the apparatus as shown in **Figure 8** with the milk at 20 °C.
2. Record the pH each day for 7 days.
3. Repeat with more samples of milk at 5 °C and at 30 °C.

4.7.2.3 Decomposition (biology only)

Question 30 · continued

0 5 . 2 What was the dependent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- The pH of the milk ☐
- The type of milk ☐
- The volume of the milk ☐

0 5 . 3 How could the students keep the milk at 30 °C for 7 days?

[1 mark]

Tick (✓) **one** box.

- Put a lid on the beaker. ☐
- Put the beaker in a water bath. ☐
- Stir the milk continuously. ☐
- Wrap cloth around the beaker. ☐

0 5 . 4 As the milk decays, the bacteria digest fats in the milk.

What type of acid is produced by digestion of fats in the milk?

[1 mark]

Tick (✓) **one** box.

- Amino acid ☐
- Fatty acid ☐
- Hydrochloric acid ☐

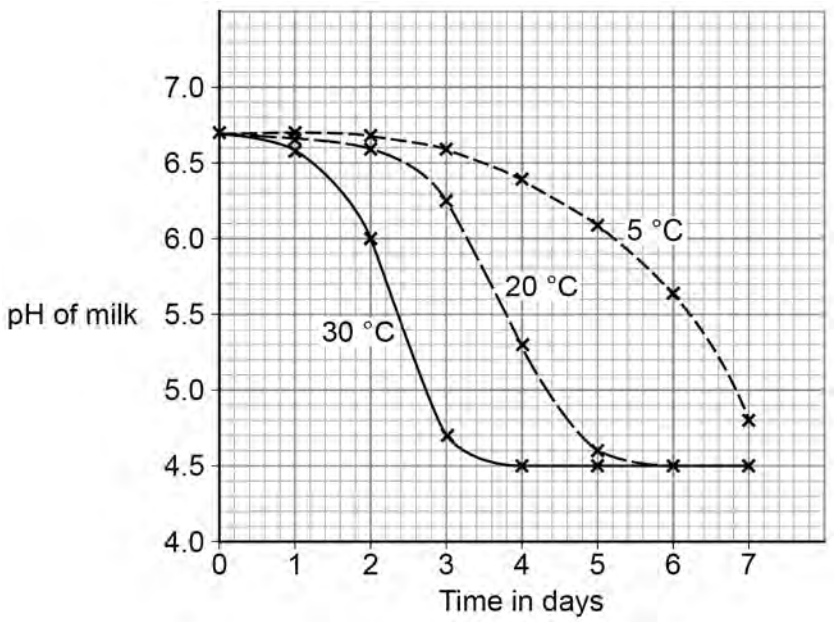
Question 5 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 30 · continued

Figure 9 shows the results.

Figure 9



0 5 . 5 Why did the pH **not** fall below pH 4.5 at 20 °C?

[1 mark]

Tick (✓) **one** box.

All the fat had been digested. ☐

The reaction was too fast. ☐

The temperature was too low. ☐

4.7.2.3 Decomposition (biology only)

Question 30 · continued

The digestion of fat was fastest at 30 °C and slowest at 5 °C.

0 5 . 6 Give **one** reason why the rate of digestion was faster at 30 °C than at 5 °C.

[1 mark]

0 5 . 7 Calculate the rate of digestion at 30 °C from day 2 to day 3.

Complete the following calculation.

Use data from **Figure 9**.

[2 marks]

At 30 °C, the pH at day 2 = _____

At 30 °C, the pH at day 3 = _____

Therefore the fall in pH at 30 °C from day 2 to day 3 = _____ pH units/day

0 5 . 8 The rate of digestion at 5°C from day 2 to day 3 is 0.1 pH units/day.

How many times faster is the rate of digestion at 30°C than the rate of digestion at 5°C from day 2 to day 3?

[2 marks]

Use your answer to Question **05.7**.

Rate at 30 °C is _____ times faster

10

4.7.2.3 Decomposition (biology only)

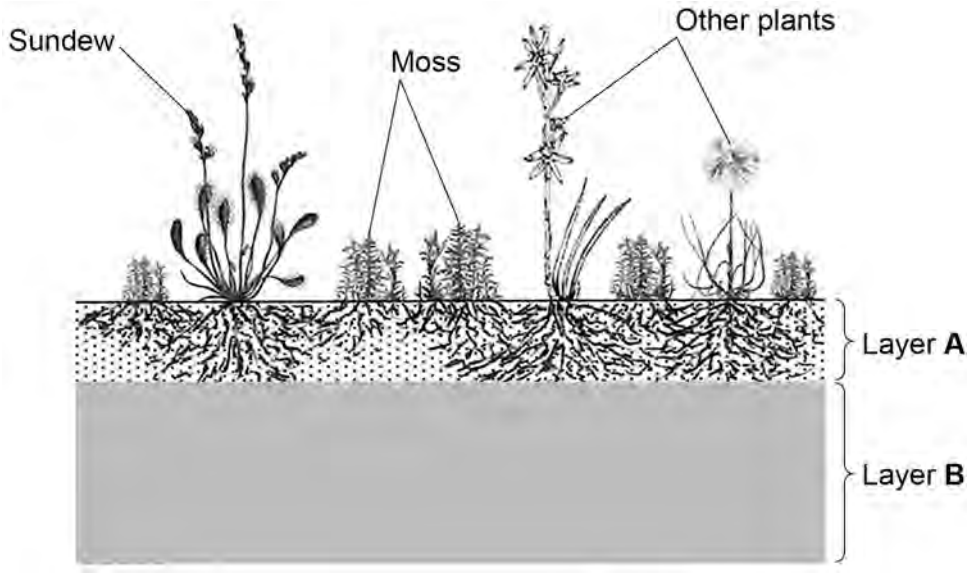
Question 31

1 0

Peat bogs are estimated to contain twice as much carbon as all the world's forests.

Figure 13 shows a section through part of a peat bog.

Figure 13



Layer **A** contains a lot of air.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

4.7.2.3 Decomposition (biology only)

Question 31 · continued

1 0 . 1 Explain why most of the dead remains of plants in layer **B** do **not** decay.

[3 marks]

1 0 . 2 The peat bog in **Figure 13** is a stable community.

The moss produces biomass at a rate of 340 g/m^2/year.

What is the approximate biomass of the moss that becomes biomass in primary consumers?

[1 mark]

Tick (✓) **one** box.

- 0.34 g/m^2/year ☐
- 3.4 g/m^2/year ☐
- 34 g/m^2/year ☐
- 340 g/m^2/year ☐

Question 10 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 31 · continued

The sundew plant shown in **Figure 13** on page 38 has leaves with sticky hairs that trap and digest insects.

Digestion of the insects releases phosphates and simple compounds of nitrogen that are used by the sundew plant.

1 0 . 3 What substance can the sundew plant make using the **phosphates**?

[1 mark]

Tick (✓) **one** box.

- Cellulose ☐
- DNA ☐
- Glycerol ☐
- Starch ☐

1 0 . 4 What substance can the sundew plant make using the **nitrogen**?

[1 mark]

Tick (✓) **one** box.

- Fatty acid ☐
- Glucose ☐
- Lactic acid ☐
- Protein ☐

4.7.2.3 Decomposition (biology only)

Question 31 · continued

1 0 . 5 Humans have destroyed large areas of peat bog to collect peat.

The peat provides fuel and provides compost for gardeners to use.

The peat comes from layer **B** in **Figure 13** on page 38.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

Figure 14 shows the removal of peat from a peat bog.

Figure 14



Explain how the destruction of peat bogs and the use of peat affects the temperature of the Earth's atmosphere.

[4 marks]

10

4.7.2.3 Decomposition (biology only)

Question 32

0 7 Eating too much carbohydrate can cause obesity.

0 7 . 1 Name **one** disease that obesity is a risk factor for.

[1 mark]

Table 5 shows information about sugar intake and obesity in different countries.

Table 5

Country	Mean sugar intake per person per day in grams	Mean obesity rate in arbitrary units
A	122	18
B	80	9
C	172	25
D	150	23
E	110	15
F	144	19
G	192	32

4.7.2.3 Decomposition (biology only)

Question 32 · continued

0 7 . 2 Complete **Figure 10**.

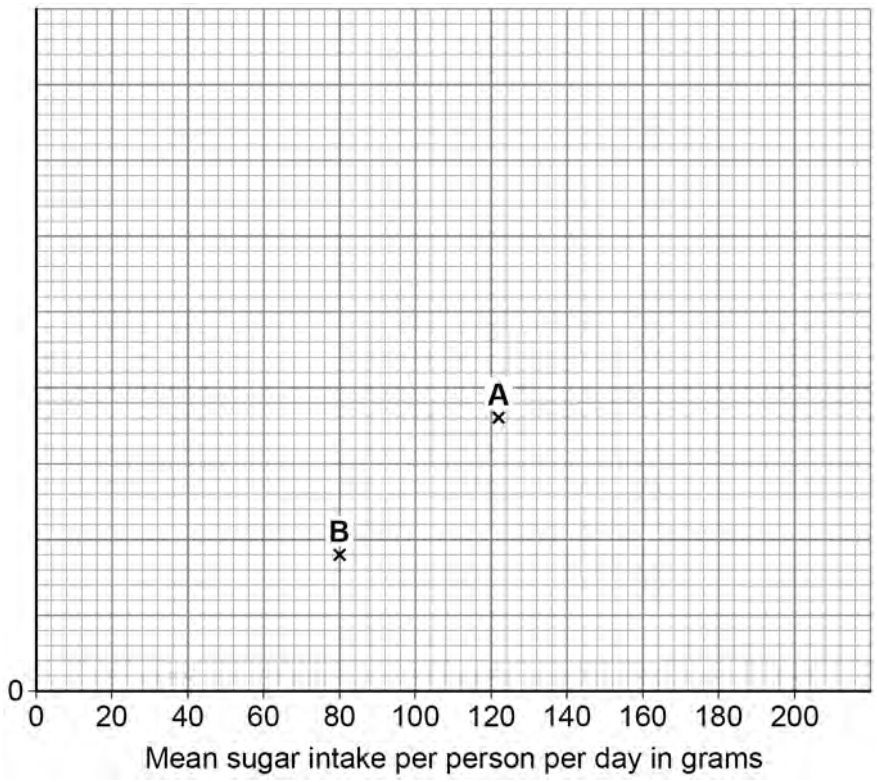
You should:

- label the *y*-axis
- add the scale for the *y*-axis
- plot the data for countries **C**, **D**, **E**, **F** and **G** from **Table 5**
- draw a line of best fit.

Countries **A** and **B** have been completed for you.

[4 marks]

Figure 10



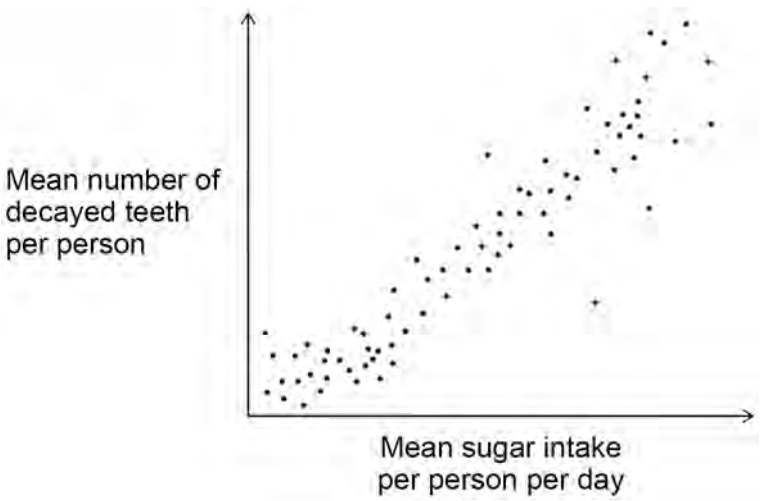
Question 7 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 32 · continued

Figure 11 shows information about the relationship between sugar intake and tooth decay.

Figure 11



0 7 . 3 Name the type of graph shown in **Figure 11**.

[1 mark]

0 7 . 4 What relationship is shown between the two variables in **Figure 11**?

[1 mark]

Tick (✓) **one** box.

Inversely proportional ☐

No correlation ☐

Positive correlation ☐

Question 32 · continued

Sugars and starch are carbohydrates.

A student investigated the effect of temperature on the activity of amylase.

For each temperature, the student:

- mixed starch and amylase together
- added iodine solution after 5 minutes.

The iodine solution was yellow-brown before it was added to the mixture.

Table 6 shows the results.

Table 6

Temperature in °C	Colour of iodine solution
10	blue-black
30	yellow-brown
60	blue-black
90	blue-black

0 7 . 5 Explain the results at 30 °C and at 90 °C.

[4 marks]

30 °C _____

_____

_____

_____

90 °C _____

_____

_____

_____

4.7.2.3 Decomposition (biology only)

Question 32 · continued

0 7 . 6 How could the student change the investigation to find a more precise temperature that amylase works best at?

[1 mark]

Tick (✓) **one** box.

Test more temperatures between 10 °C and 30 °C. ☐

Test more temperatures between 10 °C and 60 °C. ☐

Test more temperatures between 30 °C and 60 °C. ☐

Test more temperatures between 30 °C and 90 °C. ☐

0 7 . 7 Protease enzymes are involved in protein digestion.

Different types of protease enzyme are active in different organs of the digestive system.

Complete **Table 7** to identify the organ where each protease enzyme is active.

[2 marks]

Table 7

Protease enzyme	Optimum pH	Organ where enzyme is active
Pepsin	2	
Trypsin	8	

14

4.7.2.3 Decomposition (biology only)

Question 33

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0 7 Many farmers keep animals such as cows and chickens.

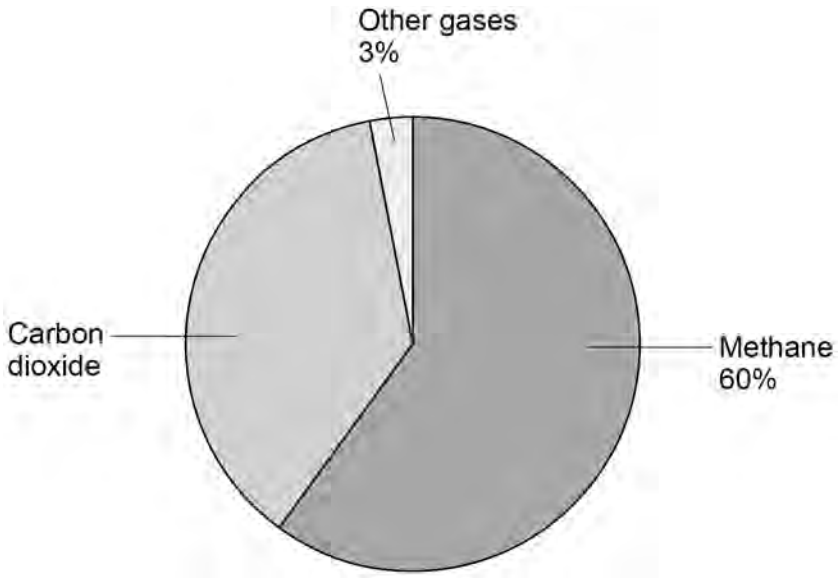
The animals produce a lot of manure (faeces).

The farmer can put the manure into a biogas generator.

In the biogas generator, microorganisms produce biogas.

0 7 . 1 **Figure 11** shows the percentages of the gases found in a sample of biogas.

Figure 11



Calculate the percentage of carbon dioxide in the biogas in **Figure 11**.

[2 marks]

Percentage of carbon dioxide = _____ %

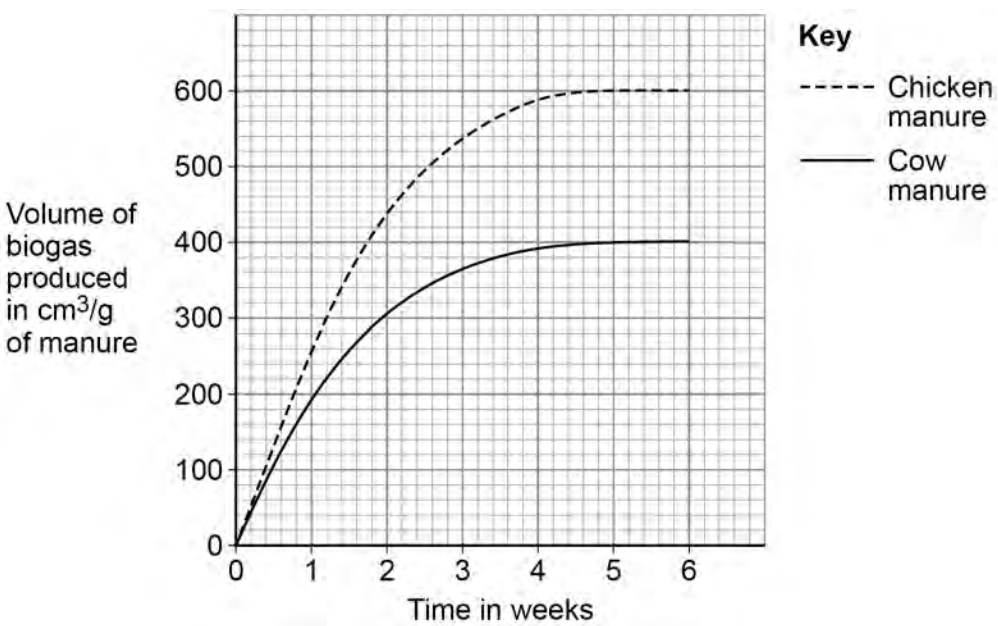
Question 7 continues on the next page

0 7 . 2 Scientists investigated biogas production from manure produced by cows and by chickens.

The scientists measured the production of biogas for 6 weeks.

Figure 12 shows the results.

Figure 12



The scientists made **three** conclusions from the results.

Give evidence from **Figure 12** to support each conclusion.

[3 marks]

Conclusion 1: 'It is better to use chicken manure than cow manure for making biogas.'

Evidence _____

_____

Conclusion 2: 'Biogas production is fastest in the first week.'

Evidence _____

_____

Conclusion 3: 'After 4 weeks it is a waste of money to run the biogas generator.'

Evidence _____

_____

Another group of scientists investigated the effect of adding fish fat to the manure used for biogas production.

Fish fat is a waste product from the sea fishing industry.

Table 4 shows the results.

Table 4

	Volume of biogas produced in cm^3/g	Volume of methane produced in cm^3/g	Percentage (%) of methane in the biogas
No fish fat	426	256	60
Fish fat added	999	599	60

0 7 . 3 Complete the sentences.

[3 marks]

Choose answers from the box.

decreases	stays the same	increases

Each answer may be used once, more than once or not at all.

When fish fat is added, the volume of biogas produced _____.

When fish fat is added, the volume of methane produced _____.

When fish fat is added, the percentage of methane in the biogas _____.

Question 7 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 33 · continued

A farmer has a farm 250 kilometres from the sea.

The farmer has a biogas generator on the farm.

The farmer adds manure to the biogas generator.

0 7 . 4 The farmer decided **not** to add fish fat to the manure in the biogas generator.

Suggest **one** reason why.

[1 mark]

0 7 . 5 There is some manure left in the biogas generator.

Explain why the farmer spreads the manure on fields where crops will be grown.

[2 marks]

11