AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.2.2

How materials are cycled

Past-paper questions

Tier	**Higher**
Question groups	**8**
Available paper years	**2010–2023**

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:** _____

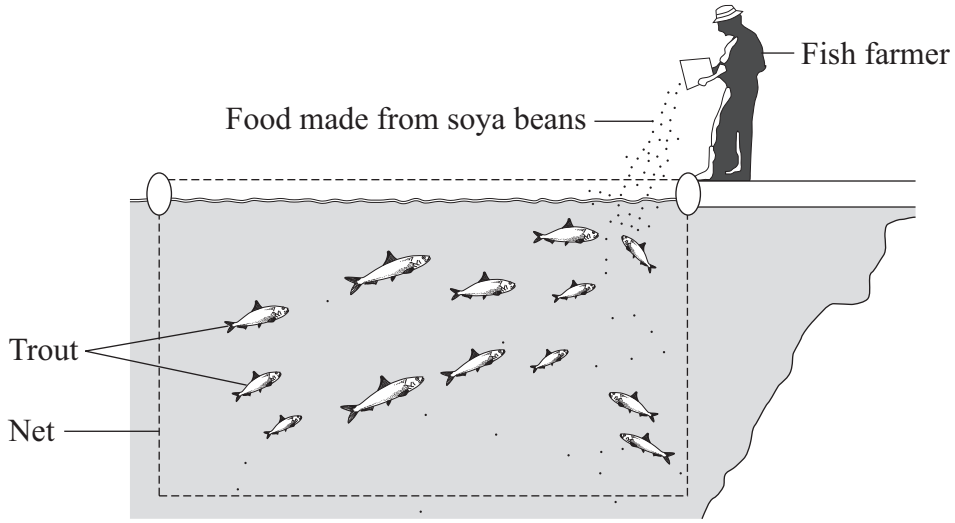
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.7.2.2 How materials are cycled

Question 01

January 2010 | BLY2H | Original Q1 | Legacy

1 A fish farmer keeps trout in a large net in a lake.



The fish farmer feeds the trout on food made from soya beans.

When the trout are large enough the farmer sells them for food for people.

1 (a) Draw a pyramid of biomass for the three organisms in this food chain.

Label the pyramid.

(2 marks)

4.7.2.2 How materials are cycled

Question 01 · continued

for mark

1 (b) It would be more energy efficient if people ate the soya beans rather than eating the trout.

Which **two** of the following are reasons for this?

Tick (✓) **two** boxes.

Some people do not like eating animals such as trout. ☐

The trout release energy when they respire. ☐

Soya bean plants release energy when they respire. ☐

Some energy will be lost in waste from the trout. ☐

Soya bean plants absorb energy during photosynthesis. ☐

(2 marks)

1 (c) Suggest **one** advantage to the fish farmer of keeping the trout in a large net instead of letting them swim freely in the lake.

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(1 mark)

1 (d) Some trout die before they are large enough to be sold.
The dead trout contain carbon.

Use your knowledge of the carbon cycle to describe how this carbon is returned to the atmosphere after the trout die.

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(2 marks)

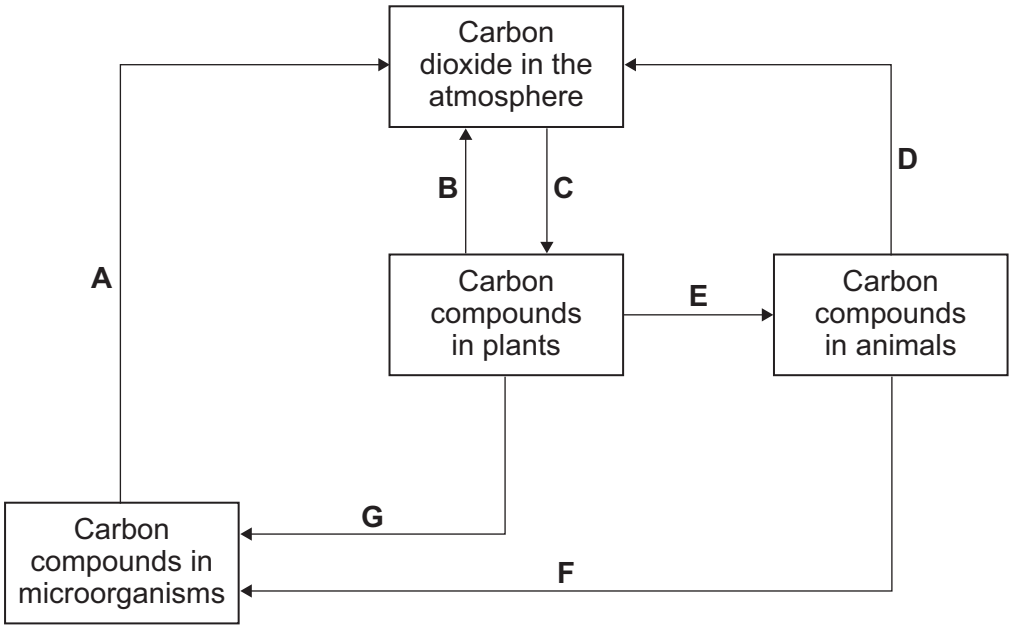
7

4.7.2.2 How materials are cycled

Question 02

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)

4.7.2.2 How materials are cycled

Question 02 · 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)

5

Turn over for the next question

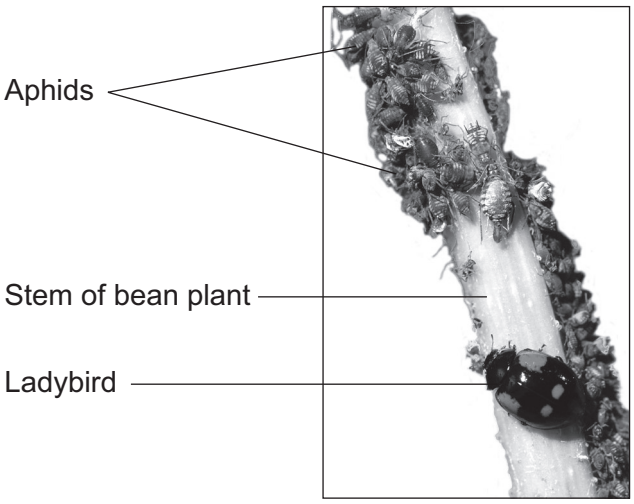
4.7.2.2 How materials are cycled

Question 03

January 2012 | BL1HP | Original Q3 | Legacy

3 Students investigated a food chain in a garden.

The students found 650 aphids feeding on one bean plant.
Five ladybirds were feeding on the aphids.



3 (a) (i) Draw a pyramid of biomass for this food chain.
Label the pyramid.

(2 marks)

4.7.2.2 How materials are cycled

Question 03 · continued

3 (a) (ii) The biomass in the five ladybirds is less than the biomass in the bean plant.

Give **two** reasons why.

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(2 marks)

3 (b) The carbon in dead bean plants is returned to the atmosphere via the carbon cycle.

Describe this part of the carbon cycle.

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(4 marks)

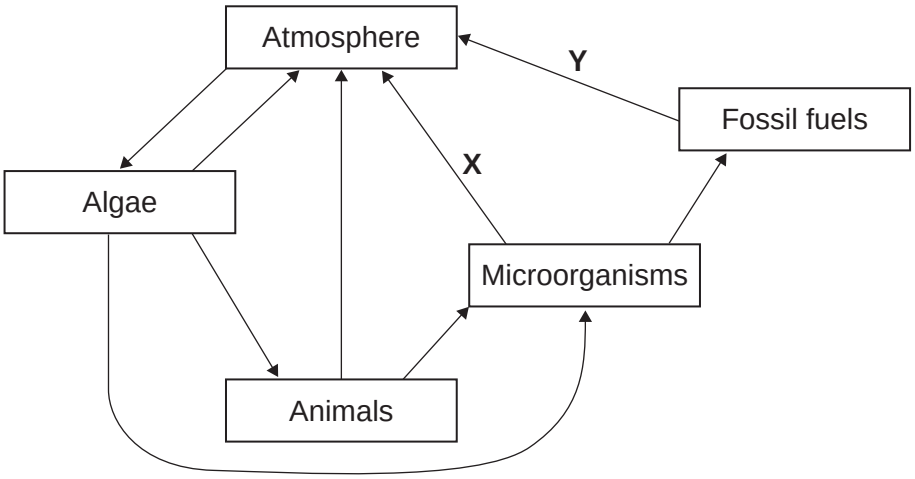
8

4.7.2.2 How materials are cycled

Question 04

June 2012 | BL1HP | Original Q2 | Legacy

2 The diagram shows part of a carbon cycle in a habitat.



2 (a) Name the processes shown by arrows **X** and **Y**.

X .....

Y .....

(2 marks)

2 (b) Describe the part played by algae in this carbon cycle.

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(3 marks)

2 (c) In tropical rainforests process **X** is much faster than in most other habitats.

Suggest why.

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(2 marks)

7

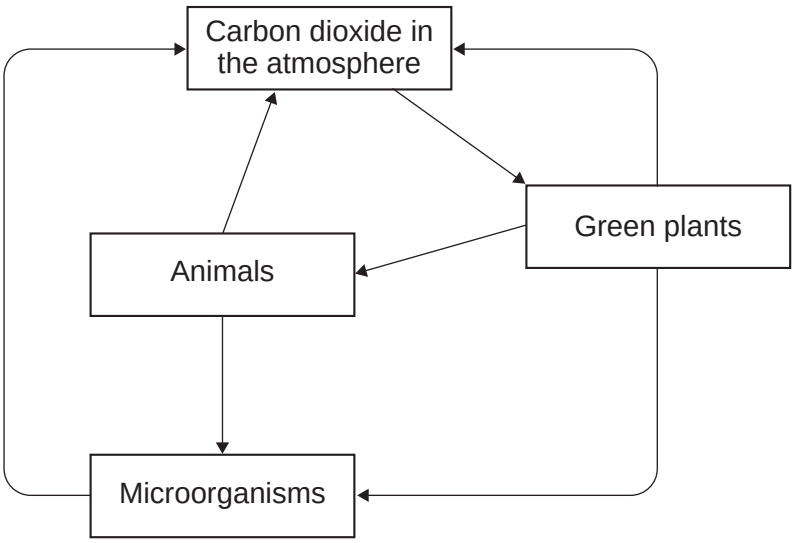
4.7.2.2 How materials are cycled

Question 05

June 2013 | BL1HP | Original Q3 | Legacy

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

The diagram shows part of the carbon cycle.



Describe how living things are involved in the constant cycling of carbon.

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4.7.2.2 How materials are cycled

Question 06

June 2017 | BL1HP | Original Q4 | Legacy

4 Plants, animals and microorganisms are involved in the carbon cycle.

Describe how **living plants** are involved in the carbon cycle.

[4 marks]

4

4.7.2.2 How materials are cycled

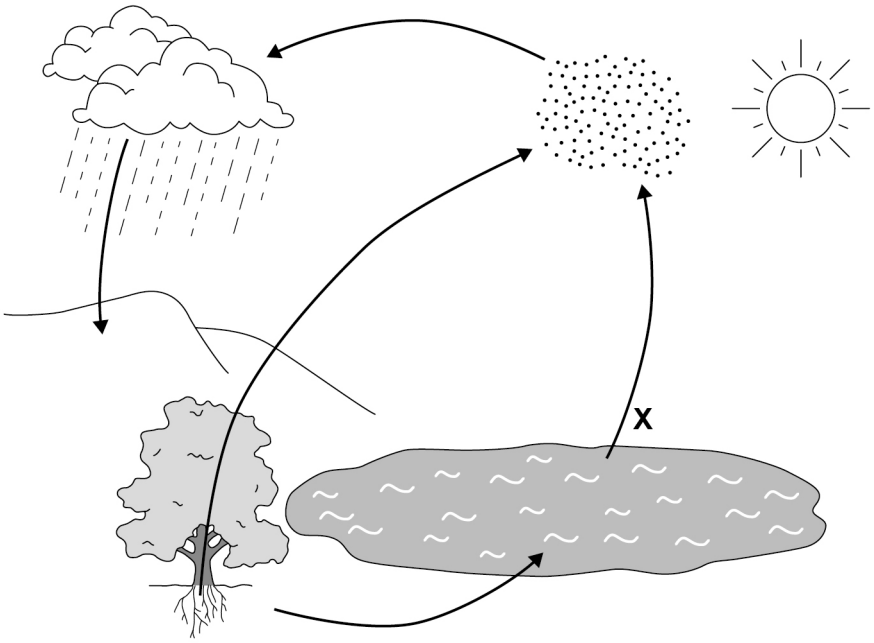
Question 07

June 2022 | 8461/2H | Original Q6

0 6 Energy flows through an ecosystem and materials are recycled.

Figure 6 shows the water cycle.

Figure 6



0 6 . 1 Name process **X**.

[1 mark]

0 6 . 2 Name the process by which water is absorbed into plant roots.

[1 mark]

0 6 . 3 Give **two** uses of water in plants.

[2 marks]

1

2

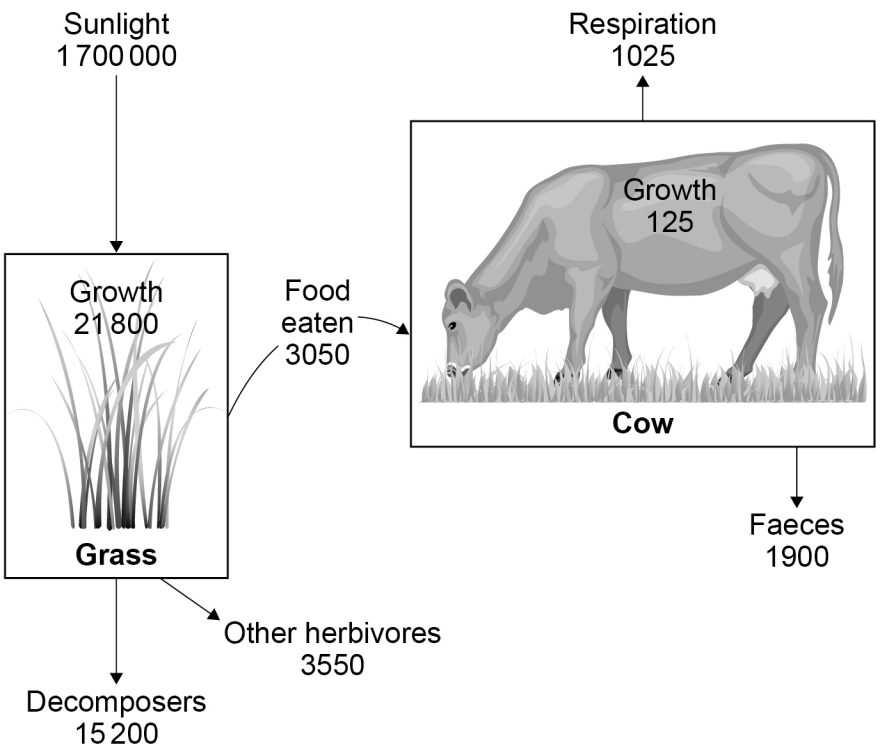
4.7.2.2 How materials are cycled

Question 07 · continued

Figure 7 shows the flow of energy through a food chain.

The numbers are in kilojoules/m^2/year.

Figure 7



Question 07 · continued

0 6 . 4 The cow is more efficient than the grass at converting energy.

The energy conversion efficiency of the cow is 4.098%.

Calculate how many times more efficient the cow is at converting energy than the grass.

The equation for energy conversion efficiency is:

$$\text{energy conversion efficiency} = \frac{\text{energy used for growth}}{\text{energy input}} \times 100$$

Give your answer to 3 significant figures.

[5 marks]

Number of times (3 significant figures) = _____

Question 6 continues on the next page

4.7.2.2 How materials are cycled

Question 07 · continued

0 6 . 5 It is more energy-efficient to rear cows indoors than to rear cows outdoors.

Give **two** reasons why.

[2 marks]

1 _____

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2 _____

_____

0 6 . 6 Suggest **two** possible disadvantages of rearing cows indoors.

[2 marks]

1 _____

_____

2 _____

_____

13

4.7.2.2 How materials are cycled

Question 08

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

Question 08 · 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.

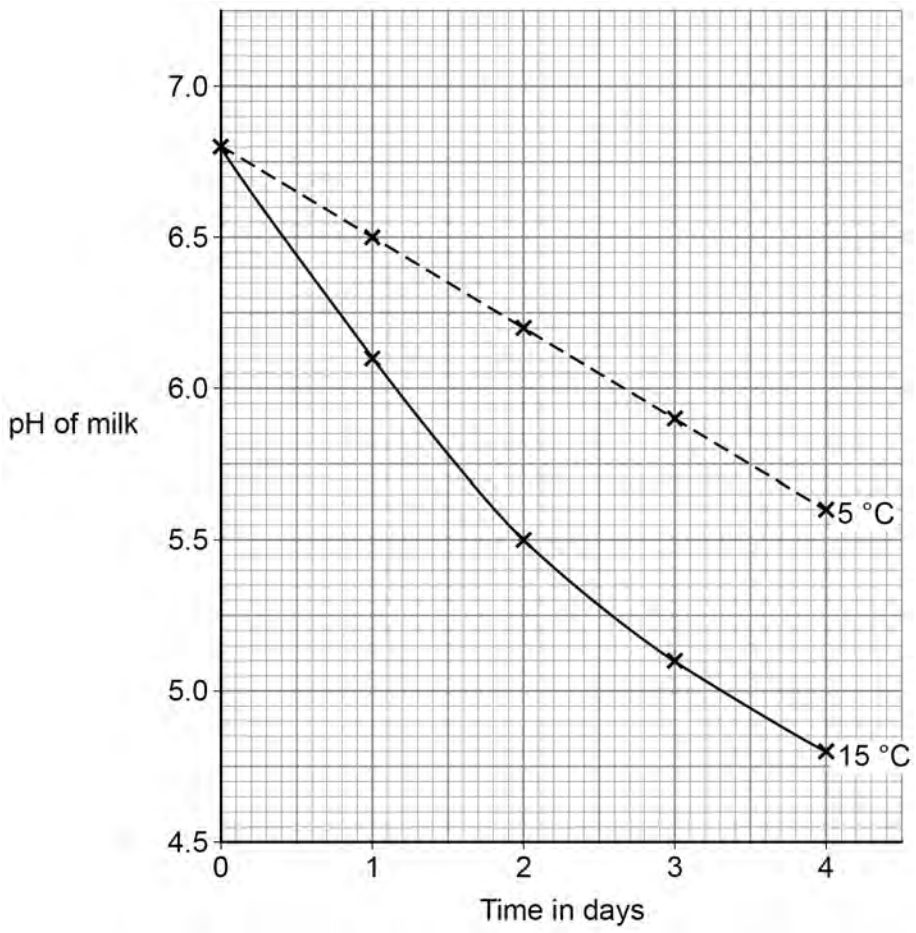
[1 mark]

4.7.2.2 How materials are cycled

Question 08 · 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]

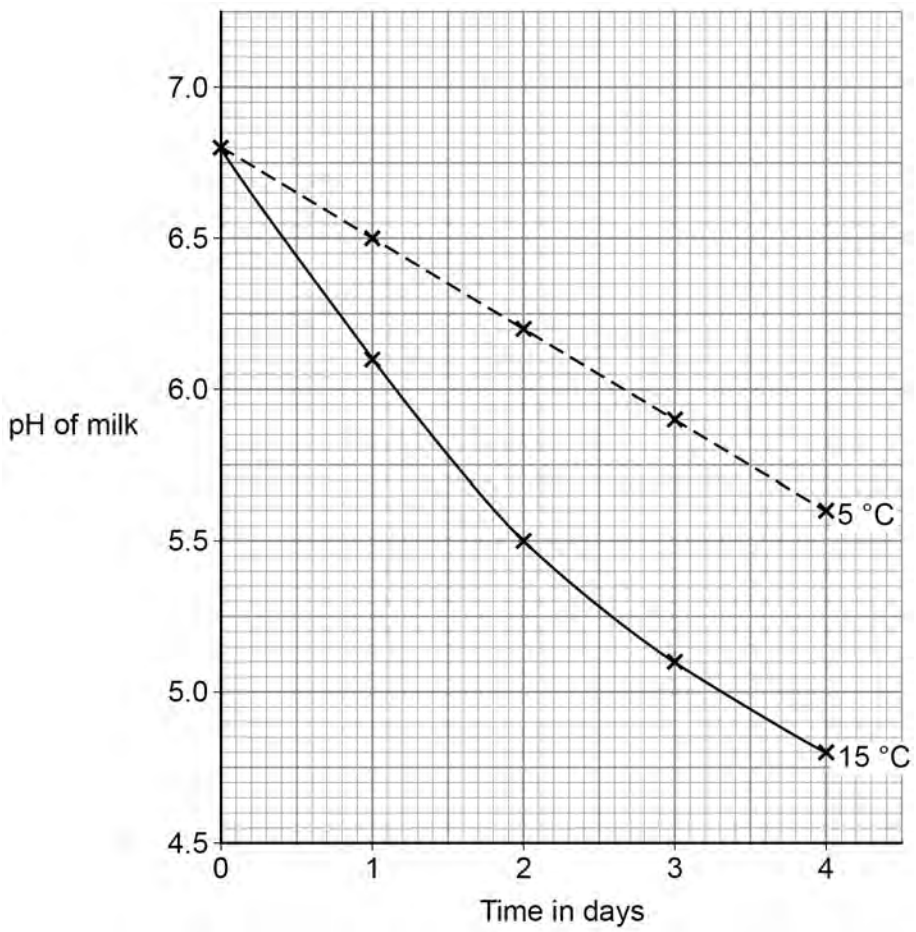
Question 4 continues on the next page

4.7.2.2 How materials are cycled

Question 08 · continued

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

Figure 7



4.7.2.2 How materials are cycled

Question 08 · 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