AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.4.2.1

Aerobic and anaerobic respiration

Past-paper questions

Tier	**Foundation**
Question groups	**6**
Available paper years	**2020–2025**

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.

4.4.2.1 Aerobic and anaerobic respiration

Question 01

November 2020 | 8464/B/1F | Original Q1

0 1 Being overweight can affect the health and life expectancy of a person.

0 1 . 1 What is **one** lifestyle change a person could make to help them lose body mass?

[1 mark]

Tick (✓) **one** box.

Drink more alcohol ☐

Eat less fatty food ☐

Stop smoking ☐

0 1 . 2 Exercise has many health benefits.

Give **two** health benefits of regular exercise.

Do **not** refer to losing body mass in your answer.

[2 marks]

1 _____

_____

2 _____

_____

4.4.2.1 Aerobic and anaerobic respiration

Question 01 · continued

During exercise, breathing rate increases to provide more oxygen for aerobic respiration.

0 1 . 3 What is the equation for aerobic respiration?

[1 mark]

Tick (✓) **one** box.

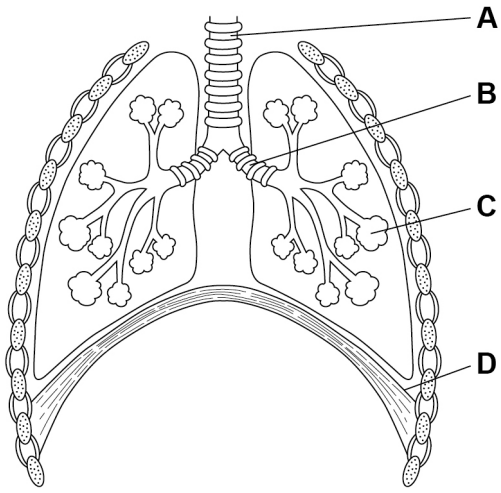
carbon dioxide + water → glucose + oxygen ☐

glucose + oxygen → carbon dioxide + water ☐

oxygen + water → glucose + carbon dioxide ☐

0 1 . 4 **Figure 1** shows the human breathing system.

Figure 1



Where does gas exchange take place?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.4.2.1 Aerobic and anaerobic respiration

Question 01 · continued

A scientist investigated the effect of exercise on the breathing rate of four people.

This is the method used.

1. Measure the resting breathing rate.

2. Exercise for 10 minutes.

3. Measure the breathing rate as soon as exercise stops.

4. Record the time taken for the breathing rate to return to the resting rate.

Table 1 shows the results.

Table 1

Person	Resting breathing rate in breaths per minute	Breathing rate after exercise in breaths per minute	Increase in breathing rate in breaths per minute	Time for breathing rate to return to resting rate in minutes
A	12	45	33	5.5
B	10	28	18	4.0
C	11	35	24	6.5
D	13	52	39	10.0

0 1 . 5 The scientist concluded that person **B** was the fittest.

Give **two** reasons that support the scientist's conclusion.

Use **Table 1**.

[2 marks]

1 _____

_____

2 _____

_____

4.4.2.1 Aerobic and anaerobic respiration

Question 01 · continued

0 1 . 6 Suggest **two** reasons why the scientist's conclusion may **not** be valid.

[2 marks]

1 _____

_____

2 _____

_____

0 1 . 7 Give **two** changes that happen in the body during aerobic exercise.

Do **not** refer to increased breathing rate in your answer.

[2 marks]

1 _____

_____

2 _____

_____

0 1 . 8 Muscles respire anaerobically during vigorous exercise.

Complete the sentences.

Choose answers from the box.

[2 marks]

amino acids	**carbon dioxide**	**glucose**
lactic acid	**oxygen**	

Muscles respire anaerobically if they do not have

enough _____ .

Anaerobic respiration of glucose produces _____ .

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4.4.2.1 Aerobic and anaerobic respiration

Question 02

November 2021 | 8464/B/1F | Original Q3

0 3 Anaerobic respiration in yeast is called fermentation.

The equation for fermentation is:

glucose → ethanol + carbon dioxide

0 3 . 1 How does the equation show that fermentation is an **anaerobic** reaction?

[1 mark]

Fermentation in yeast is used in the manufacture of beer, wine and bread.

0 3 . 2 Why is fermentation used when making beer and wine?

[1 mark]

0 3 . 3 Explain why fermentation is used when making bread.

[2 marks]

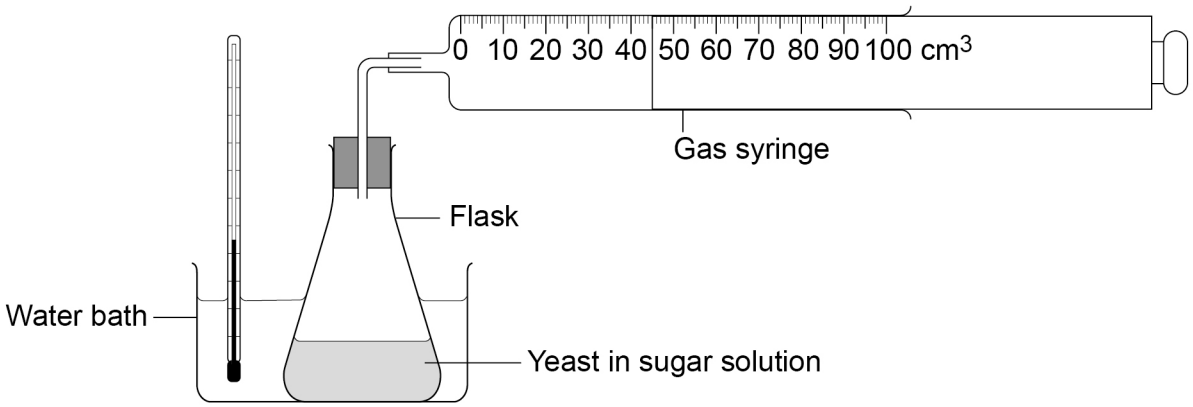
4.4.2.1 Aerobic and anaerobic respiration

Question 02 · continued

A student investigated fermentation in yeast.

Figure 3 shows the apparatus.

Figure 3



This is the method used.

1. Mix yeast with sugar solution in a flask.
2. Put the flask in a water bath at 35 °C.
3. After 10 minutes attach a gas syringe to the flask.
4. Record the volume of carbon dioxide collected every 5 minutes for 1 hour.

0 3 . 4 What volume of carbon dioxide has been collected in the gas syringe in **Figure 3**?

[1 mark]

Volume of carbon dioxide = _____ cm^3

0 3 . 5 Why did the student wait 10 minutes before attaching the gas syringe?

[1 mark]

Tick (✓) **one** box.

To allow time for the mixture to reach 35 °C ☐

To allow time for the sugar to dissolve ☐

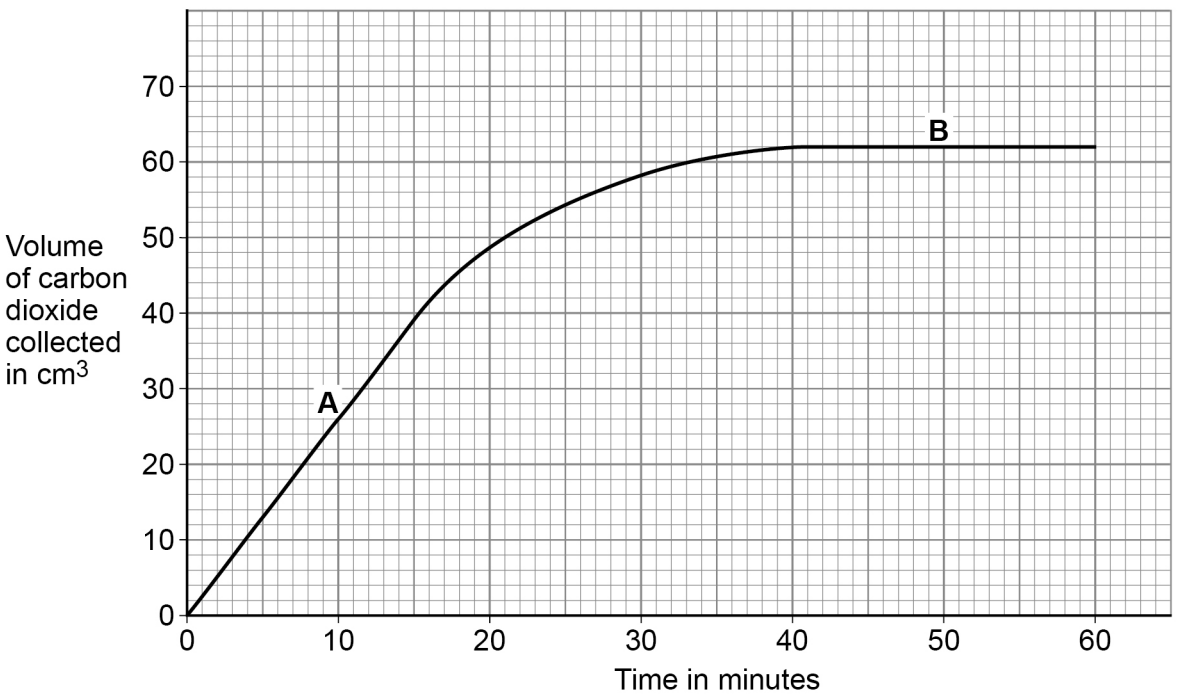
To allow time to draw a results table ☐

4.4.2.1 Aerobic and anaerobic respiration

Question 02 · continued

Figure 4 shows the results.

Figure 4



4.4.2.1 Aerobic and anaerobic respiration

Question 02 · continued

0 3 . 6 **A** and **B** are different parts of the graph in **Figure 4**.

Draw **one** line from each part of the graph to the description of the reaction.

[2 marks]

Part of the graph	Description of the reaction
	Carbon dioxide is **not** being produced
A	
	Carbon dioxide production is **fastest**
B	
	Carbon dioxide production is **slowing down**

Question 3 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 02 · continued

The equation for fermentation is repeated here.

glucose → ethanol + carbon dioxide

0 3 . 7 Suggest **one** reason why fermentation in the flask stopped.

[1 mark]

0 3 . 8 Fermentation is controlled by enzymes.

The investigation was repeated at 2 °C and at 75 °C.

No carbon dioxide was produced at either of these temperatures.

Suggest why **no** carbon dioxide was produced at 2 °C or at 75 °C.

[2 marks]

Reason at 2 °C

Reason at 75 °C

0 3 . 9 Anaerobic respiration also happens in animal cells.

Complete the equation for anaerobic respiration in animal cells.

Choose answers from the box.

[2 marks]

carbon dioxide	ethanol	glucose	lactic acid	water

_____ → _____

13

4.4.2.1 Aerobic and anaerobic respiration

Question 03

November 2021 | 8464/B/2F | Original Q3

0 3 **Figure 2** shows one species of bird on a bird feeder.

Figure 2



The birds use their beaks to reach nuts inside the bird feeder.

Cats sometimes eat the birds.

0 3 . 1 Give the food chain for the birds, cats and nuts.

[2 marks]

0 3 . 2 Which organism in the food chain you gave in Question **03.1** is the primary consumer?

[1 mark]

4.4.2.1 Aerobic and anaerobic respiration

Question 03 · continued

0 3 . 3 Cats are one biotic factor that affects the size of the bird population.

Which **two** of the following are **biotic** factors?

[2 marks]

Tick (✓) **two** boxes.

- Food ☐
- Pathogens ☐
- Sunlight ☐
- Temperature ☐
- Water ☐

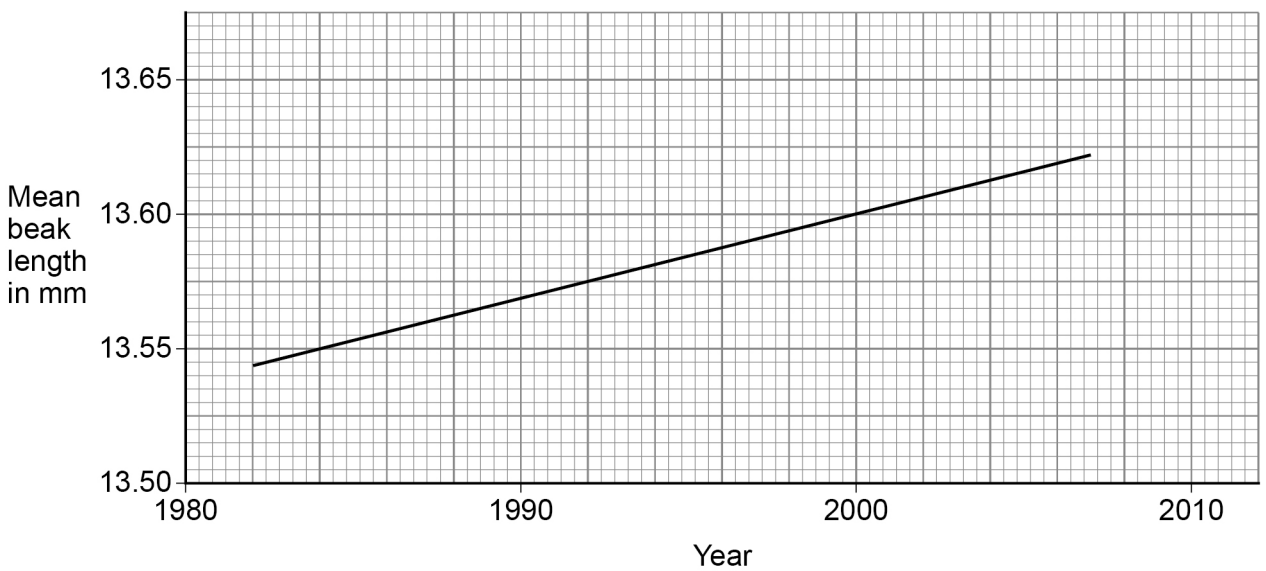
Question 3 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 03 · continued

Figure 3 shows the mean beak length of this species of bird from 1982 to 2007.

Figure 3



0 3 . 4 What was the mean beak length in 2000?

[1 mark]

Mean beak length = _____ mm

0 3 . 5 What type of adaptation is beak length?

[1 mark]

Tick (✓) **one** box.

Behavioural ☐

Chemical ☐

Structural ☐

4.4.2.1 Aerobic and anaerobic respiration

Question 03 · continued

Figure 3 shows evidence of evolution in this species of bird.

0 3 . 6 Scientists have concluded that beak length in this species of bird is increasing.

Complete the sentences about the evolution of this species of bird.

Choose answers from the box.

[4 marks]

excretion	**generation**	**mutation**
reproduction	**respiration**	**variation**

The difference in beak length in the bird population is called _____ .

A change in a gene affects the beak length.

Change in a gene is called _____ .

The birds with the longest beaks get more food.

Getting more food improves a bird's chances of survival and _____ .

This process of evolution takes place over more than one _____ .

Question 3 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

0 3 . 7 Birds of this species:

- live for about 3 years
- produce up to 24 eggs every year.

Why is evolution easier to study in birds than in humans?

[1 mark]

Tick (✓) **one** box.

Birds breed less frequently than humans. ☐

Birds have a shorter life cycle than humans. ☐

Birds have fewer offspring than humans. ☐

0 3 . 8 Bacteria also provide evidence for evolution.

Which statement describes evidence for evolution?

[1 mark]

Tick (✓) **one** box.

Bacteria can become resistant to antibiotics. ☐

Decomposition can be caused by bacteria. ☐

Some bacteria are pathogens. ☐

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4.4.2.1 Aerobic and anaerobic respiration

Question 04

June 2023 | 8464/B/2F | Original Q1

0 1 **Figure 1** shows a place where peat is being removed from a peat bog.

Figure 1



0 1 . 1 Why is peat removed from peat bogs?

[1 mark]

Tick (✓) **one** box.

To increase biodiversity ☐

To produce garden compost ☐

To protect rare habitats ☐

4.4.2.1 Aerobic and anaerobic respiration

Question 04 · continued

0 1 . 2 Peat can decay.

Name **one** type of organism that causes decay.

[1 mark]

_____

0 1 . 3 Complete the sentences.

Choose answers from the box.

[2 marks]

carbon dioxide	**nitrogen**	**oxygen**	**sulfur dioxide**

The organisms that cause decay respire.

The gas used for respiration is _____ .

The gas produced by respiration is _____ .

Question 1 continues on the next page

Question 04 · continued

0 1 . 4 Peat bogs cover a total area of 3 700 000 km^2.

In 2020, 46% of peat bogs were frozen.

How can the area of peat bogs that were frozen be calculated?

[1 mark]

Tick (✓) **one** box.

$3\,700\,000 \times \frac{46}{100}$ ☐

$\frac{46}{3\,700\,000} \times 100$ ☐

$\frac{3\,700\,000}{46} \times 100$ ☐

0 1 . 5 The percentage of peat bogs that are frozen decreases each year.

Suggest why the **percentage** of peat bogs that are frozen is decreasing.

[1 mark]

4.4.2.1 Aerobic and anaerobic respiration

Question 04 · continued

0 1 . 6 Which **two** human activities **decrease** the area of land available for other animals and plants?

[2 marks]

Tick (✓) **two** boxes.

- Building factories ☐
- Recycling plastics ☐
- Replanting hedgerows ☐
- Reusing glass bottles ☐
- Quarrying rocks ☐

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Turn over for the next question

4.4.2.1 Aerobic and anaerobic respiration

Question 05

June 2025 | 8464/B/1F | Original Q4

0 4 This question is about exercise.

0 4 . 1 Which **two** substances do muscles need during exercise?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Glucose ☐
- Lactic acid ☐
- Oxygen ☐
- Urea ☐

Question 4 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Question 05 · continued

Two people exercised on running machines.

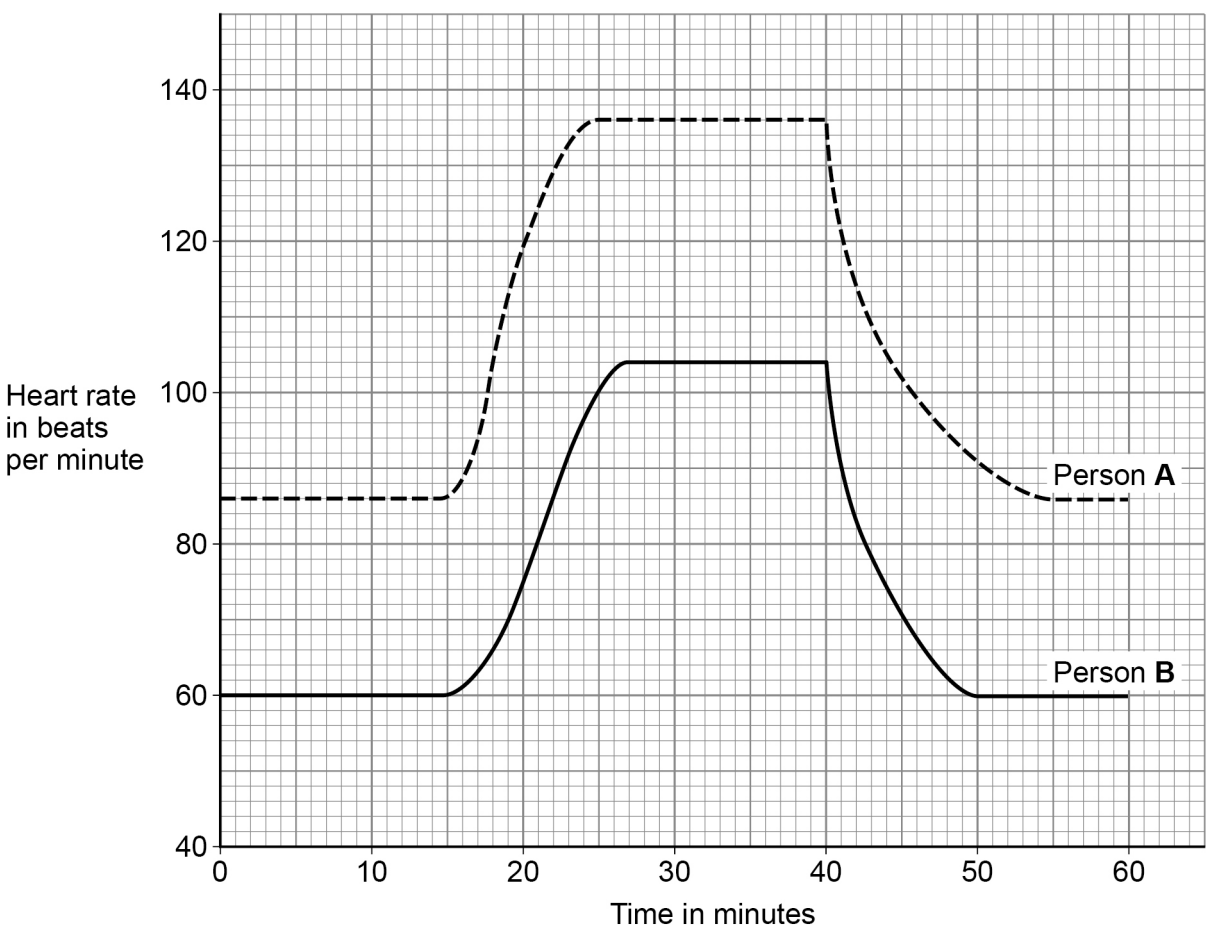
The two people ran at the same speed.

Each person's heart rate was monitored:

- before exercising
- while exercising
- after they stopped exercising.

Figure 8 shows the results.

Figure 8



0 4 . 2 How many minutes did person **B** exercise for?

[2 marks]

Number of minutes = _____

4.4.2.1 Aerobic and anaerobic respiration

Question 05 · continued

0 4 . 3 Calculate the percentage increase in heart rate for person **B** during the exercise.

Use the equation:

$$\text{percentage increase} = \frac{\text{maximum heart rate} - \text{resting heart rate}}{\text{resting heart rate}} \times 100$$

Give your answer to 2 significant figures.

[3 marks]

Percentage increase (2 significant figures) = _____ %

0 4 . 4 A student stated:

'Person **B** is fitter than person **A**.'

Give **two** pieces of evidence to support the student's statement.

Use **Figure 8**.

[2 marks]

1 _____

2 _____

Question 4 continues on the next page

Immediately after exercise, the concentration of lactic acid in the blood of the two people was measured.

Table 5 shows the results.

Table 5

	Concentration of lactic acid in arbitrary units
Person **A**	22
Person **B**	4

0 4 . 5 Complete the bar chart in **Figure 9**.

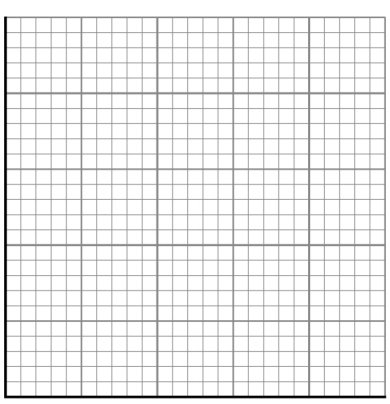
You should:

- use a suitable scale for the *y*-axis
- plot the data from **Table 5**
- label each bar.

[3 marks]

Figure 9

Concentration of lactic acid in arbitrary units



4.4.2.1 Aerobic and anaerobic respiration

Question 05 · continued

0 4 . 6 The concentration of lactic acid in the blood of person **A** is proportional to the intensity of the exercise.

Which symbol means 'proportional to'?

[1 mark]

Tick (✓) **one** box.

~ ☐

> ☐

∝ ☐

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Turn over for the next question

4.4.2.1 Aerobic and anaerobic respiration

Question 06

0 2 Farmers can increase crop yield by controlling the conditions that plants grow in.

0 2 . 1 Draw **one** line from each substance to how the substance increases crop yield.

[2 marks]

Substance	How the substance increases crop yield
Fertiliser	Adds mineral ions to the soil
	Decreases carbon dioxide concentration in the soil
Herbicide	Increases oxygen concentration in the air
	Kills weeds that compete with crops

0 2 . 2 **Figure 1** shows a food chain for a farmer's field.

Figure 1

Seeds → Mice → Owls

Which is the secondary consumer in the food chain?

[1 mark]

Tick (✓) **one** box.

- Seeds ☐
- Mice ☐
- Owls ☐

0 2 . 3 Bees are insects that live in hives.

The bees fly in and out of the hives.

Figure 2 shows a crop growing in a field.

The farmer has added bee hives to increase the number of bees in the field.

Figure 2



Increasing the number of bees and other insects increases crop yield.

Which are **two** ways that increasing the number of insects in an area will increase crop yield?

[2 marks]

Tick (✓) **two** boxes.

- Insects change the soil pH around the crop. ☐
- Insects eat leaves from the crop. ☐
- Insects eat pests on the crop. ☐
- Insects pollinate the crop. ☐
- Insects shelter in the crop. ☐

0 2 . 4 Some farmers increase the size of hedgerows between fields where crops grow.

Suggest **one** reason why.

[1 mark]

Peat comes from peat bogs.

0 2 . 5 Peat can be used to produce garden compost.

Table 1 compares peat compost with a sample of soil.

Table 1

	Mineral ion concentration	**Speed at which water drains through**
Peat compost	Low	Slow
Soil	High	Fast

Young plants have short roots.

Explain **one** advantage of growing young plants in peat compost instead of in soil.

[2 marks]

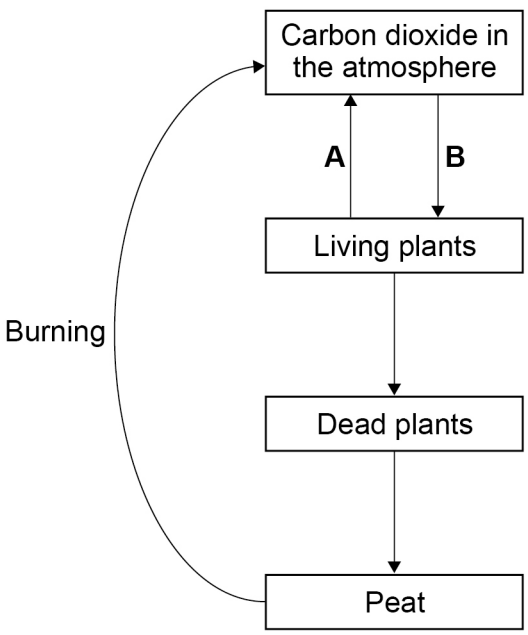
Question 2 continues on the next page

4.4.2.1 Aerobic and anaerobic respiration

Peat can also be burnt as fuel.

Figure 3 shows part of the carbon cycle.

Figure 3



0 2 . 6 Name process **A** and process **B**.

Choose answers from the box.

[2 marks]

condensation	**photosynthesis**	**respiration**	**transpiration**

Process **A** _____

Process **B** _____

4.4.2.1 Aerobic and anaerobic respiration

0 2 . 7 Peat contains carbon compounds.

Explain why burning peat contributes to climate change.

[2 marks]

0 2 . 8 Decay is an important process in the carbon cycle.

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

[2 marks]

Tick (✓) **two** boxes.

- Algae ☐
- Animals ☐
- Bacteria ☐
- Fungi ☐
- Plants ☐

0 2 . 9 Deforestation affects the carbon cycle.

Give **one** use of the land after the land has been cleared by deforestation.

[1 mark]

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