AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.2.3

Decomposition (biology only)

Past-paper questions

Tier	**Higher**
Question groups	**23**
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 | BLY3H | Original Q3 | Legacy

3 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?

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(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 .....

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2 .....

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(2 marks)

4.7.2.3 Decomposition (biology only)

Question 01 · 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)

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Turn over for the next question

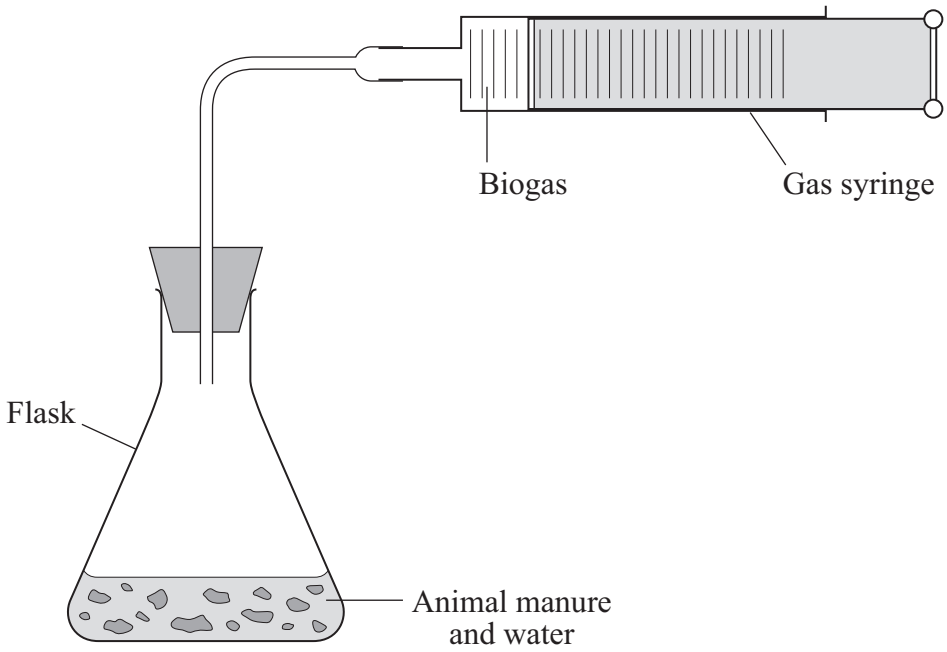
4.7.2.3 Decomposition (biology only)

Question 02

January 2009 | BLY3H | Original Q6 | Legacy

6 Some students investigated the production of biogas from animal manure.

They used the apparatus shown in the diagram.



In their first investigation, the students collected the biogas in the gas syringe.

The table shows the percentage composition of the biogas.

Gas	Percentage composition
Methane	55
Carbon dioxide	40
Water vapour	5

6 (a) To make the biogas a more efficient fuel, the percentages of two of the gases in the table should be reduced.

Which **two** gases should these be?

1 .....

2 ..... *(1 mark)*

4.7.2.3 Decomposition (biology only)

Question 02 · continued

for mark

6 (b) The students then used the apparatus for a second investigation.

They bubbled oxygen through some fresh manure and water for one hour.
They then set up the apparatus again and collected a second sample of biogas in the gas syringe.

Predict the effect of this procedure on the composition of the second sample of biogas.

Explain your answer.

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(4 marks)

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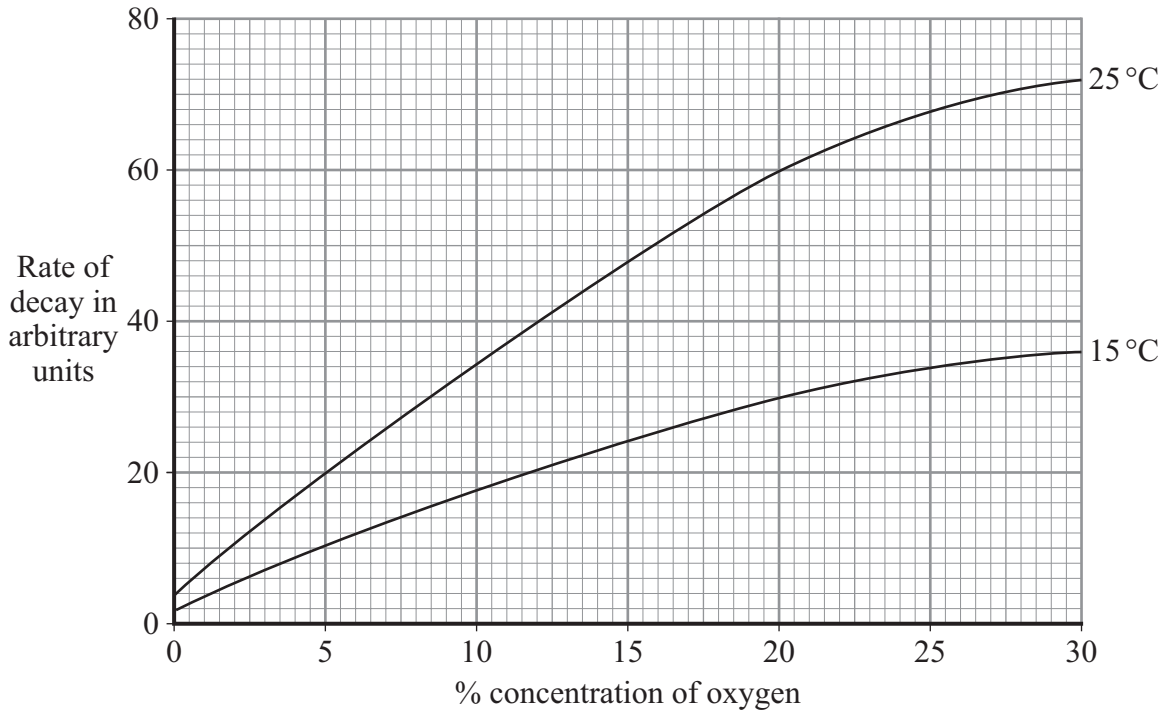
4.7.2.3 Decomposition (biology only)

Question 03

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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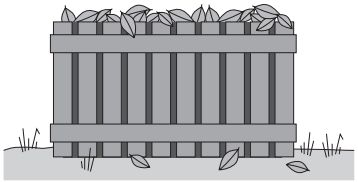
(2 marks)

4.7.2.3 Decomposition (biology only)

Question 03 · 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.

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(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.

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(1 mark)

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4.7.2.3 Decomposition (biology only)

Question 04

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.

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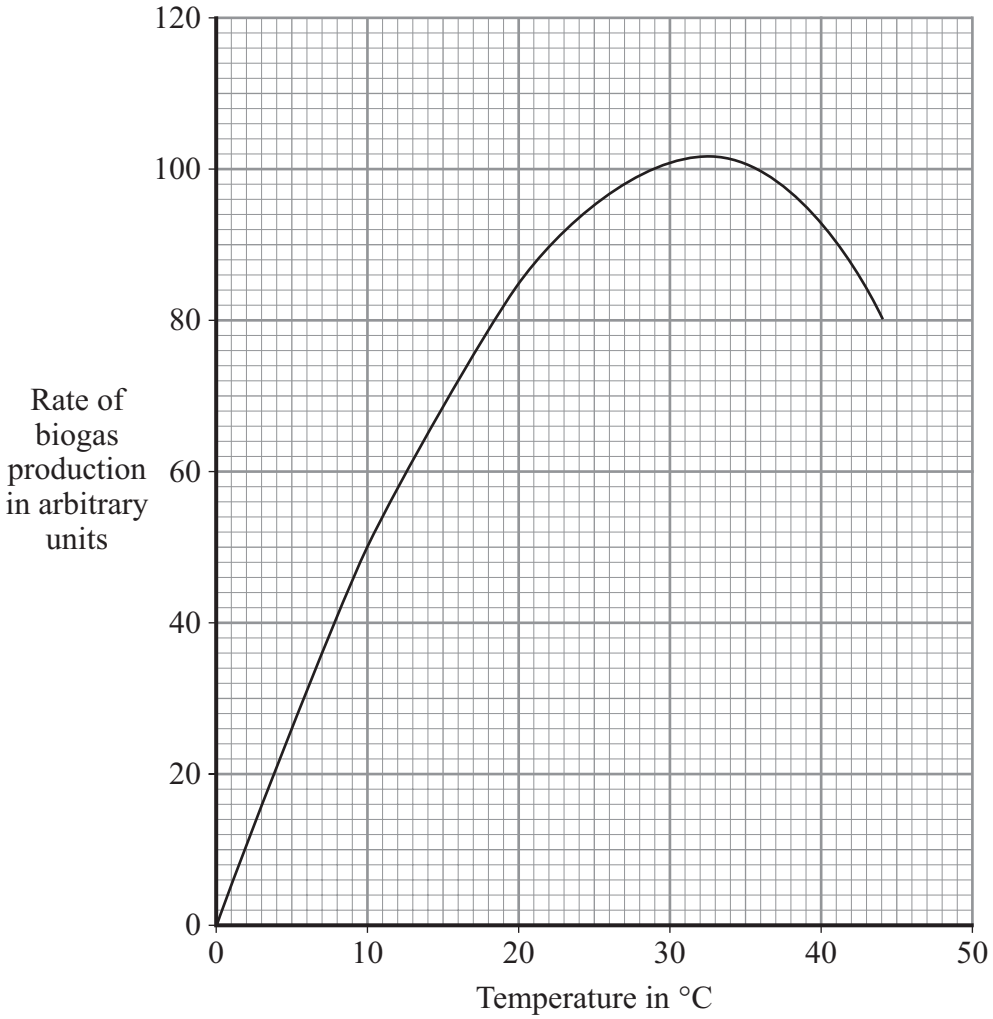
(1 mark)

4.7.2.3 Decomposition (biology only)

Question 04 · 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.

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(2 marks)

Question 3 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 04 · 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.

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(2 marks)

(Extra space) .....

7

4.7.2.3 Decomposition (biology only)

Question 05

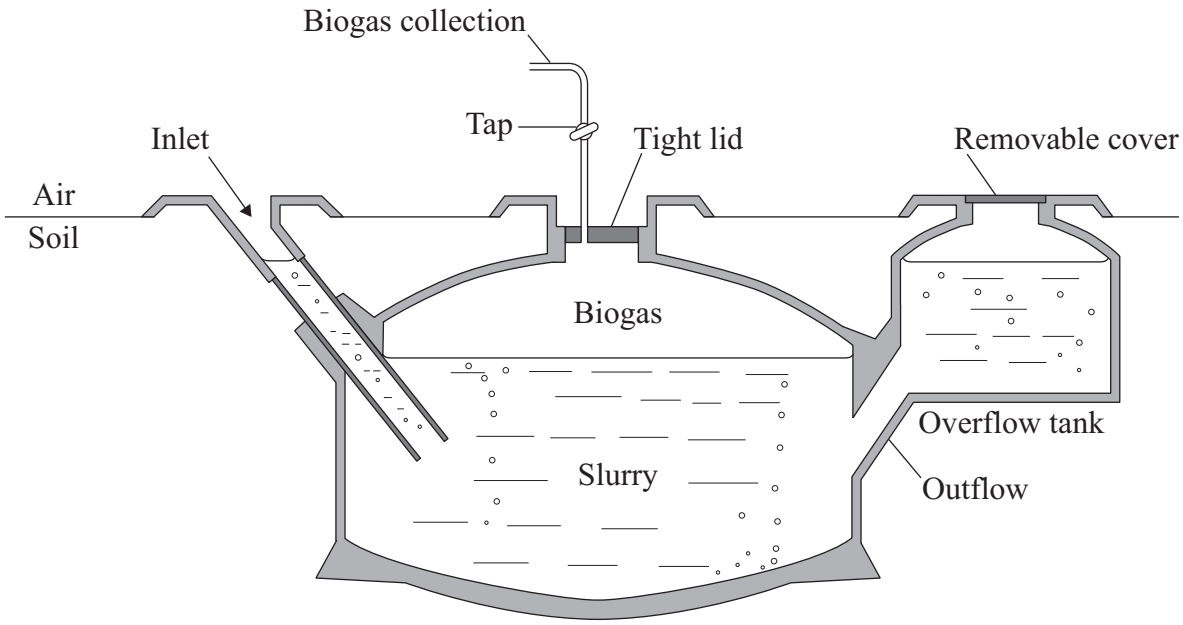
4 Biogas can be produced from waste materials that contain carbohydrates.

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 .....

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2 .....

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(2 marks)

4.7.2.3 Decomposition (biology only)

Question 05 · 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.

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(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)

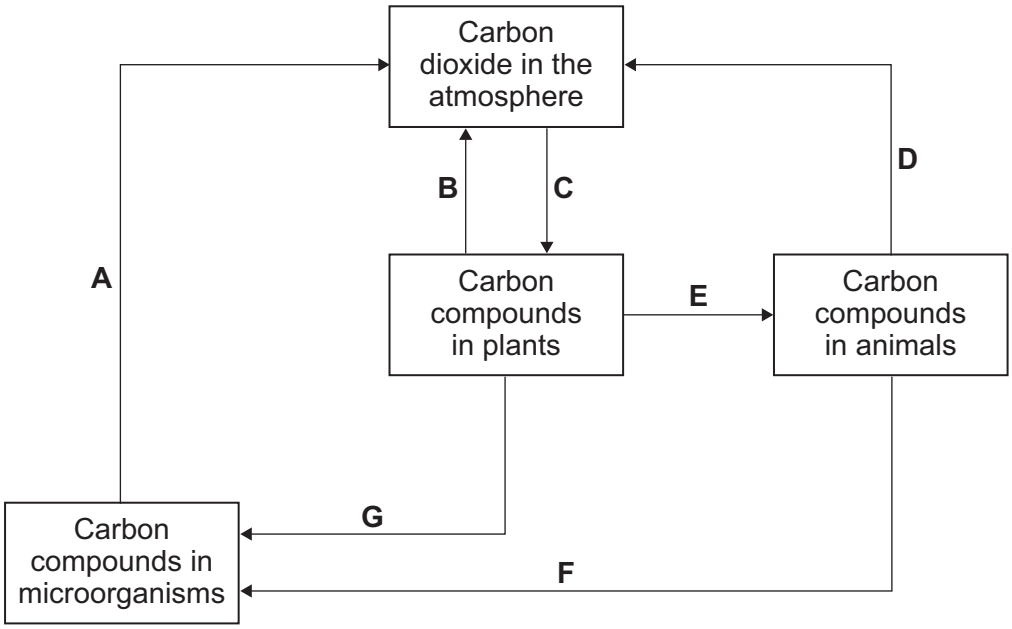
6

4.7.2.3 Decomposition (biology only)

Question 06

June 2010 | BLY2H | Original Q3 | Legacy

3 The diagram shows part of the carbon cycle.



3 (a) Letter **A** represents respiration.

Which **two** other letters represent respiration?

☐ and ☐

(1 mark)

3 (b) Other than carbon dioxide name **two** carbon compounds found in plants.

1 .....

2 .....

(2 marks)

4.7.2.3 Decomposition (biology only)

Question 06 · continued

3 (c) Gardeners use compost heaps to decay dead plants. Decayed compost is then spread onto the soil in a garden.

Explain why gardeners spread decayed compost onto the soil.

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(2 marks)

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Turn over for the next question

4.7.2.3 Decomposition (biology only)

Question 07

June 2010 | BLY2H | Original Q6 | Legacy

6 Fresh milk is a mixture of compounds including fat, protein and about 5% lactose sugar. Lactose must be digested by the enzyme lactase, before the products can be absorbed.

Lactase can be added to fresh milk to pre-digest the lactose. This makes 'lactose-free' milk, which is suitable for people who do not produce enough lactase of their own.

A student investigated the effect of changing pH and temperature on the digestion of lactose in milk.

The results are shown in **Tables 1** and **2**.

Table 1
Effect of pH

pH	Time taken to digest lactose in minutes
4.0	20
5.0	18
6.0	13
7.0	7
8.0	5
9.0	6

Table 2
Effect of temperature

Temperature in °C	Time taken to digest lactose in minutes
30	20
35	14
40	11
45	6
50	12
55	23

6 (a) The label on a carton of lactose-free milk states:

'Lactase is normally produced in the stomach of mammals.'

The results in **Table 1** show that this statement is unlikely to be true.

Explain how.

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(2 marks)

4.7.2.3 Decomposition (biology only)

Question 07 · continued

6 (b) Explain as fully as you can the results shown in **Table 2**.

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(3 marks)

6 (c) Bile is produced in the liver and is released into the small intestine.

Explain how bile helps the digestion of milk.

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(2 marks)

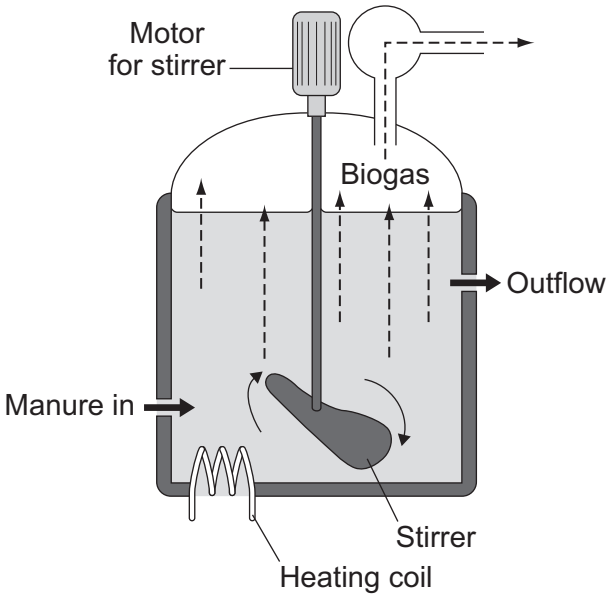
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4.7.2.3 Decomposition (biology only)

Question 08

June 2010 | BLY3H | Original Q3 | Legacy

3 The diagram shows one type of *anaerobic* digester. This is used to produce biogas.



3 (a) (i) What does *anaerobic* mean?

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(1 mark)

3 (a) (ii) The concentration of solids fed into this digester must be kept very low.

Suggest **one** reason why.

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(1 mark)

3 (a) (iii) This digester is more expensive to run than some other simpler designs of biogas generator.

Suggest **one** reason why.

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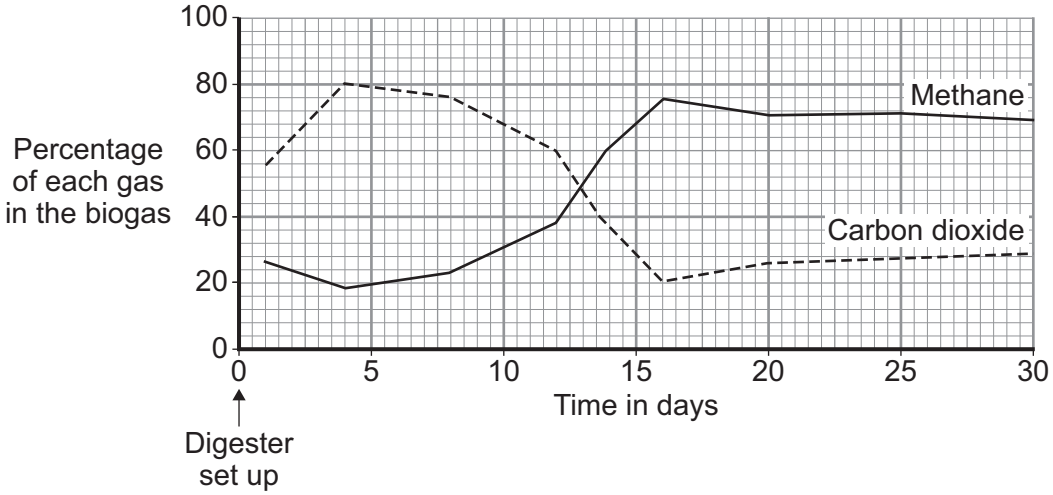
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(1 mark)

4.7.2.3 Decomposition (biology only)

Question 08 · continued

3 (b) The graph shows how the composition of the biogas produced by the digester changed over the first 30 days after the digester was set up.



Use information from the graph to answer the following questions.

3 (b) (i) Describe how the percentage of carbon dioxide changed over the 30 days.

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(3 marks)

3 (b) (ii) On which day was the best quality biogas produced? .....

(1 mark)

3 (c) Four days after the digester was first set up, the biogas contained a high percentage of carbon dioxide.

Suggest an explanation for this.

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(2 marks)

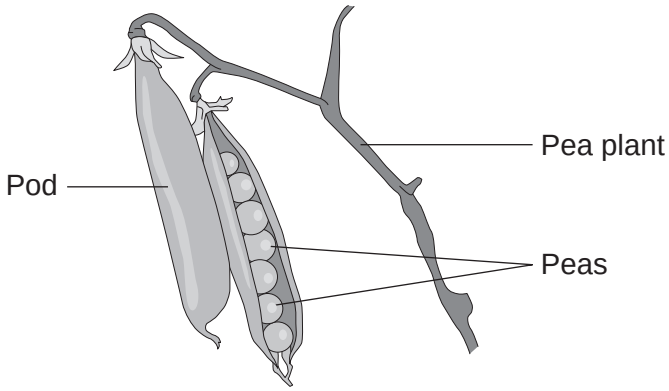
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4.7.2.3 Decomposition (biology only)

Question 09

January 2013 | BL1HP | Original Q1 | Legacy

1 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

1 (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 09 · continued

1 (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.

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(1 mark)

1 (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)

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4.7.2.3 Decomposition (biology only)

Question 10

June 2014 | BL1HP | Original Q3 | Legacy

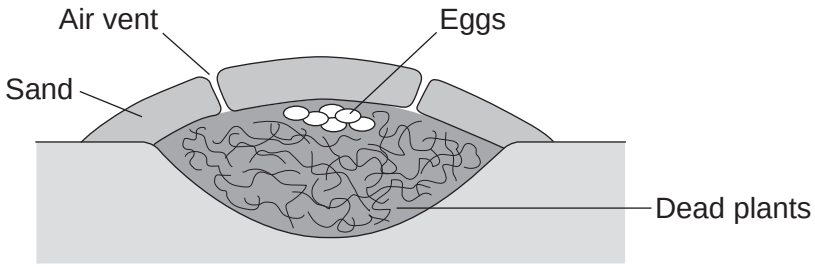
3 Most birds sit on their eggs to keep them warm until they hatch.

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 2 shows a megapode bird's nest.

Figure 2



3 (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 10 · continued

3 (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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3 (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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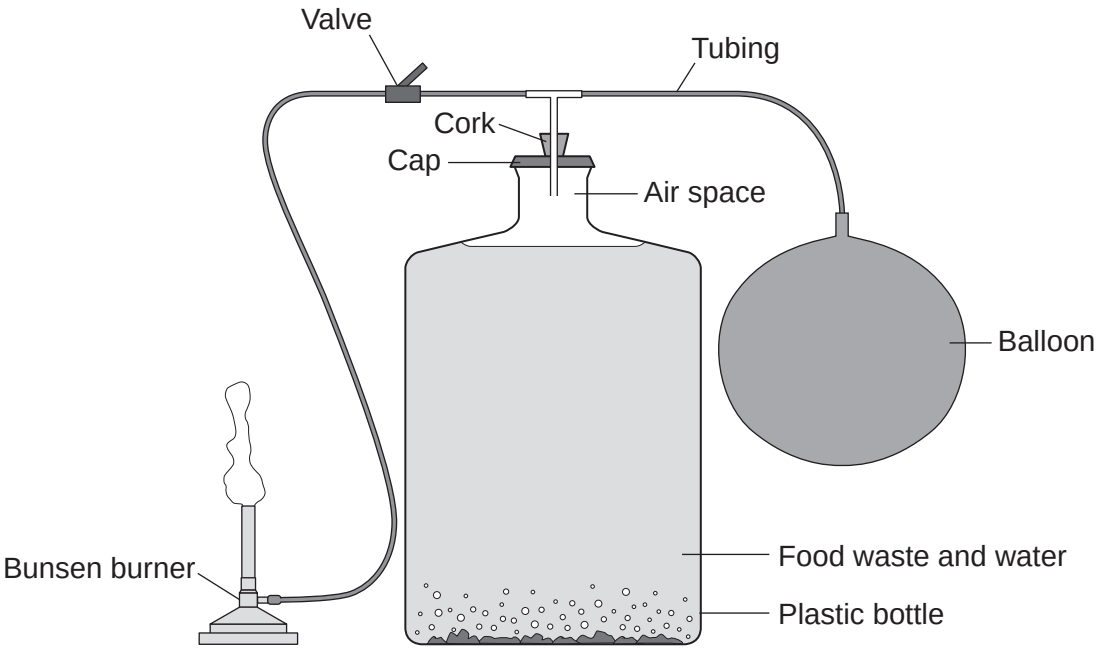
4.7.2.3 Decomposition (biology only)

Question 11

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.

4.7.2.3 Decomposition (biology only)

Question 11 · 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]

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Question 7 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 11 · 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]

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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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4.7.2.3 Decomposition (biology only)

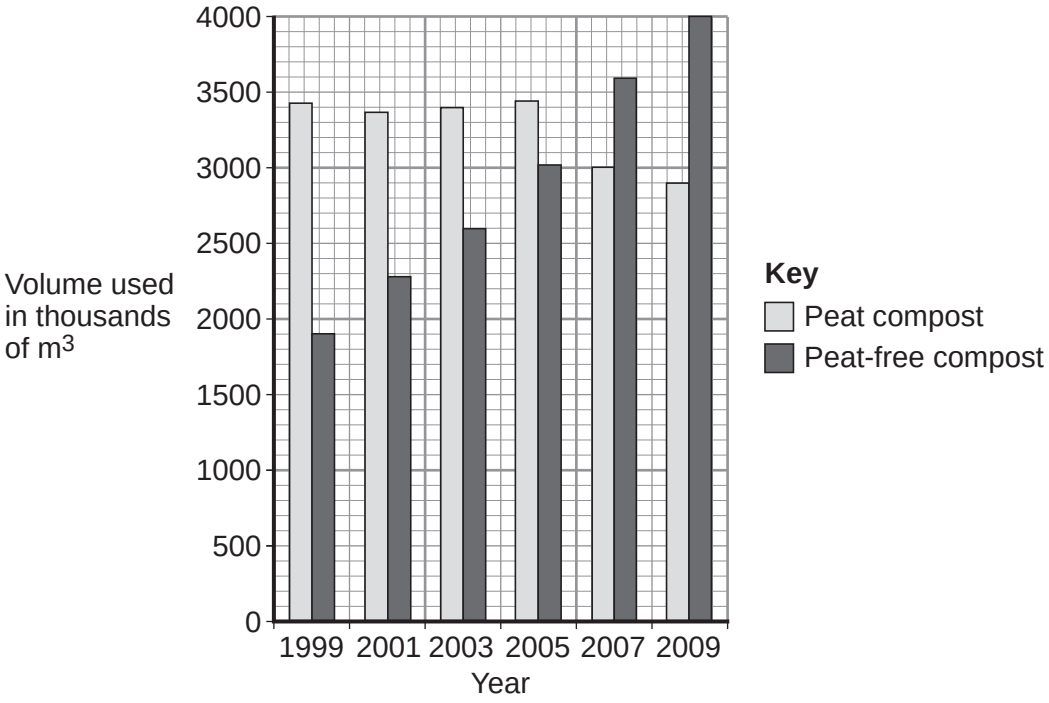
Question 12

June 2015 | BL3HP | Original Q3 | Legacy

3 Human activities have many effects on our ecosystem.

Figure 3 shows the volume of peat compost and peat-free compost used in gardening from 1999 to 2009.

Figure 3



3 (a) Describe the trends shown in **Figure 3**.

[2 marks]

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4.7.2.3 Decomposition (biology only)

Question 12 · continued

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

[1 mark]

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3 (c) Deforestation is also damaging ecosystems.

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

[1 mark]

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4

Turn over for the next question

4.7.2.3 Decomposition (biology only)

Question 13

June 2016 | BL1HP | Original Q3 | Legacy

3 Students investigated decomposition.

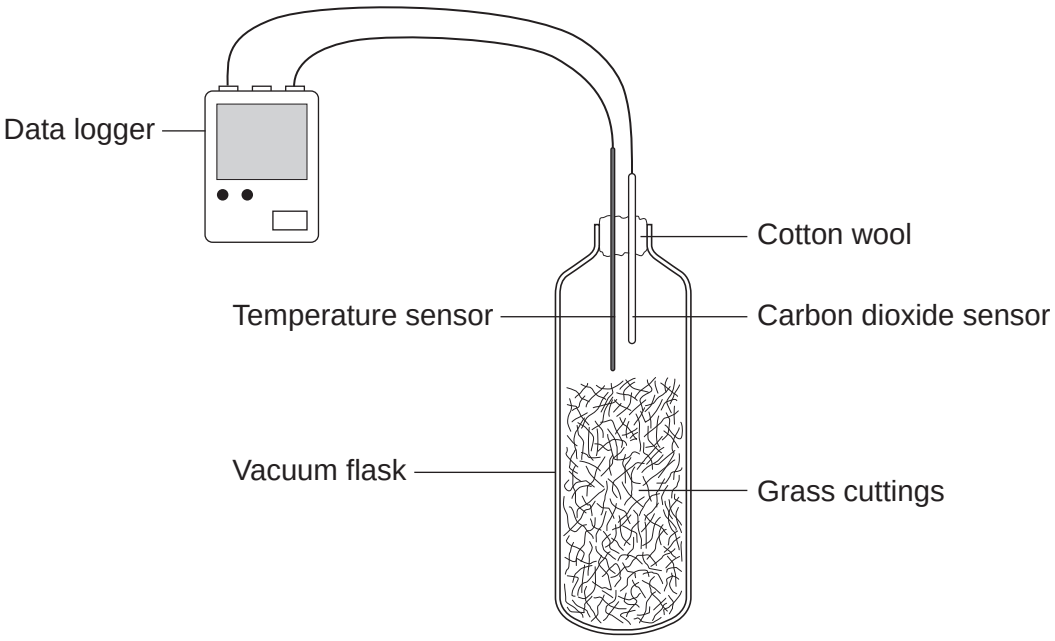
The students:

- 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 2 shows the investigation.

Figure 2



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

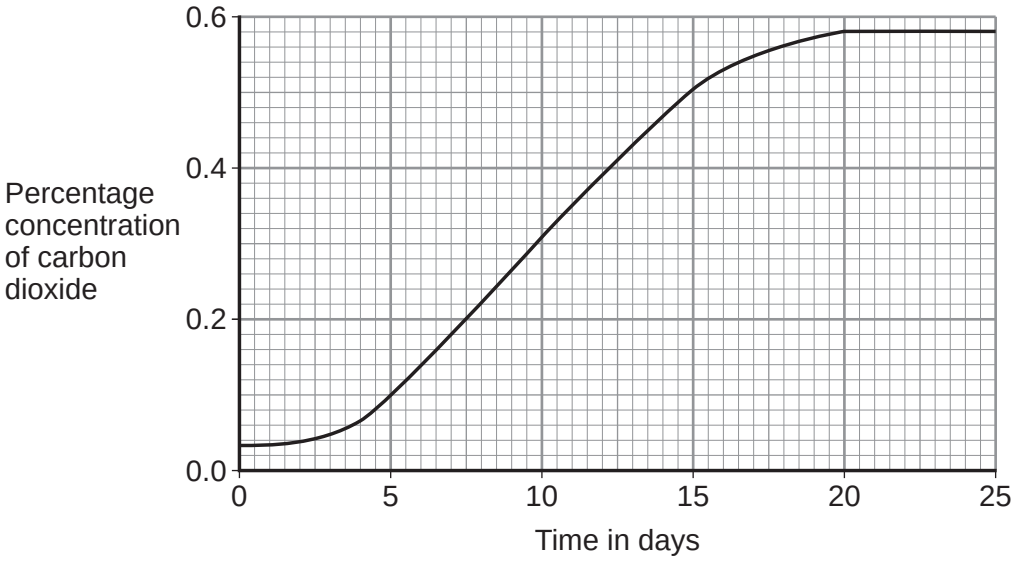
[1 mark]

4.7.2.3 Decomposition (biology only)

Question 13 · continued

3 (b) **Figure 3** shows the results from the data logger for carbon dioxide concentration in the flask for the next 25 days.

Figure 3



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

[3 marks]

3 (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 14

June 2016 | BL2HP | Original Q3 | Legacy

3 Enzymes are made and used in all living organisms.

3 (a) What is an enzyme?

[2 marks]

3 (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**

3 (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 15

June 2017 | BL3HP | Original Q1 | Legacy

1 Large areas of forest are cut down each year. This is called deforestation.

1 (a) Apart from decay, describe how the removal of trees from forests can lead to global warming.

[1 mark]

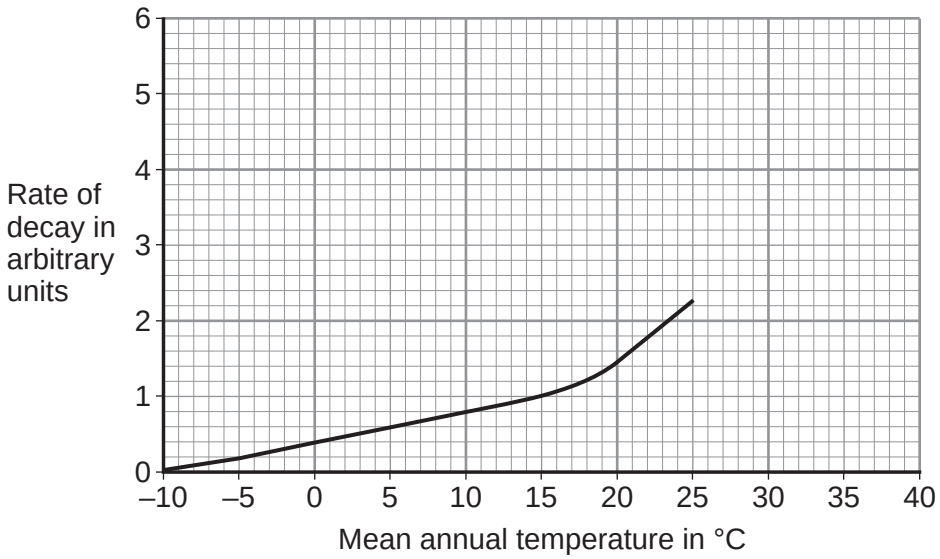
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1 (b) After trees have been cut down, branches and leaves are left on the ground to decay.

Figure 1 shows how the rate of decay changes with the mean annual temperature in different environments.

Figure 1



1 (b) (i) The mean annual temperature in forest **A** is 10 °C.

What is the rate of decay in forest **A**?

[1 mark]

Rate of decay = _____ arbitrary units

1 (b) (ii) Forest **B** has a mean annual temperature of 30 °C.

Use information from **Figure 1** to predict the rate of decay in forest **B**.

[1 mark]

Rate of decay = _____ arbitrary units

4.7.2.3 Decomposition (biology only)

Question 15 · continued

1 (c) Describe how decay in forests contributes to global warming.

[2 marks]

5

Turn over for the next question

4.7.2.3 Decomposition (biology only)

Question 16

June 2018 | 8461/1H | Original Q7

0 7 **Table 8** shows information about some food components in cow's milk.

Table 8

	Value per 500 cm^3	Recommended Daily Allowance (RDA) for a typical adult
Energy in kJ	1046	8700
Fat in g	8.4	70.0
Salt in g	0.5	6.0
Calcium in mg	605	1000
Vitamin B-12 in µg	4.5	2.4

0 7 . 1 How much **more** milk would a typical adult have to drink to get their RDA for calcium compared with the amount of milk needed to get their RDA for vitamin B-12?

[3 marks]

Volume of milk = _____ cm^3

4.7.2.3 Decomposition (biology only)

Question 16 · continued

0 7 . 2 Describe how a student could test cow's milk to show whether it contains protein and different types of carbohydrate.

[6 marks]

Question 7 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 16 · continued

A scientist investigated the effect of bile on the breakdown of fat in a sample of milk.

The scientist used an indicator that is colourless in solutions with a pH lower than 10, and pink in solutions with a pH above 10.

This is the method used.

1. Add 1 drop of bile to a test tube and one drop of water to a second test tube.

2. Add the following to each test tube:
   - 5 cm^3 of milk
   - 7 cm^3 of sodium carbonate solution (to make the solution above pH 10)
   - 5 drops of the indicator
   - 1 cm^3 of lipase.

3. Time how long it takes for the indicator in the solutions to become colourless.

The results are shown in **Table 9**.

Table 9

	Time taken for the indicator to become colourless in seconds
Solution with bile	65
Solution without bile	143

0 7 . 3 Explain why the indicator in both tubes became colourless.

[3 marks]

4.7.2.3 Decomposition (biology only)

Question 16 · continued

0 7 . 4 Give the reason why the measurement of the time taken for the indicator to become colourless might be inaccurate.

[1 mark]

0 7 . 5 Explain the difference in the results for the two test tubes in **Table 9**.

[3 marks]

16

4.7.2.3 Decomposition (biology only)

Question 17

November 2020 | 8461/2H | Original Q1

0 1 This question is about the decay of milk.

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

[2 marks]

1 _____

2 _____

0 1 . 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]

_____

Question 17 · continued

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 1 . 3 Give **one** way the pH can be measured.

[1 mark]

_____

0 1 . 4 Give **two** control variables the student should have used in this investigation.

[2 marks]

1 _____

2 _____

Question 1 continues on the next page

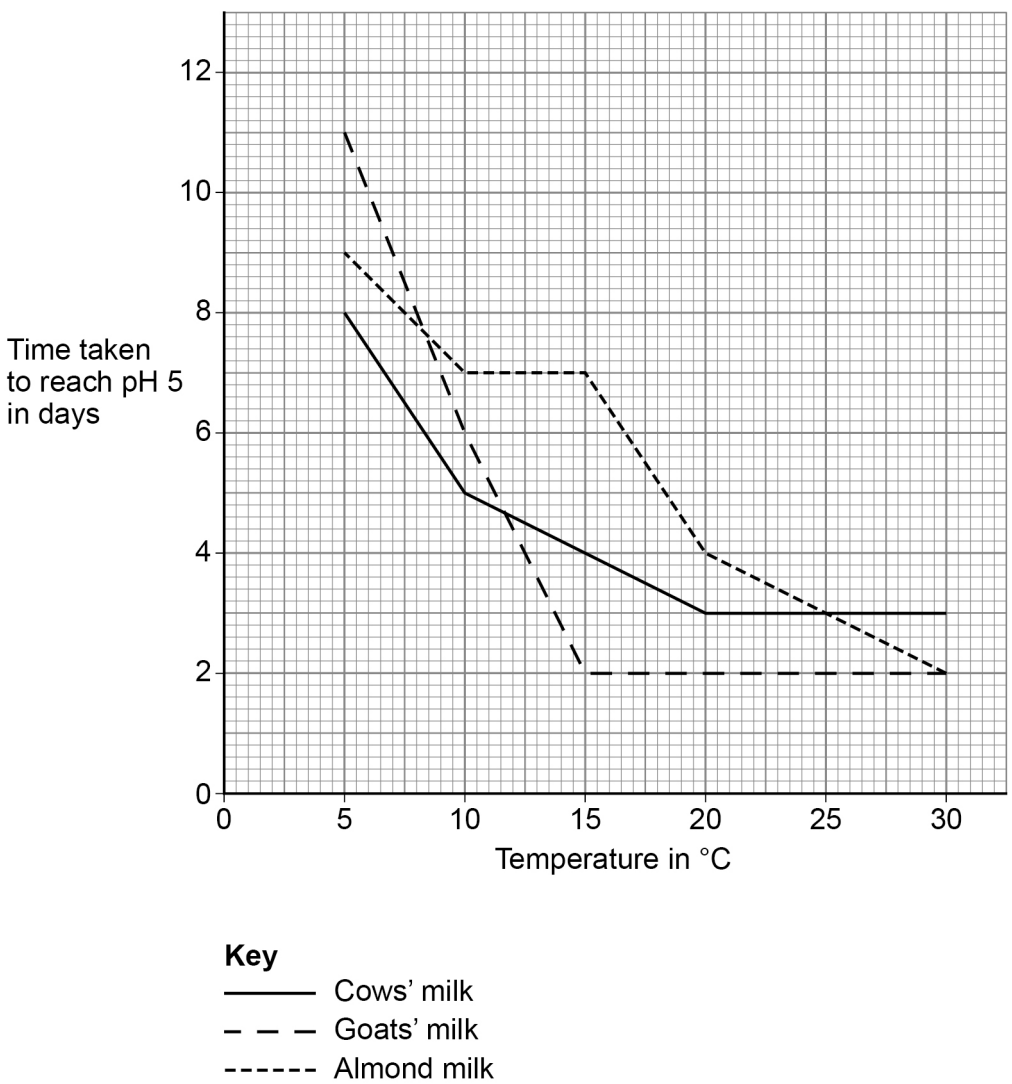
4.7.2.3 Decomposition (biology only)

Question 17 · continued

The student improved the investigation to produce valid results.

Figure 1 shows the results.

Figure 1



0 1 . 5 Which type of milk stays fresh the longest at 10 °C?

[1 mark]

4.7.2.3 Decomposition (biology only)

Question 17 · continued

0 1 . 6 Describe the effect of temperature on the time taken for **goats'** milk to reach pH 5.

Use data from **Figure 1** in your answer.

[2 marks]

0 1 . 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 1 . 8 Suggest **two** reasons why the different types of milk took different lengths of time to reach pH 5.

[2 marks]

1

2

Question 1 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 17 · continued

0 1 . 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

4.7.2.3 Decomposition (biology only)

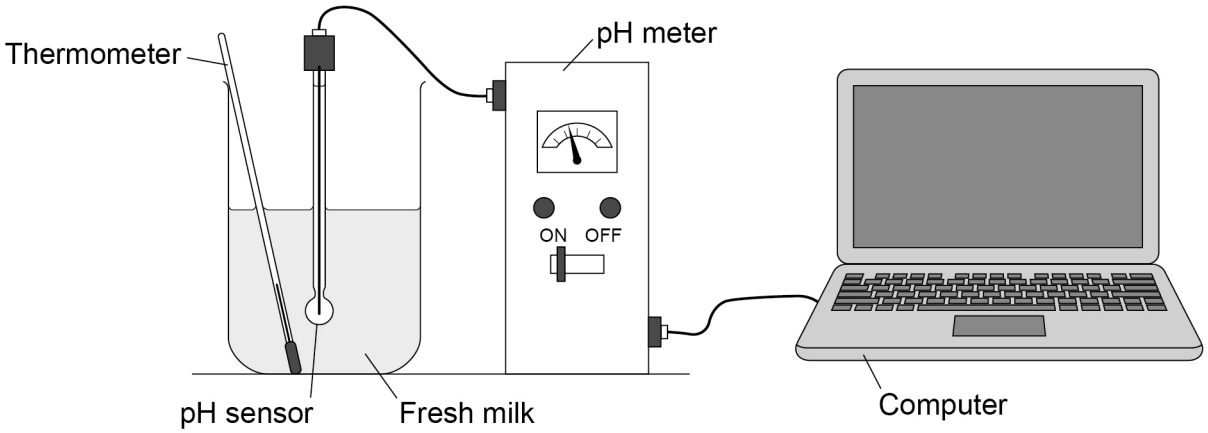
Question 18

November 2021 | 8461/2H | Original Q2

0 2 A student investigated the effect of temperature on the decay of milk.

Figure 3 shows the apparatus the student used.

Figure 3



This is the method used.

1. Set up the apparatus as shown in **Figure 3** 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 2 . 1 How could the student keep the milk at a constant temperature for 5 days?

[1 mark]

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

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

[1 mark]

Question 2 continues on the next page

Question 18 · continued

Table 1 shows the student's results for the milk at 20 °C.

Table 1

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

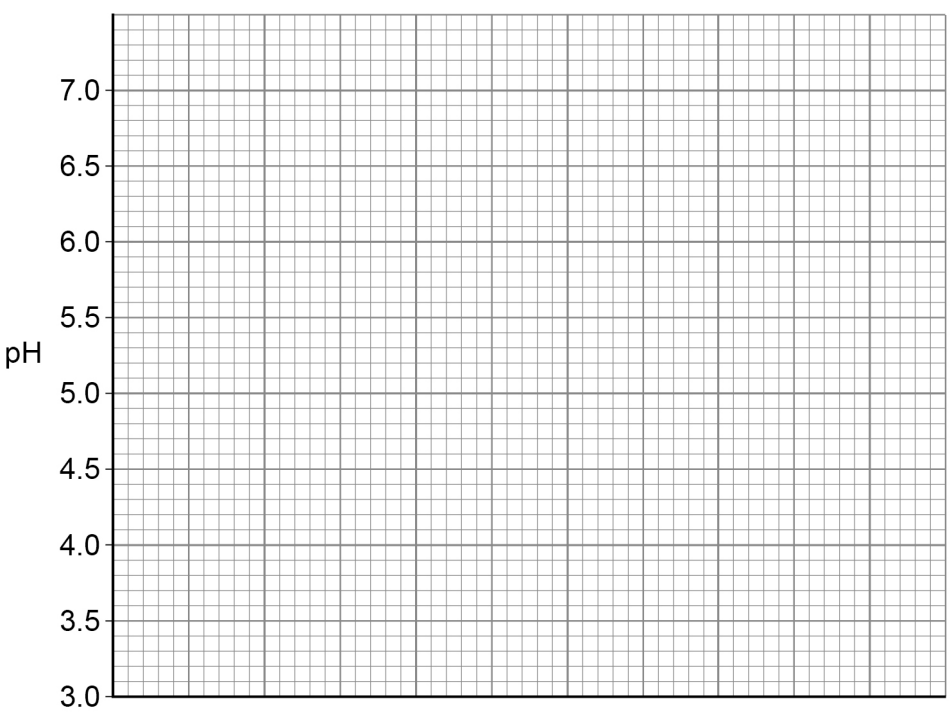
0 2 . 3 Complete **Figure 4**.

[4 marks]

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 1**
- draw a line of best fit.

Figure 4



0 2 . 4 The data you plotted in Question **02.3** were obtained at 20 °C.

Sketch a line on **Figure 4** 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)

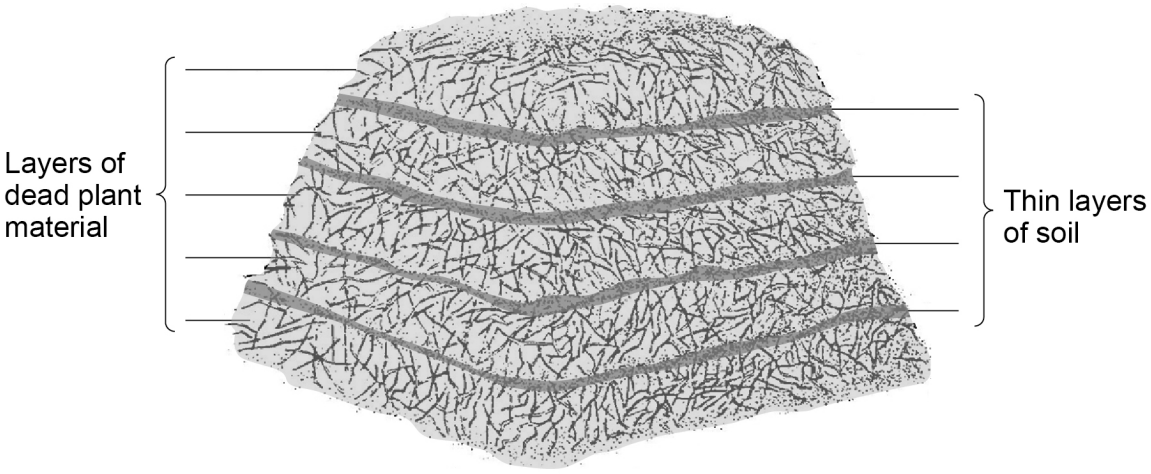
Question 19

November 2021 | 8461/2H | Original Q4

0 4 Decay occurs in a compost heap.

Figure 7 shows a compost heap.

Figure 7



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 19 · continued

6

Turn over for the next question

4.7.2.3 Decomposition (biology only)

Question 20

June 2022 | 8461/2H | Original Q2

0 2 Earthworms:

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

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

[4 marks]

Abiotic factors

1 _____

_____

2 _____

_____

Biotic factors

1 _____

_____

2 _____

_____

4.7.2.3 Decomposition (biology only)

Question 20 · continued

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

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

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

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

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

[6 marks]

10

4.7.2.3 Decomposition (biology only)

Question 21

June 2023 | 8461/2H | Original Q4

0 4 Organic substances decay into simpler substances.

0 4 . 1 The leaves fall off many trees in autumn.

The dead leaves contain carbon compounds and nitrogen compounds.

Describe how carbon **and** nitrogen in compounds in the leaves are recycled and used by living trees.

You should include a description of:

- how the leaves are broken down
- how substances are taken in and used by the trees.

[6 marks]

Question 4 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 21 · continued

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

This is the method used.

1. Place 25 cm^3 of fresh milk into each of three beakers.
2. Keep one beaker of milk at 5 °C.
3. Keep one beaker of milk at 15 °C.
4. Keep one beaker of milk at 25 °C.
5. Record the pH of the milk in each beaker every day for 4 days.

Table 1 shows the results.

Table 1

Time in days	pH of milk		
	5 °C	15 °C	25 °C
0	6.8	6.8	6.8
1	6.5	6.1	5.3
2	6.2	5.5	4.9
3	5.9	5.1	4.8
4	5.6	4.8	4.8

0 4 . 2 Suggest **one** improvement the students could have made to the method.

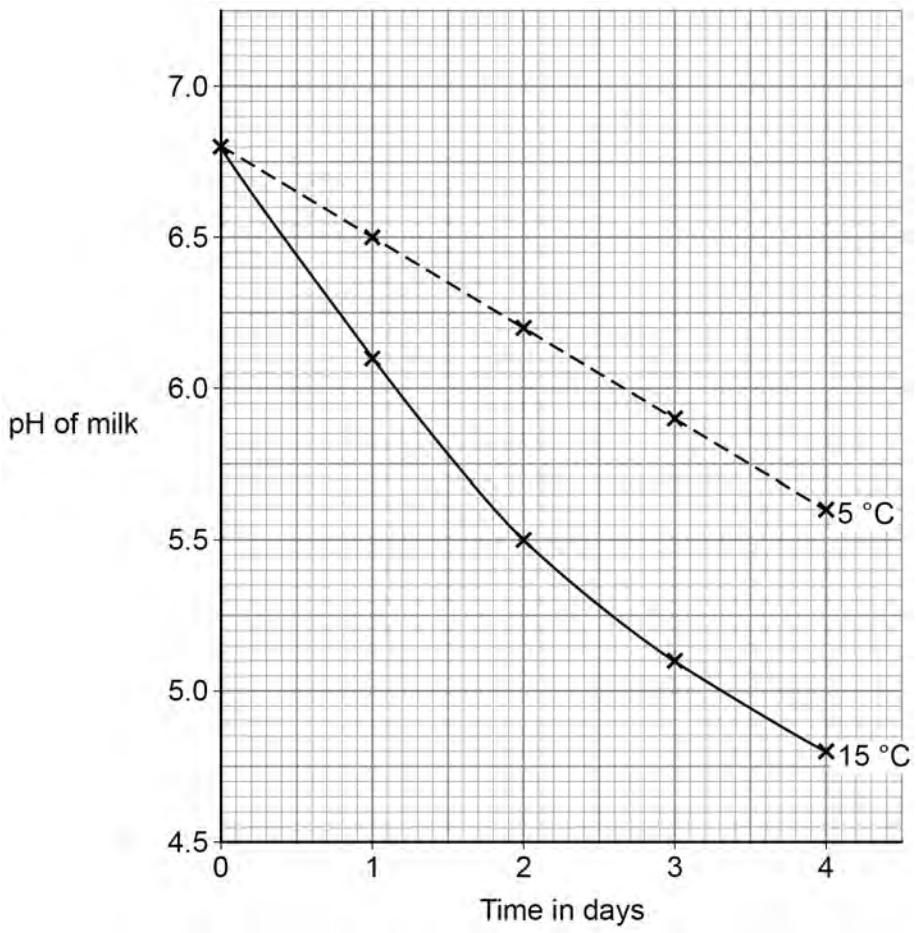
[1 mark]

4.7.2.3 Decomposition (biology only)

Question 21 · continued

Figure 6 shows the results at 5 °C and at 15 °C.

Figure 6



0 4 . 3 Complete **Figure 6**.

You should:

- plot the data for 25 °C from **Table 1**
- draw a line of best fit.

[3 marks]

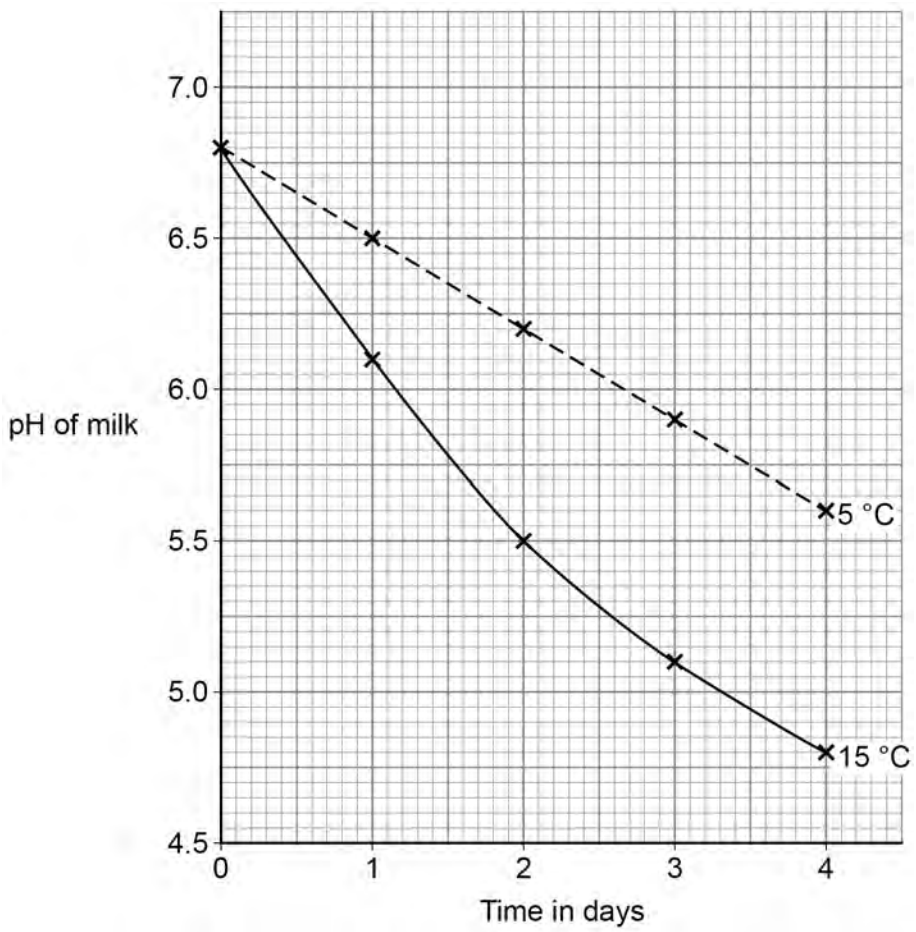
Question 4 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 21 · continued

Figure 7 shows the results for 5 °C and at 15 °C again.

Figure 7



4.7.2.3 Decomposition (biology only)

Question 21 · continued

0 4 . 4 The rate of pH change increases with an increase in temperature.

The rate of pH change at 5 °C is 0.3 pH units per day.

Calculate how many times faster the rate of pH change is at 15 °C than the rate of pH change at 5 °C, at **day 2**.

You should draw a tangent on **Figure 7**.

[4 marks]

Rate at 15 °C is _____ times faster.

0 4 . 5 Milk contains lipids.

The lipids are broken down when the milk decays.

Explain why the pH changes more quickly when the temperature is higher.

[3 marks]

17

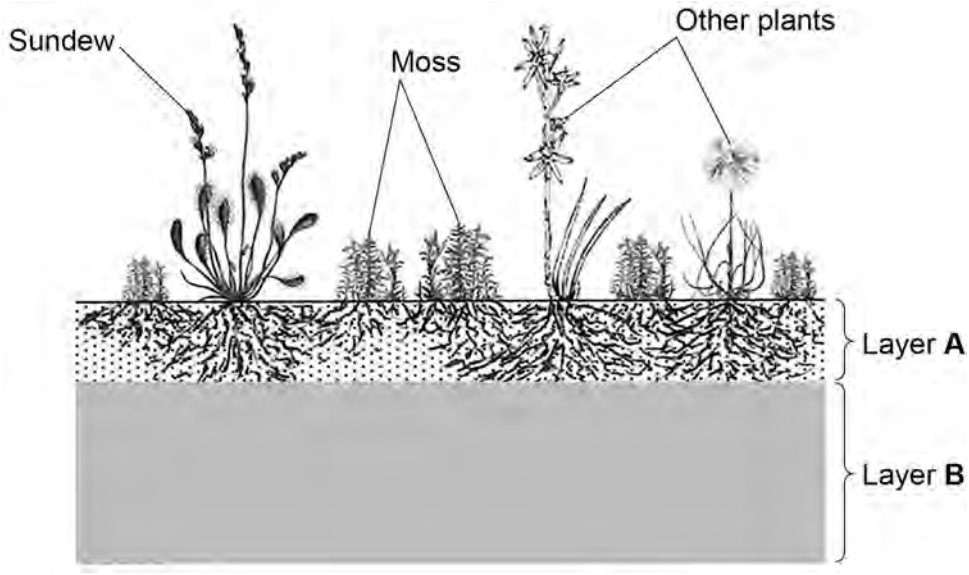
4.7.2.3 Decomposition (biology only)

Question 22

0 2 Peat bogs are estimated to contain twice as much carbon as all the world's forests.

Figure 2 shows a section through part of a peat bog.

Figure 2



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 22 · continued

0 2 . 1 Explain why most of the dead remains of plants in layer **B** do **not** decay.

[3 marks]

0 2 . 2 The peat bog in **Figure 2** 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 2 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 22 · continued

The sundew plant shown in **Figure 2** on page 4 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.

0 2 . 3 What substance can the sundew plant make using the **phosphates**?

[1 mark]

Tick (✓) **one** box.

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

0 2 . 4 What substance can the sundew plant make using the **nitrogen**?

[1 mark]

Tick (✓) **one** box.

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

0 2 . 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 2** on page 4.

Layer **B**:

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

Figure 3 shows the removal of peat from a peat bog.

Figure 3



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 23

0 2 Eating too much carbohydrate can cause obesity.

0 2 . 1 Name **one** disease that obesity is a risk factor for.

[1 mark]

Table 1 shows information about sugar intake and obesity in different countries.

Table 1

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 23 · continued

0 2 . 2 Complete **Figure 2**.

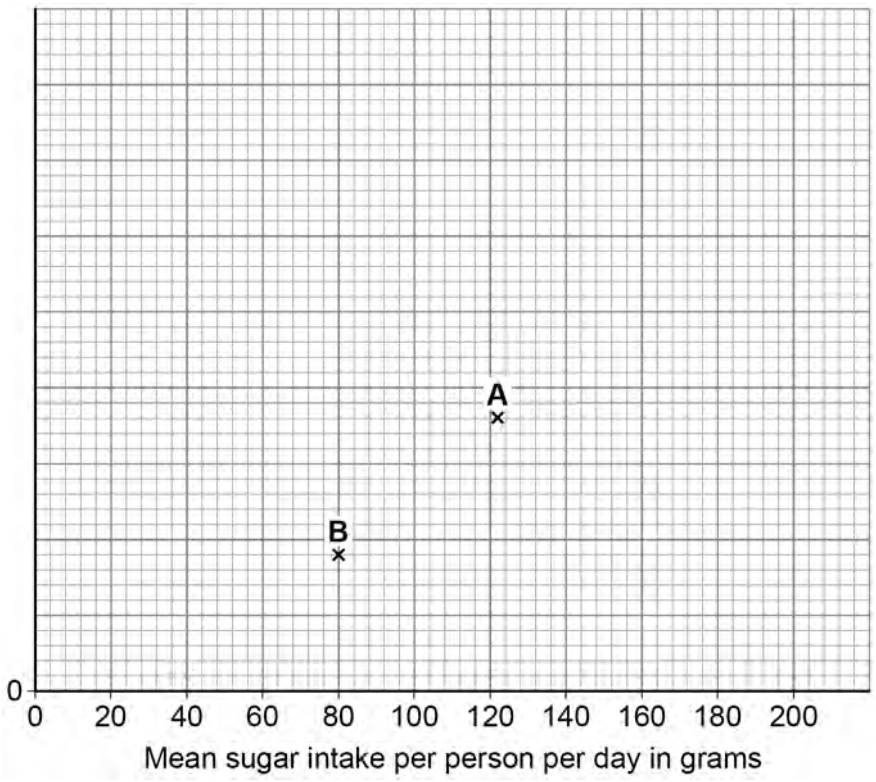
You should:

- label the *y*-axis
- add the scale for the *y*-axis
- plot the data for countries **C**, **D**, **E**, **F** and **G** from **Table 1**
- draw a line of best fit.

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

[4 marks]

Figure 2



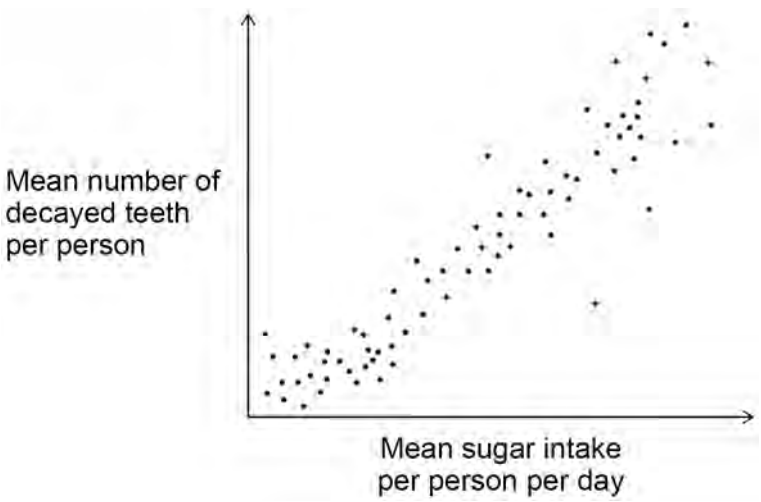
Question 2 continues on the next page

4.7.2.3 Decomposition (biology only)

Question 23 · continued

Figure 3 shows information about the relationship between sugar intake and tooth decay.

Figure 3



0 2 . 3 Name the type of graph shown in **Figure 3**.

[1 mark]

0 2 . 4 What relationship is shown between the two variables in **Figure 3**?

[1 mark]

Tick (✓) **one** box.

Inversely proportional ☐

No correlation ☐

Positive correlation ☐

4.7.2.3 Decomposition (biology only)

Question 23 · 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 2 shows the results.

Table 2

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

0 2 . 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 23 · continued

0 2 . 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 2 . 7 Protease enzymes are involved in protein digestion.

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

Complete **Table 3** to identify the organ where each protease enzyme is active.

[2 marks]

Table 3

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

14