AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.1.1.5

Microscopy

Past-paper questions

Tier	**Foundation**
Question groups	**8**
Available paper years	**2018–2024**

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.

4.1.1.5 Microscopy

Question 01

June 2018 | 8464/B/1F | Original Q6

0 6 This question is about cell structures.

0 6 . 1 Draw **one** line from each cell structure to the type of cell where the structure is found.

[2 marks]

Cell Structure	Type of cell where the structure is found
Nucleus	Prokaryotic cells
Permanent vacuole	Plant cells only
Plasmid	Eukaryotic cells

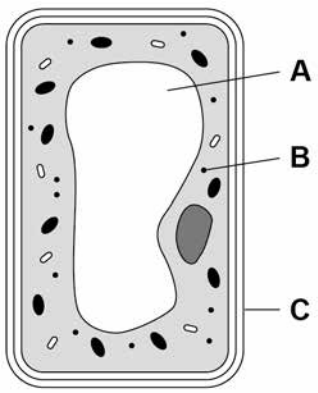
Question 6 continues on the next page

4.1.1.5 Microscopy

Question 01 · continued

0 6 . 2 **Figure 11** shows a plant cell.

Figure 11



What are the names of structures **A**, **B** and **C**?

[1 mark]

Tick **one** box.

Structure A	Structure B	Structure C	
Chloroplast	Vacuole	Cell wall	☐
Nucleus	Chloroplast	Cell membrane	☐
Vacuole	Mitochondrion	Cell membrane	☐
Vacuole	Ribosome	Cell wall	☐

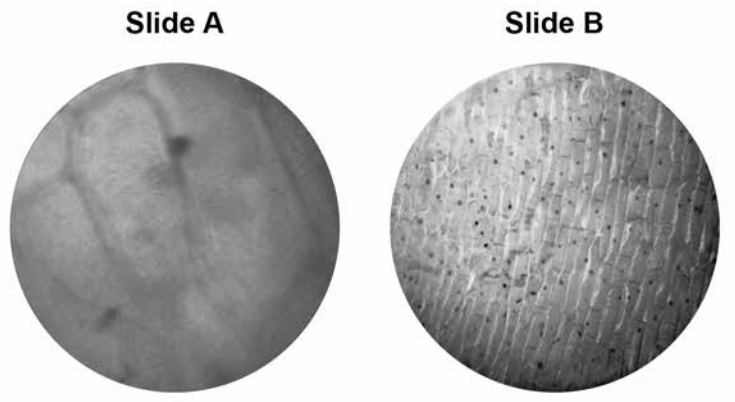
4.1.1.5 Microscopy

Question 01 · continued

A student observed slides of onion cells using a microscope.

Figure 12 shows two of the slides the student observed.

Figure 12



The cells on the slides are **not** clear to see.

0 6 . 3 Describe how the student should adjust the microscope to see the cells on **Slide A** more clearly.

[1 mark]

0 6 . 4 Describe how the student should adjust the microscope to see the cells on **Slide B** more clearly.

[2 marks]

Question 6 continues on the next page

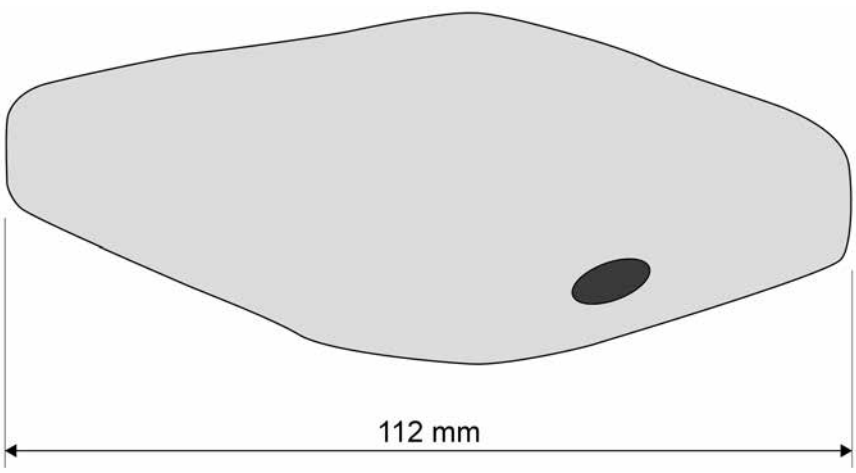
4.1.1.5 Microscopy

Question 01 · continued

0 6 . 5 The student made the necessary adjustments to get a clear image.

Figure 13 shows the student's drawing of one of the cells.

Figure 13



The real length of the cell was 280 micrometres (µm).

Calculate the magnification of the drawing.

[3 marks]

Magnification = × _____

9

4.1.1.5 Microscopy

Question 02

0 4 Water is lost from the leaves of a plant through stomata.

0 4 . 1 What is the process by which water is lost from the leaves of a plant?

[1 mark]

Tick (✓) **one** box.

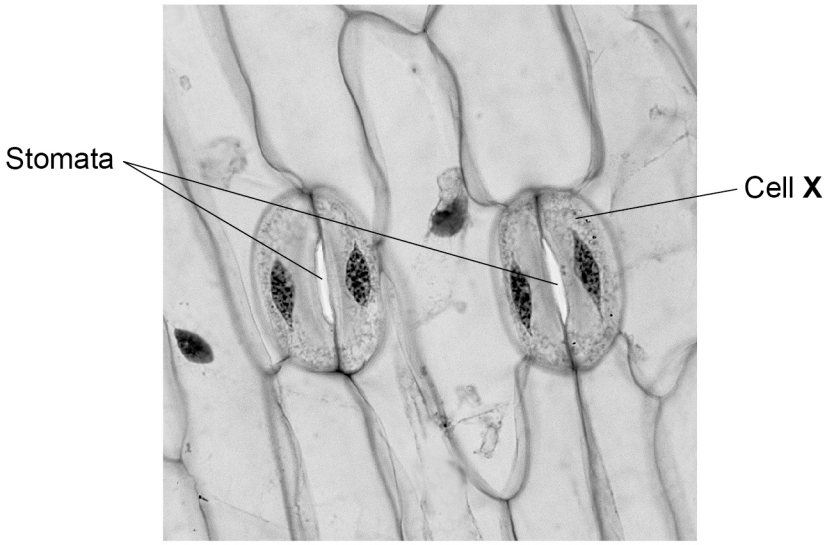
Osmosis ☐

Photosynthesis ☐

Transpiration ☐

Figure 7 shows stomata on the lower surface of a leaf.

Figure 7



4.1.1.5 Microscopy

Question 02 · continued

0 4 . 2 What is the name of cell **X**?

[1 mark]

Tick (✓) **one** box.

- Epidermal cell ☐
- Guard cell ☐
- Palisade cell ☐
- Xylem cell ☐

0 4 . 3 The length of cell **X** is 25 mm when viewed at a magnification of ×800

Calculate the real length of cell **X**.

Give your answer in micrometres (μm).

1 mm = 1000 μm

Use the equation:

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

[3 marks]

Real length of cell **X** = _____ μm

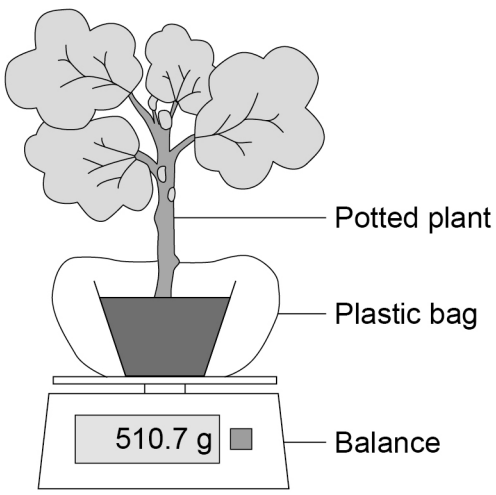
Question 4 continues on the next page

Question 02 · continued

A student measured the mass of water lost from some similar plants.
The plants were at different temperatures.

Figure 8 shows the apparatus used.

Figure 8



This is the method used.

1. Seal a plastic bag around the pot of a potted plant.
2. Place the potted plant with the bag on a balance in a room at 20 °C
3. Record the mass.
4. After 3 hours record the mass again.
5. Calculate the mass of water lost from the plant.
6. Repeat steps 1–5 at 25 °C and at 30 °C with other similar plants.

0 4 . 4 What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

Initial mass of the plant ☐

Length of time the plant was left ☐

Mass of water lost ☐

Temperature of the room ☐

4.1.1.5 Microscopy

Question 02 · continued

0 4 . 5 Suggest why the student sealed a plastic bag around the pot.

[1 mark]

Question 4 continues on the next page

Question 02 · continued

Table 1 shows the student's results.

Table 1

Temperature in °C	Mass at the start in g	Mass after 3 hours in g	Mass of water lost in 3 hours in g
20	510.7	508.6	2.1
25	510.4	507.1	3.3
30	**X**	506.3	4.9

0 4 . 6 What is the resolution of the balance used in this investigation?

[1 mark]

Tick **one** box.

0.1 g ☐ 1.0 g ☐ 100 g ☐ 500 g ☐

0 4 . 7 Calculate value **X** in **Table 1**.

[1 mark]

X = _____ g

0 4 . 8 Give **one** conclusion that can be made from the results in **Table 1**.

[1 mark]

0 4 . 9 Give **two** factors that might affect the rate of water loss from the leaves.

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

[2 marks]

1 _____

2 _____

12

4.1.1.5 Microscopy

Question 03

November 2020 | 8464/B/1F | Original Q6

0 6 Starch is digested to form sugar molecules in the digestive system.

0 6 . 1 What is the name of the enzyme that digests starch?

[1 mark]

0 6 . 2 Where are most food molecules absorbed?

[1 mark]

Tick (✓) **one** box.

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

Question 6 continues on the next page

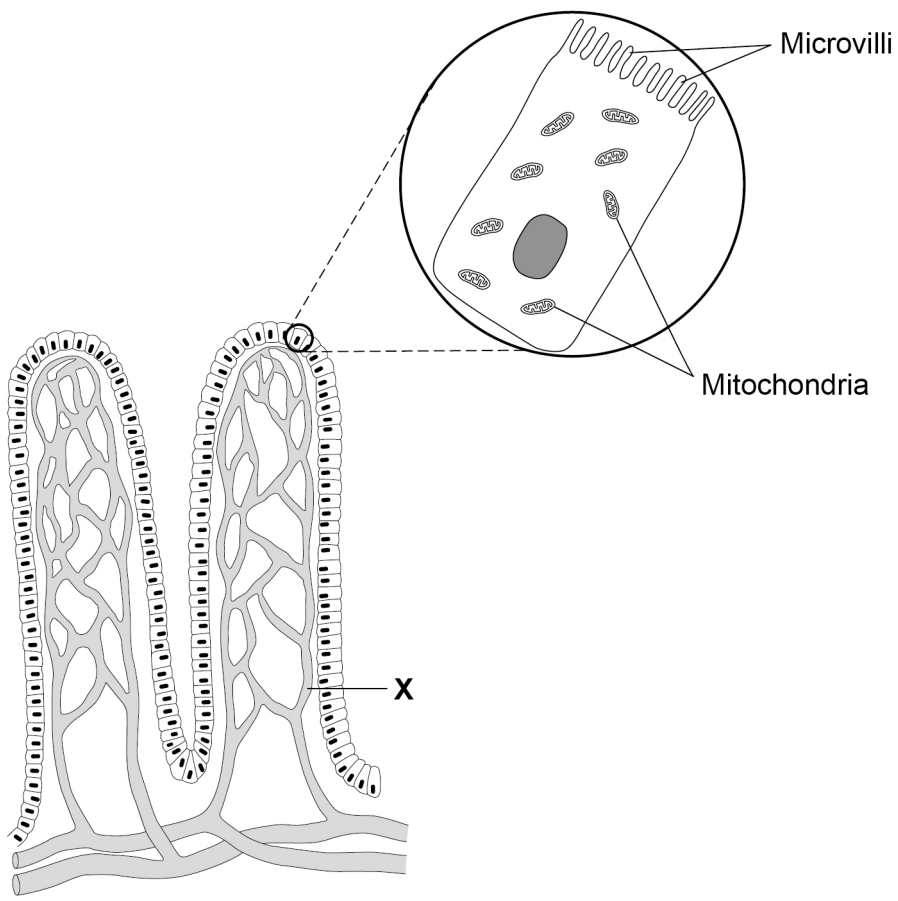
4.1.1.5 Microscopy

Question 03 · continued

Figure 6 shows two villi.

Figure 6 also shows one cell on the surface of a villus as seen using an electron microscope.

Figure 6



0 6 . 3 Give **one** advantage of using an electron microscope compared with using a light microscope.

[1 mark]

4.1.1.5 Microscopy

Question 03 · continued

0 6 . 4 What type of blood vessel is labelled **X**?

[1 mark]

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

0 6 . 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 6 continues on the next page

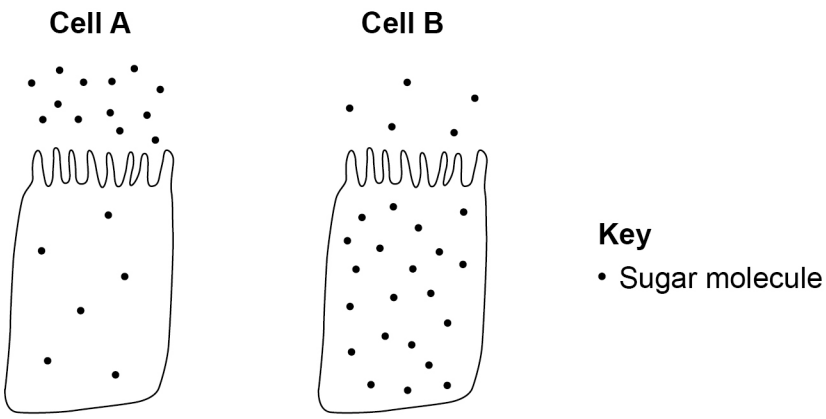
4.1.1.5 Microscopy

Question 03 · continued

Figure 7 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.

Figure 7



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

[1 mark]

0 6 . 7 Name the process by which sugar moves into cell **B**.

[1 mark]

0 6 . 8 Give **one** use of sugar in the body.

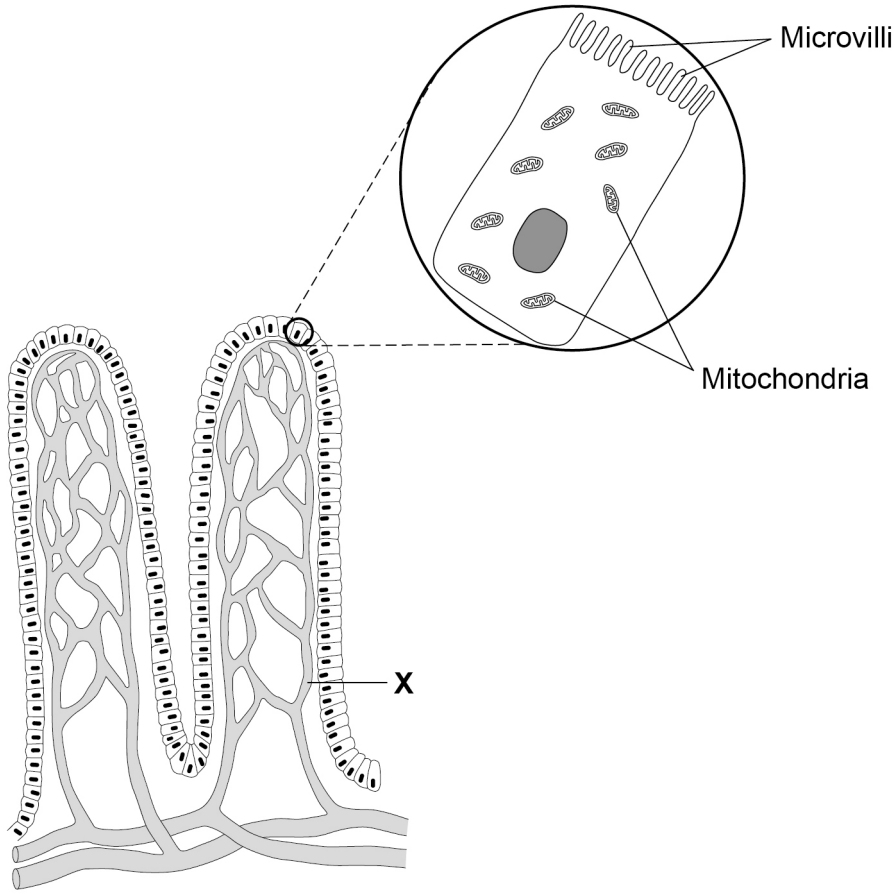
[1 mark]

4.1.1.5 Microscopy

Question 03 · continued

0 6 . 9 **Figure 6** is repeated below.

Figure 6



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

[4 marks]

14

4.1.1.5 Microscopy

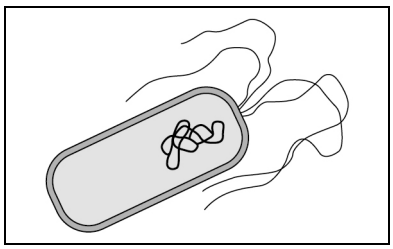
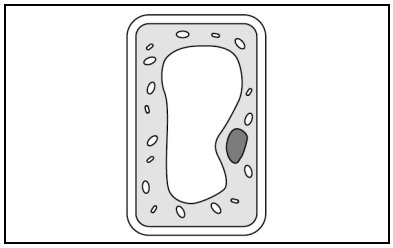
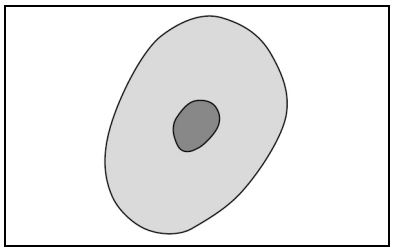
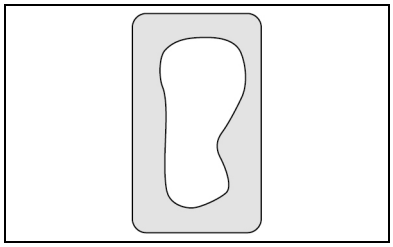
Question 04

November 2021 | 8464/B/1F | Original Q1

0 1 Cells are the building blocks of life.

0 1 . 1 Draw **one** line from each type of organism to the diagram of one of its cells.

[3 marks]

Type of organism	Diagram of one cell
Animal	
Bacterium	
Plant	
	

4.1.1.5 Microscopy

Question 04 · continued

0 1 . 2 Cells contain structures. These structures have different functions.

Draw **one** line from each function to the correct structure.

[3 marks]

Function	Structure
Contains genetic information	Cell membrane
Controls what enters and leaves a cell	Cell wall
Where photosynthesis happens	Chloroplast
	Nucleus

Question 1 continues on the next page

4.1.1.5 Microscopy

Question 04 · continued

0 1 . 3 Chemicals are produced in cells.

Complete the sentences.

Choose answers from the box.

[4 marks]

cellulose	**DNA**	**glycogen**	**starch**	**urea**

A chemical excreted by animals is _____ .

A chemical stored in animal cells is _____ .

A chemical stored in plant cells is _____ .

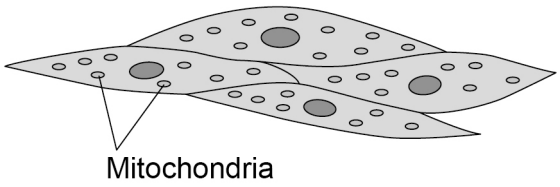
A chemical that strengthens plant cell walls is _____ .

4.1.1.5 Microscopy

Question 04 · continued

Figure 1 shows a diagram of muscle cells.

Figure 1



0 1 . 4 Give **one** function of muscle cells.

[1 mark]

0 1 . 5 Explain how muscle cells are adapted for their function.

Use **Figure 1**.

[2 marks]

Question 1 continues on the next page

4.1.1.5 Microscopy

Question 04 · continued

0 1 . 6 One muscle cell was 0.05 mm wide.

When viewed using a microscope the image of the muscle cell was 2 mm wide.

Calculate the magnification used to view the cell.

Use the equation:

$$\text{magnification} = \frac{\text{width of image}}{\text{width of real cell}}$$

[2 marks]

Magnification = × _____

15

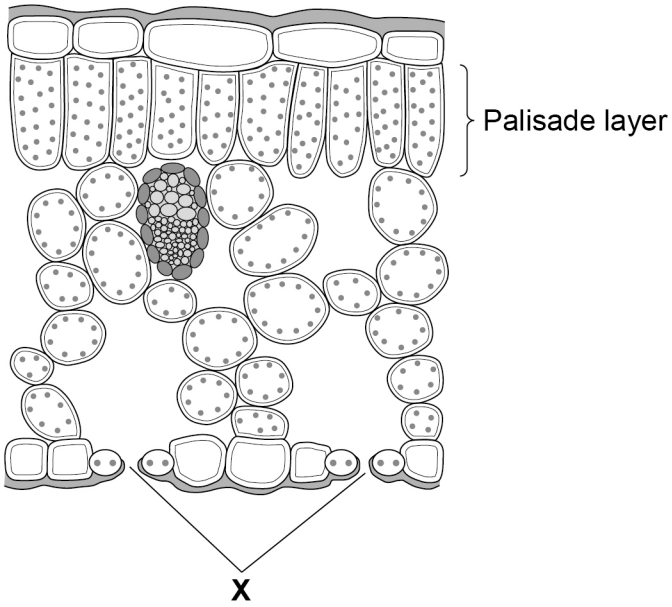
4.1.1.5 Microscopy

Question 05

June 2022 | 8464/B/1F | Original Q2

0 2 **Figure 2** shows a section through a leaf.

Figure 2



0 2 . 1 Give **one** way that the palisade layer is adapted for photosynthesis.

[1 mark]

0 2 . 2 Gases pass into and out of the leaf through small pores in the surface of the leaf.

What are the small pores labelled **X** called?

[1 mark]

Tick (✓) **one** box.

Guard cells ☐

Stomata ☐

Xylem vessels ☐

Question 05 · continued

0 2 . 3 A student viewed a section of a leaf using a microscope.

The student measured the length of one of the palisade cells.

The cell image measured 28 mm in length when viewed at a magnification of ×400

Calculate the real length of the palisade cell in millimetres (mm).

Use the equation:

$$\text{real length} = \frac{\text{image length}}{\text{magnification}}$$

[3 marks]

Real length = _____ mm

Convert the real length of the cell from millimetres to micrometres (μm).

1 mm = 1000 μm

Real length = _____ μm

0 2 . 4 Carbon dioxide can move into and out of cells.

What is the process by which carbon dioxide can move into and out of cells?

[1 mark]

Tick (✓) **one** box.

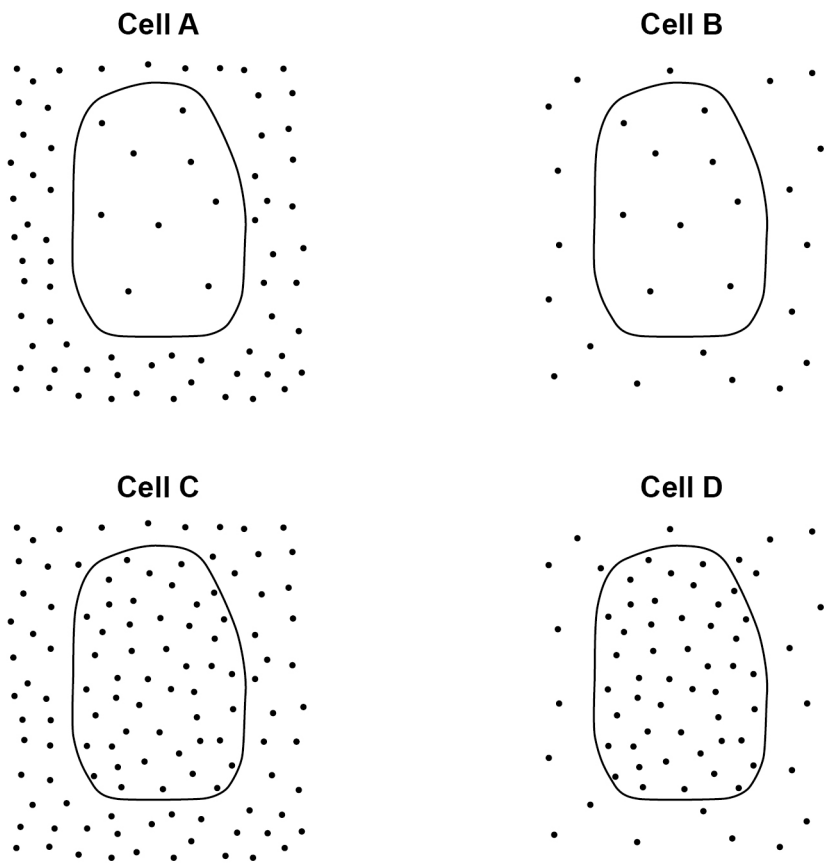
- Active transport ☐
- Diffusion ☐
- Osmosis ☐

Question 05 · continued

Figure 3 shows a diagram of four cells.

Each cell is surrounded by carbon dioxide molecules.

Figure 3



0 2 . 5 Which cell will carbon dioxide move into at the fastest rate?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Reason _____

_____

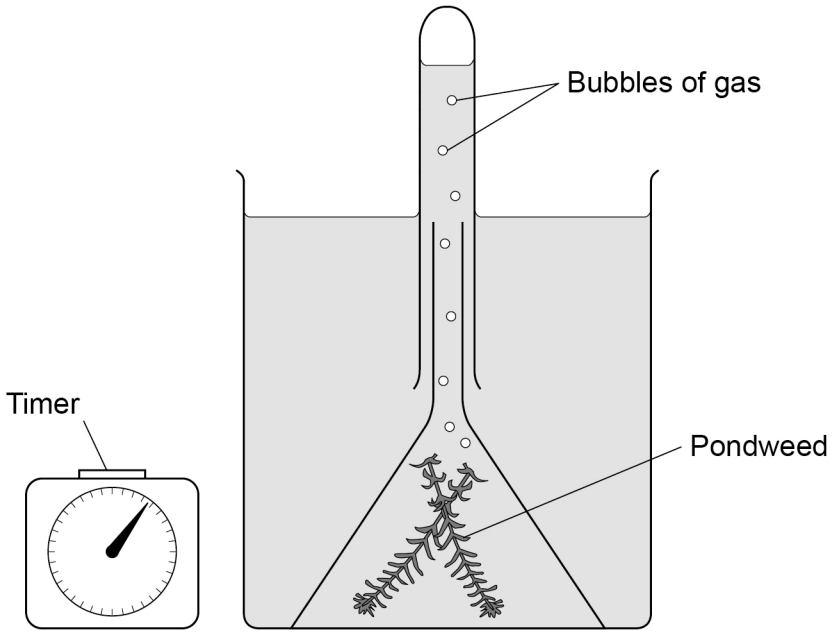
4.1.1.5 Microscopy

Question 05 · continued

A student investigated the effect of different colours of light on the rate of photosynthesis.

Figure 4 shows some of the apparatus the student used.

Figure 4



The student placed the apparatus in blue light, then in green light and then in red light.

The student measured the rate of photosynthesis in each colour of light.

0 2 . 6 What **two** measurements should the student make to calculate the **rate** of photosynthesis?

[2 marks]

1 _____

2 _____

Question 2 continues on the next page

4.1.1.5 Microscopy

Question 05 · continued

0 2 . 7 Give **two** variables the student should keep the same in this investigation.

[2 marks]

1 _____

_____

2 _____

_____

Table 2 shows the results.

Table 2

Colour of light	Rate of photosynthesis in arbitrary units
Blue	9
Green	1
Red	8

4.1.1.5 Microscopy

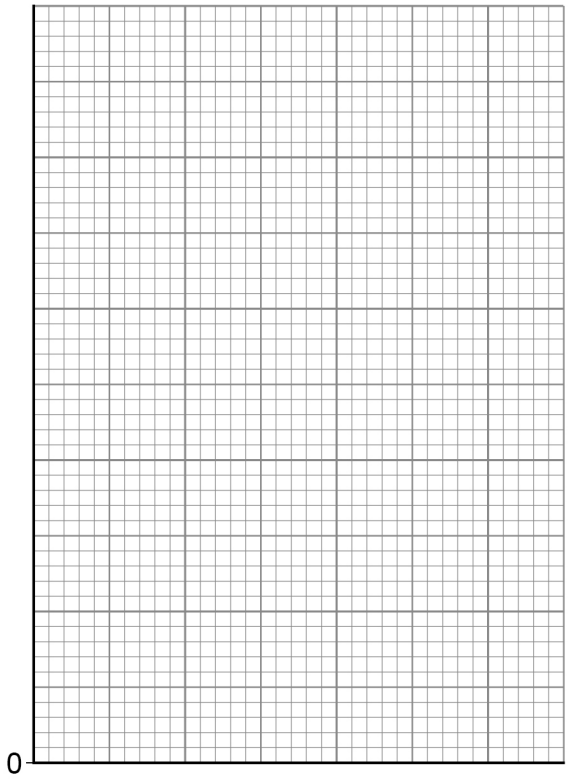
0 2 . 8 Complete **Figure 5**.

You should:

- label the y-axis
- use a suitable scale
- plot the data from **Table 2** as a bar chart
- label each bar.

[4 marks]

Figure 5



0 2 . 9 Look at **Table 2**.

What colour of light should be used to grow plants in a greenhouse?

[1 mark]

Tick (✓) **one** box.

Blue ☐ Green ☐ Red ☐

17

4.1.1.5 Microscopy

Question 06

June 2022 | 8464/B/1F | Original Q5

0 5 Bacteria can cause a variety of diseases in humans.

0 5 . 1 What are **two** similarities between a bacterial cell and an animal cell?

[2 marks]

Tick (✓) **two** boxes.

- Both have a cell membrane. ☐
- Both have a cell wall. ☐
- Both have a nucleus. ☐
- Both have cytoplasm. ☐
- Both have plasmids. ☐

0 5 . 2 Salmonella food poisoning is caused by bacteria in food.

Give **one** symptom of salmonella food poisoning.

Do **not** refer to vomiting or diarrhoea in your answer.

[1 mark]

_____

_____

Question 5 continues on the next page

Question 06 · continued

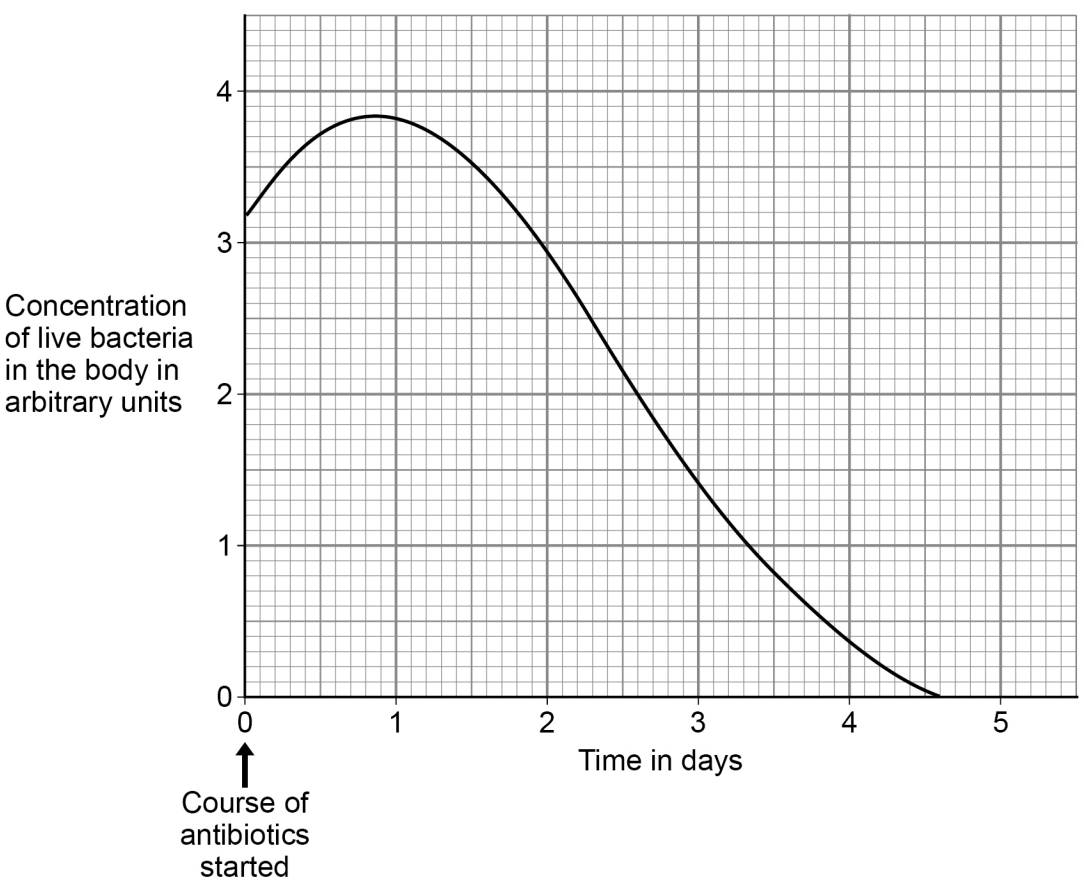
0 5 . 3 What is the name of the first antibiotic developed?

[1 mark]

A child with a severe bacterial infection was given a course of antibiotics.

Figure 7 shows how the concentration of live bacteria in the child's body changed when taking the course of antibiotics.

Figure 7



4.1.1.5 Microscopy

Question 06 · continued

0 5 . 4 The concentration of live bacteria in the body continued to increase after starting the course of antibiotics.

Suggest **one** reason why.

[1 mark]

0 5 . 5 After 3 days of taking the antibiotic:

- the child felt better
- there were still bacteria in the child's body.

Why did the child feel better?

[1 mark]

Tick (✓) **one** box.

Bacteria had become immune to the antibiotic. ☐

The child had become resistant to the bacteria. ☐

There were fewer toxins in the body than at day 0 ☐

0 5 . 6 Suggest why doctors do **not** give antibiotics to patients with minor infections.

[1 mark]

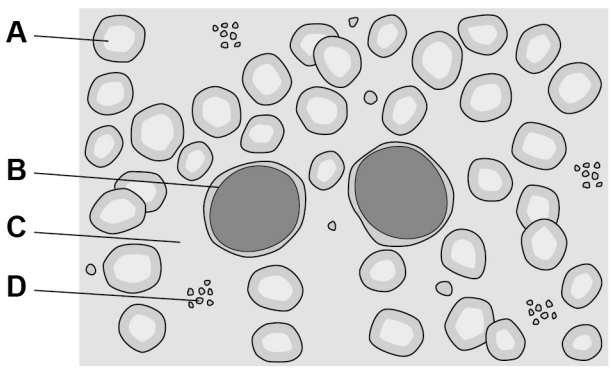
Question 5 continues on the next page

4.1.1.5 Microscopy

Question 06 · continued

Figure 8 shows blood viewed using a microscope.

Figure 8



0 5 . 7 A vaccine will stimulate the production of antibodies.

Which part of the blood in **Figure 8** produces antibodies?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 5 . 8 Which part of the blood in **Figure 8** starts the clotting process?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

9

4.1.1.5 Microscopy

Question 07

June 2023 | 8464/B/1F | Original Q7

0 7 **Figure 10** shows onion cells viewed using a light microscope.

Figure 10

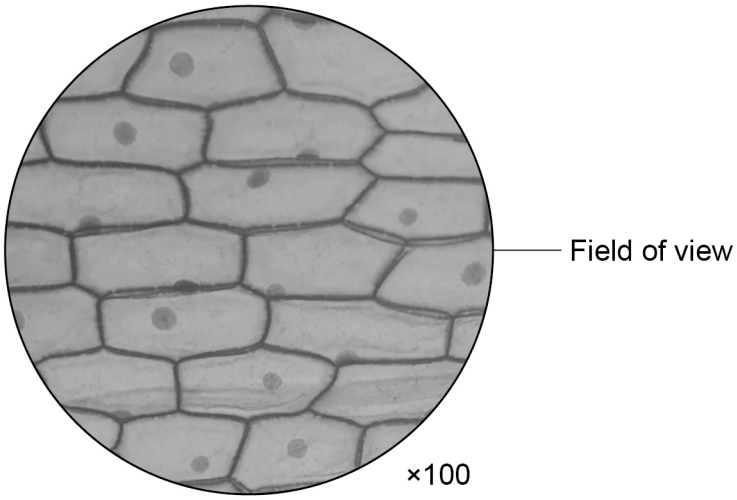
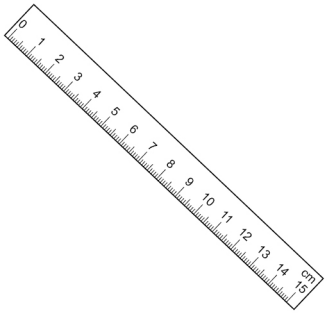


Figure 11 shows the apparatus given to a student.

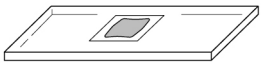
Figure 11



Microscope



15 cm transparent ruler



Prepared slide of onion cells

4.1.1.5 Microscopy

Question 07 · continued

Describe how the student could use the apparatus to estimate the **mean** length of onion cells on the slide.

[6 marks]

6

4.1.1.5 Microscopy

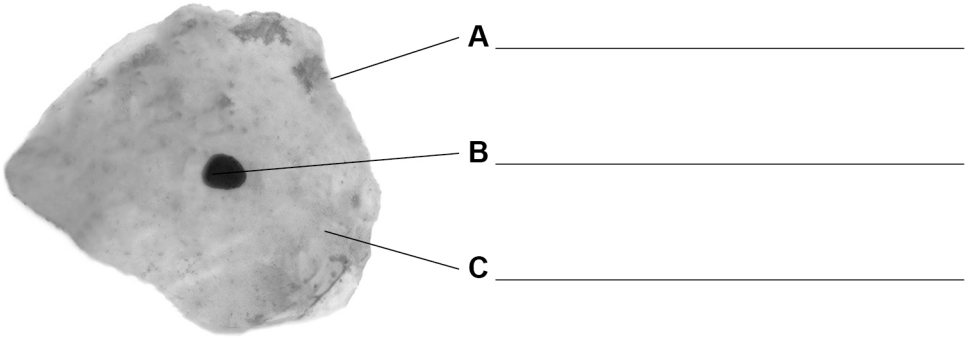
Question 08

June 2024 | 8464/B/1F | Original Q1

0 1 This question is about cells.

Figure 1 shows an animal cell.

Figure 1



0 1 . 1 Label parts **A**, **B** and **C** on **Figure 1**.

Choose answers from the box.

[3 marks]

cell membrane	**cell wall**	**chloroplast**
cytoplasm	**nucleus**	

4.1.1.5 Microscopy

Question 08 · continued

0 1 . 2 What is the function of the nucleus in a cell?

[1 mark]

Tick (✓) **one** box.

To contain a solution called cell sap ☐

To control the activities of the whole cell ☐

To control the movement of substances into the cell ☐

0 1 . 3 What is the function of the mitochondria in a cell?

[1 mark]

Tick (✓) **one** box.

To produce glucose during photosynthesis ☐

To produce proteins for the cell ☐

To release energy in respiration ☐

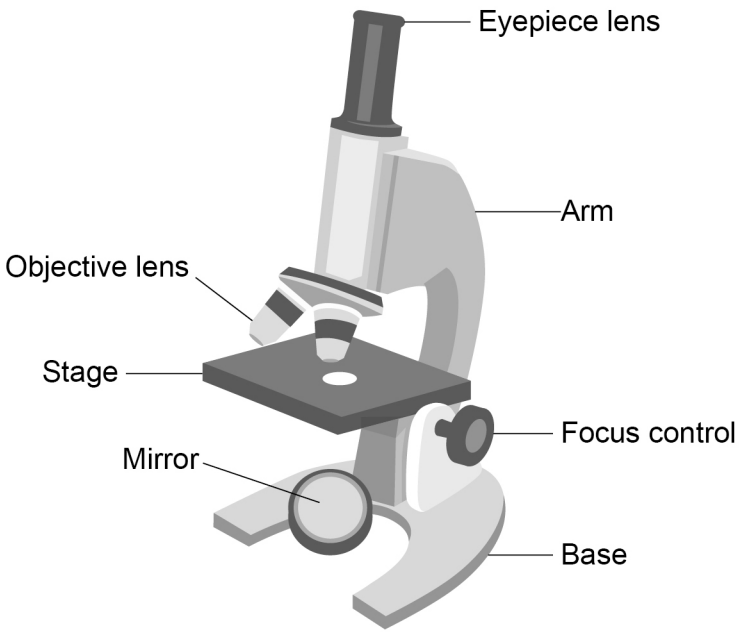
Question 1 continues on the next page

4.1.1.5 Microscopy

Question 08 · continued

0 1 . 4 **Figure 2** shows a light microscope.

Figure 2



A student is given a prepared slide of animal cells to view using the microscope.

Complete the sentences.

Use labels from **Figure 2**.

[4 marks]

Place the slide on the _____.

Use the objective lens that has low power.

Look through the _____.

Direct the light by moving the _____.

Make the image larger by using the high power _____.

4.1.1.5 Microscopy

Question 08 · continued

0 1 . 5 **Figure 3** shows a different animal cell.

Figure 3



Calculate the magnification of the image in **Figure 3**.

Complete the following steps.

[4 marks]

Measure the width of the image from **Y** to **Z**, in millimetres (mm).

Width of image = _____ mm

Give the width of the image in micrometres (μm).

1 mm = 1000 μm

_____

Width of image = _____ μm

The cell in **Figure 3** has a real width of 40 micrometres (μm).

Use the equation to calculate the magnification.

$$\text{magnification} = \frac{\text{width of image in μm}}{\text{real width of cell in μm}}$$

_____

_____

_____

Magnification = × _____

13