AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.1.4

Adaptations

Past-paper questions

Tier	**Higher**
Question groups	**6**
Available paper years	**2018–2025**

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.

4.7.1.4 Adaptations

Question 01

June 2018 | 8464/B/2H | Original Q3

0 3 Scientists have removed microorganisms from inside rocks in caves in Mexico.

The microorganisms have been trapped there for between 10 000 and 50 000 years.

The caves are dark, very hot, humid and acidic.

0 3 . 1 Why are these microorganisms called extremophiles?

[2 marks]

Tick **two** boxes.

- They are thousands of years old ☐
- They survive in high humidity ☐
- They survive in high temperatures ☐
- They survive in the dark ☐
- They survive inside rocks ☐
- They survive where it is acidic ☐

Question 3 continues on the next page

Question 01 · continued

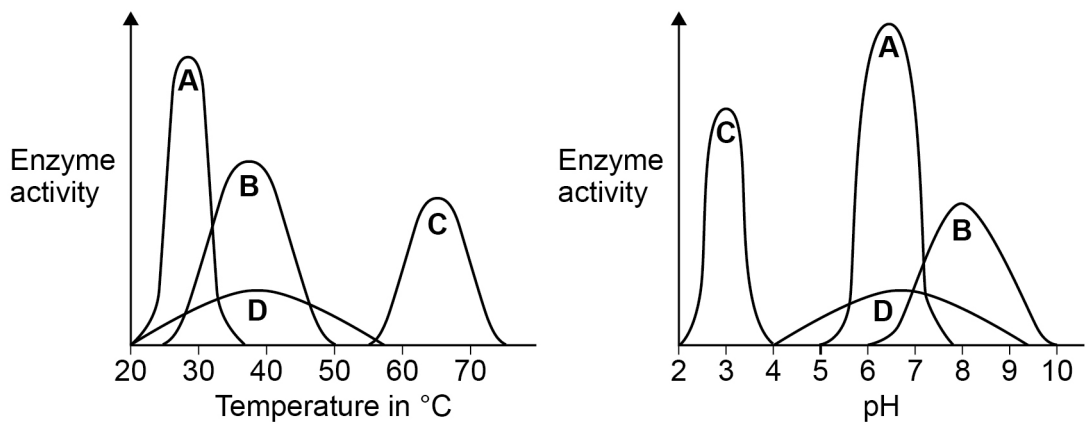
The microorganisms have been inactive for thousands of years but the scientists have reactivated them.

Figure 2 shows the results of enzyme analysis on four enzymes, **A**, **B**, **C** and **D**.

Three of the enzymes were from microorganisms found in the soil near the caves.

One of the enzymes was from a reactivated microorganism from the caves.

Figure 2



0 3 . 2 Which enzyme comes from the microorganism from the caves?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 3 . 3 Give the reasons for your answer to question **03.2**

[1 mark]

4.7.1.4 Adaptations

Question 01 · continued

0 3 . 4 Carl Woese developed the 'three-domain system' of classification.

Describe the 'three-domain system' of classification.

[3 marks]

0 3 . 5 Most of the microorganisms from the caves were classified as belonging to the Archaea domain of the 'three-domain system'.

Suggest why.

[1 mark]

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4.7.1.4 Adaptations

Question 02

June 2019 | 8464/B/2H | Original Q4

0 4 Animals have adaptations to survive in their environment.

These adaptations may be structural, behavioural or functional.

0 4 . 1 Draw **one** line from each animal adaptation to the type of adaptation it is.

[2 marks]

Animal adaptation	Type of adaptation
 Male palm cockatoos use sticks to beat on hollow branches to attract females.	Structural
 The harmless hornet moth has black and yellow stripes to look like a bee or wasp.	Behavioural
 Sea spiders have automatic muscle contractions that move oxygen around their bodies.	Functional

4.7.1.4 Adaptations

Question 02 · continued

Plants also have adaptations.

There are more than 28 000 known species of orchid plants.

0 4 . 2 Many orchid plants:

- grow attached to other types of plants
- have brightly coloured flowers
- produce large quantities of pollen
- produce thousands of tiny, light seeds.

Describe how these adaptations help orchid plants to survive and compete.

[4 marks]

Question 4 continues on the next page

4.7.1.4 Adaptations

Question 02 · continued

A rare orchid has been found in the mountains in China.

The orchid has pale yellow flowers.

DNA analysis of the genome shows that it is an ancestral species.

All other present day orchids evolved from this ancestral species millions of years ago.

0 4 . 3 One present day species has bright purple flowers.

Describe how an orchid with bright purple flowers may have evolved from the ancestral species which has pale yellow flowers.

[4 marks]

4.7.1.4 Adaptations

Question 02 · continued

0 4 . 4 The DNA code determines the sequence of amino acids which are joined together to form a specific protein.

Table 3 shows part of the amino acid sequence for the colour pigment protein in five orchid species.

The rest of the amino acid sequence is the same for all the species.

Table 3

Species	Amino acid sequence	Flower colour
Ancestral species	ala-leu-gly-isoleu-tyr-gly-ala-leu-gly-ala	pale yellow
Species **A**	ala-isoleu-gly-ala-tyr-gly-ala-tyr-gly-ala	pale yellow
Species **B**	ala-leu-ala-isoleu-tyr-gly-ala-tyr-gly-ala	pink
Species **C**	ala-isoleu-gly-ala-gly-tyr-gly-leu-gly-ala	bright red
Species **D**	ala-leu-gly-isoleu-tyr-tyr-ala-leu-gly-ala	purple

Key:
ala = alanine
gly = glycine
isoleu = isoleucine
leu = leucine
tyr = tyrosine

Suggest which orchid species is most closely related to the ancestral species.

Give a reason for your answer.

[2 marks]

Species _____

Reason _____

_____

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4.7.1.4 Adaptations

Question 03

November 2020 | 8464/B/1H | Original Q2

0 2 Starch is digested to form sugar molecules in the digestive system.

0 2 . 1 What is the name of the enzyme that digests starch?

[1 mark]

0 2 . 2 Where are most food molecules absorbed?

[1 mark]

Tick (✓) **one** box.

- Large intestine ☐
- Liver ☐
- Small intestine ☐
- Stomach ☐

Question 2 continues on the next page

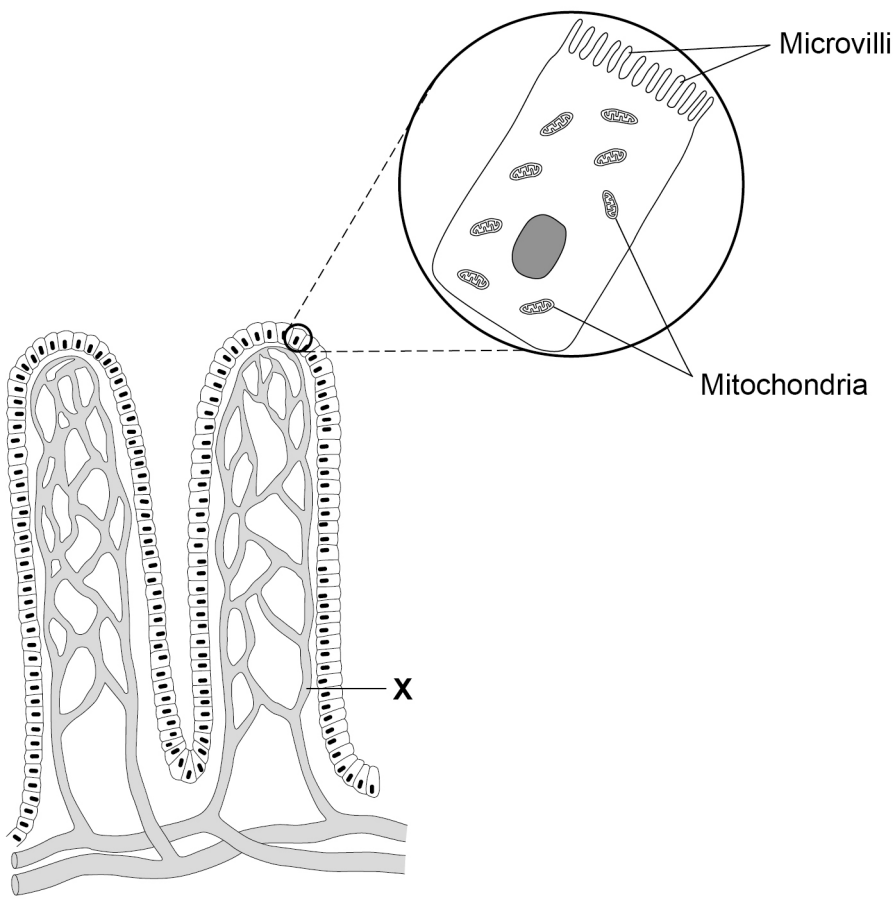
4.7.1.4 Adaptations

Question 03 · continued

Figure 2 shows two villi.

Figure 2 also shows one cell on the surface of a villus as seen using an electron microscope.

Figure 2



0 2 . 3 Give **one** advantage of using an electron microscope compared with using a light microscope.

[1 mark]

4.7.1.4 Adaptations

Question 03 · continued

0 2 . 4 What type of blood vessel is labelled **X**?

[1 mark]

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

0 2 . 5 The real length of one villus is 0.8 mm

Calculate the image length if the villus is viewed at a magnification of ×20

Use the equation:

$$\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$$

[3 marks]

Image length = _____ mm

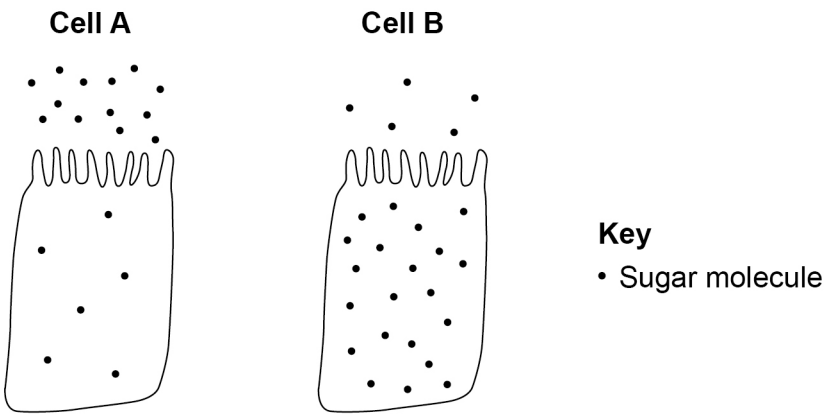
Question 2 continues on the next page

4.7.1.4 Adaptations

Figure 3 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.

Figure 3



0 2 . 6 Name the process by which sugar moves into cell **A**.

[1 mark]

0 2 . 7 Name the process by which sugar moves into cell **B**.

[1 mark]

0 2 . 8 Give **one** use of sugar in the body.

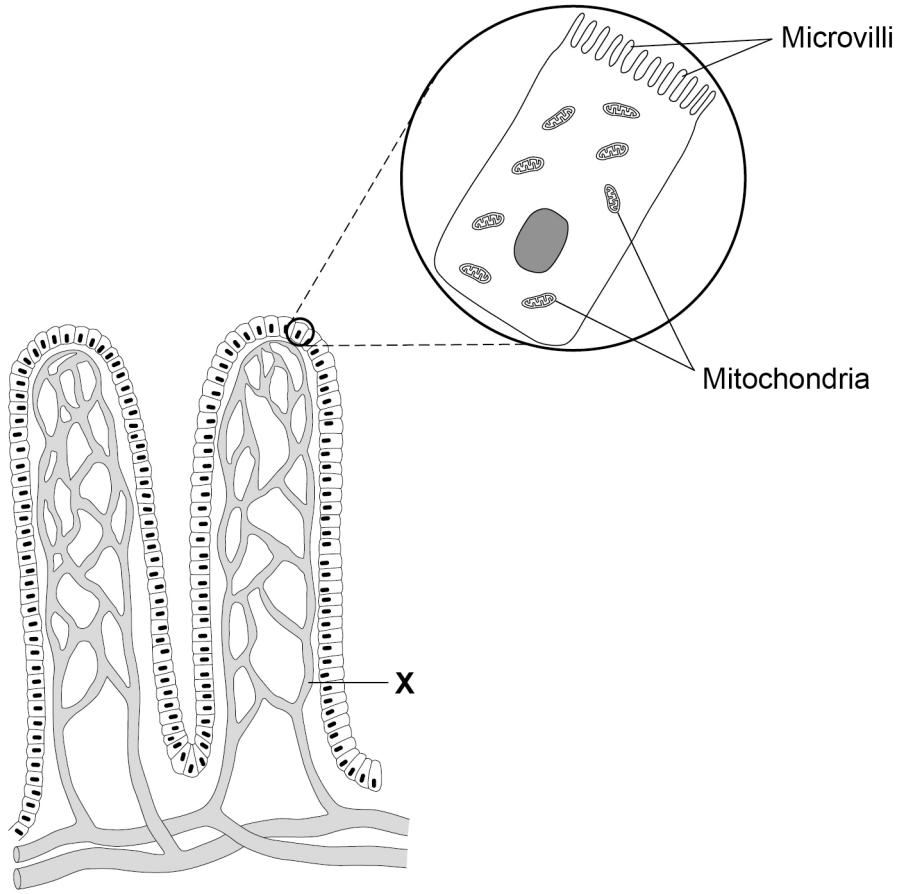
[1 mark]

4.7.1.4 Adaptations

Question 03 · continued

0 2 . 9 **Figure 2** is repeated below.

Figure 2



Explain how villi are adapted for efficient absorption of sugar molecules.

[4 marks]

14

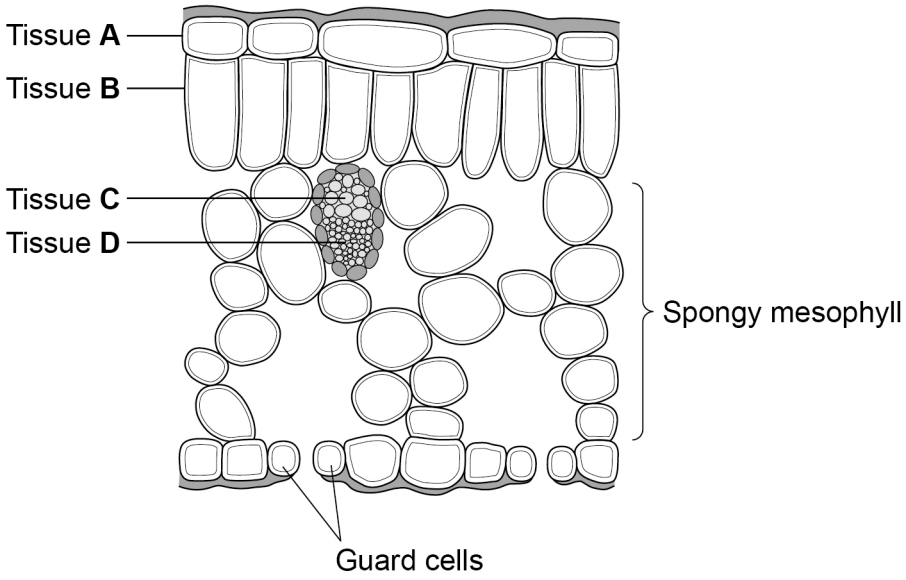
4.7.1.4 Adaptations

Question 04

0 4 A leaf is a plant organ.

Figure 4 shows tissues in a leaf.

Figure 4



0 4 . 1 Which tissue is the epidermis?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.7.1.4 Adaptations

Question 04 · continued

0 4 . 2 Explain how the spongy mesophyll is adapted for its function.

Use **Figure 4**.

[3 marks]

0 4 . 3 The xylem is adapted to transport water through a plant.

Explain **one** way that xylem is adapted for its function.

[2 marks]

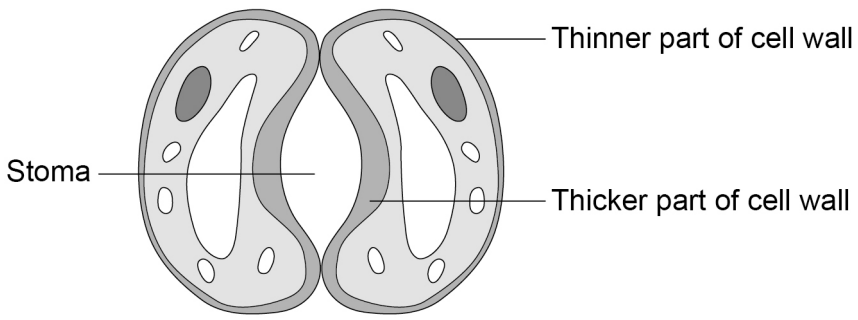
Question 4 continues on the next page

4.7.1.4 Adaptations

Question 04 · continued

0 4 . 4 **Figure 5** shows a pair of guard cells around a stoma.

Figure 5



During the day, glucose is made in the guard cells.

Describe how an increase in glucose concentration in the guard cells causes the stoma to open.

[2 marks]

8

4.7.1.4 Adaptations

Question 05

June 2025 | 8464/B/1H | Original Q5

0 5 This question is about plants.

0 5 . 1 Some plants can respire anaerobically.

Which are the **two** products of anaerobic respiration in plants?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Ethanol ☐
- Glucose ☐
- Lactic acid ☐
- Water ☐

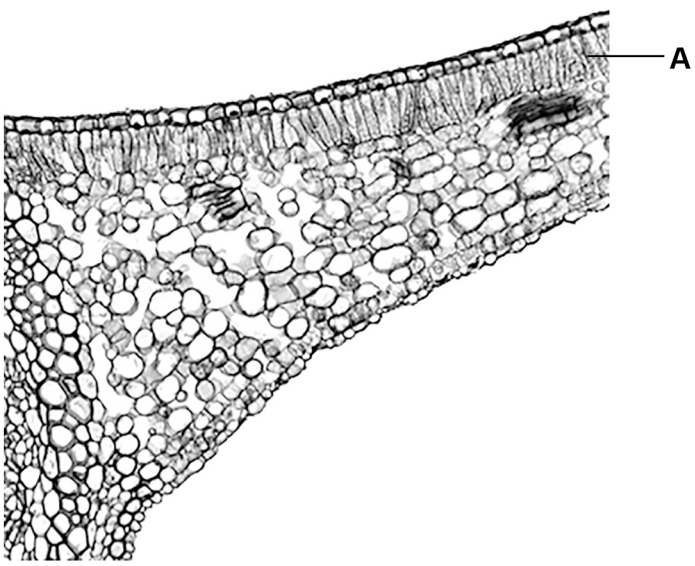
Question 5 continues on the next page

4.7.1.4 Adaptations

Question 05 · continued

Figure 6 shows the structure of part of a leaf

Figure 6



0 5 . 2 What is the name of tissue **A**?

[1 mark]

0 5 . 3 Explain how tissue **A** is adapted to its function.

[2 marks]

4.7.1.4 Adaptations

Question 05 · continued

0 5 . 4 Plants absorb water from the soil.

Describe how water is transported from the soil through plant tissues to the atmosphere.

[5 marks]

Extra space

10

4.7.1.4 Adaptations

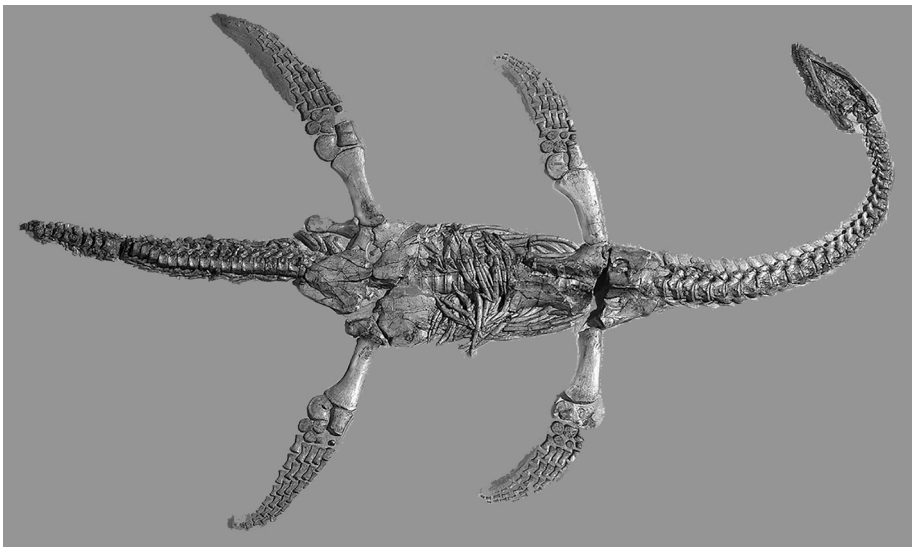
Question 06

June 2025 | 8464/B/2H | Original Q5

0 5 Plesiosaurs are extinct reptiles that lived in the ocean.

Figure 5 shows a fossil of a plesiosaur.

Figure 5



0 5 . 1 Plesiosaurs may have moved rapidly upwards to hold their heads above the water surface to search for prey.

What **type** of adaptation was the rapid upwards movement?

[1 mark]

0 5 . 2 Give **two biotic** factors that may have caused the extinction of plesiosaurs.

[2 marks]

1 _____

_____

2 _____

_____

4.7.1.4 Adaptations

Question 06 · continued

0 5 . 3 Describe how the plesiosaur fossil in **Figure 5** could have been formed.

[3 marks]

0 5 . 4 Scientists use fossils to study evolution.

Suggest **two** reasons why scientists **cannot** study the mutations involved in the evolution of plesiosaurs.

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

[2 marks]

1

2

4.7.1.4 Adaptations

0 5 . 5 **Table 1** shows part of the classification of a plesiosaur.

Complete **Table 1**.

[2 marks]

Table 1

Classification group	Name
Domain	
Kingdom	Animalia
	Chordata
Class	Reptilia
	Plesiosaur
	Cryptoclididae
Genus	Cryptoclidus
Species	eurymerus

0 5 . 6 Give the binomial name of the plesiosaur in **Table 1**.

[1 mark]

_____

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