AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.1.1.5

Microscopy

Past-paper questions

Tier	**Higher**
Question groups	**8**
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.

4.1.1.5 Microscopy

Question 01

June 2018 | 8464/B/1H | Original Q1

0 1 This question is about cell structures.

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

[2 marks]

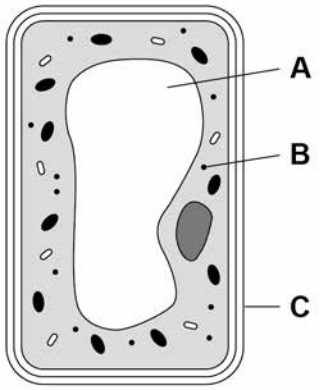
Cell Structure	Type of cell where the structure is found
Nucleus	Prokaryotic cells
Permanent vacuole	Plant cells only
Plasmid	Eukaryotic cells

4.1.1.5 Microscopy

Question 01 · continued

0 1 . 2 **Figure 1** shows a plant cell.

Figure 1



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	☐

Question 1 continues on the next page

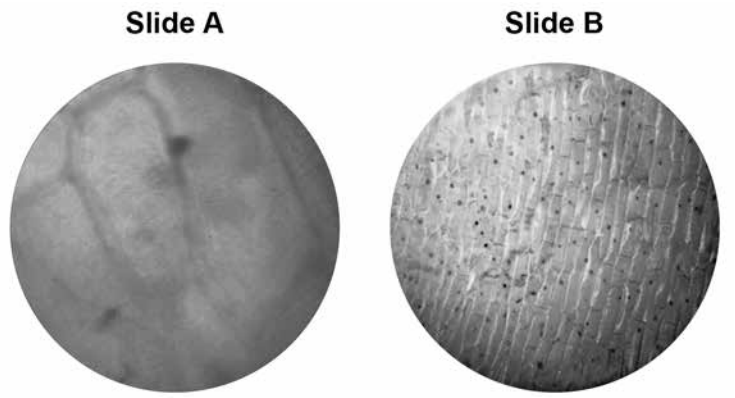
4.1.1.5 Microscopy

Question 01 · continued

A student observed slides of onion cells using a microscope.

Figure 2 shows two of the slides the student observed.

Figure 2



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

0 1 . 3 Describe how the student should adjust the microscope to see the cells on **Slide A** more clearly.

[1 mark]

0 1 . 4 Describe how the student should adjust the microscope to see the cells on **Slide B** more clearly.

[2 marks]

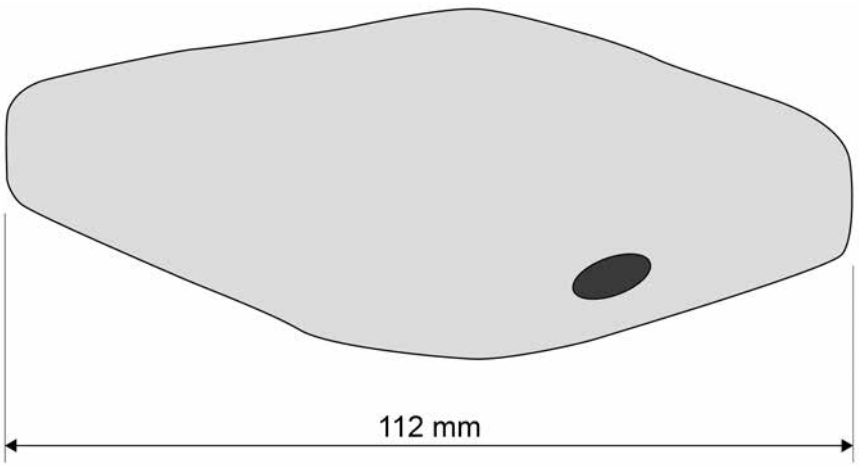
4.1.1.5 Microscopy

Question 01 · continued

0 1 . 5 The student made the necessary adjustments to get a clear image.

Figure 3 shows the student's drawing of one of the cells.

Figure 3



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

Calculate the magnification of the drawing.

[3 marks]

Magnification = ×

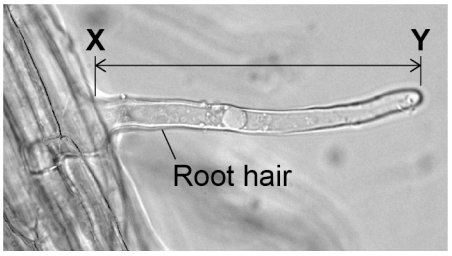
9

4.1.1.5 Microscopy

Question 02

0 5 **Figure 8** shows a root hair viewed using a microscope.

Figure 8



0 5 . 1 The root hair was viewed at a magnification of ×50

The image length of the root hair **X**–**Y** is 43 mm

Calculate the real length of the root hair in micrometres (μm).

[4 marks]

Real length = _____ μm

4.1.1.5 Microscopy

Question 02 · continued

0 5 . 2 A microscope has a ×5 eyepiece lens.

Describe how to use this microscope to observe a prepared slide of root hair cells at a magnification of ×50

[4 marks]

Question 5 continues on the next page

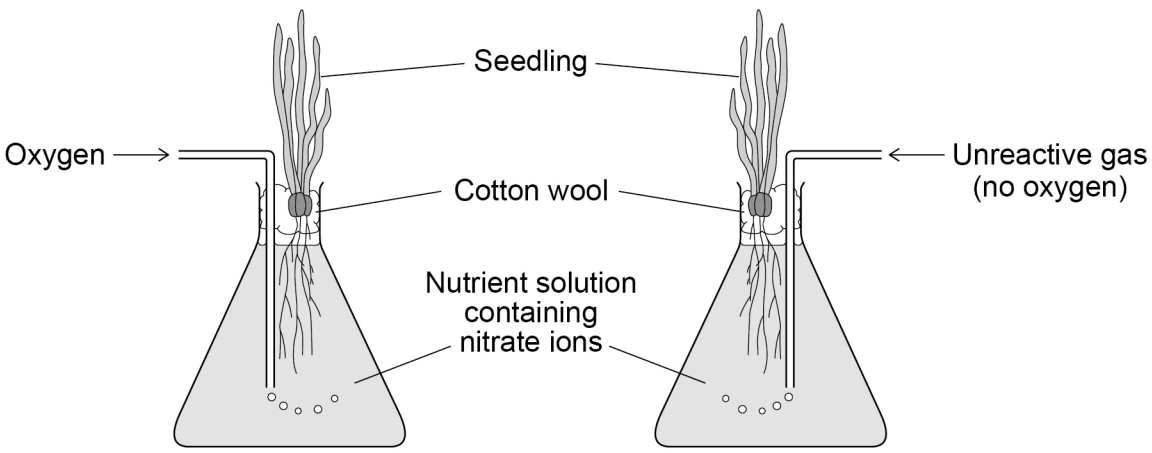
Question 02 · continued

Root hair cells absorb water and mineral ions from the soil.

A scientist investigated the rate of nitrate ion uptake by two seedlings.

Figure 9 shows how the investigation was set up.

Figure 9



The scientist determined the mass of nitrate ions absorbed by each seedling every 30 minutes for 4 hours.

Table 5 shows the results.

Table 5

Time in hours	Total mass of nitrate ions absorbed by seedling in arbitrary units	
	With oxygen added	With no oxygen added
0	0	0
0.5	100	60
1.0	145	95
1.5	170	105
2.0	195	115
2.5	215	120
3.0	235	125
3.5	250	130
4.0	265	130

4.1.1.5 Microscopy

Question 02 · continued

0 5 . 3 Describe the changes in the rate of absorption of nitrate ions for the seedling with **no** oxygen added.

Use information from **Table 5**.

[3 marks]

0 5 . 4 Explain what the results in **Table 5** show about how nitrate ions are absorbed.

[4 marks]

Question 5 continues on the next page

4.1.1.5 Microscopy

Question 02 · continued

0 5 . 5 Nitrate ions are essential for plants to grow.

Describe how nitrate ions are used in a plant to help the plant grow.

[3 marks]

18

4.1.1.5 Microscopy

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

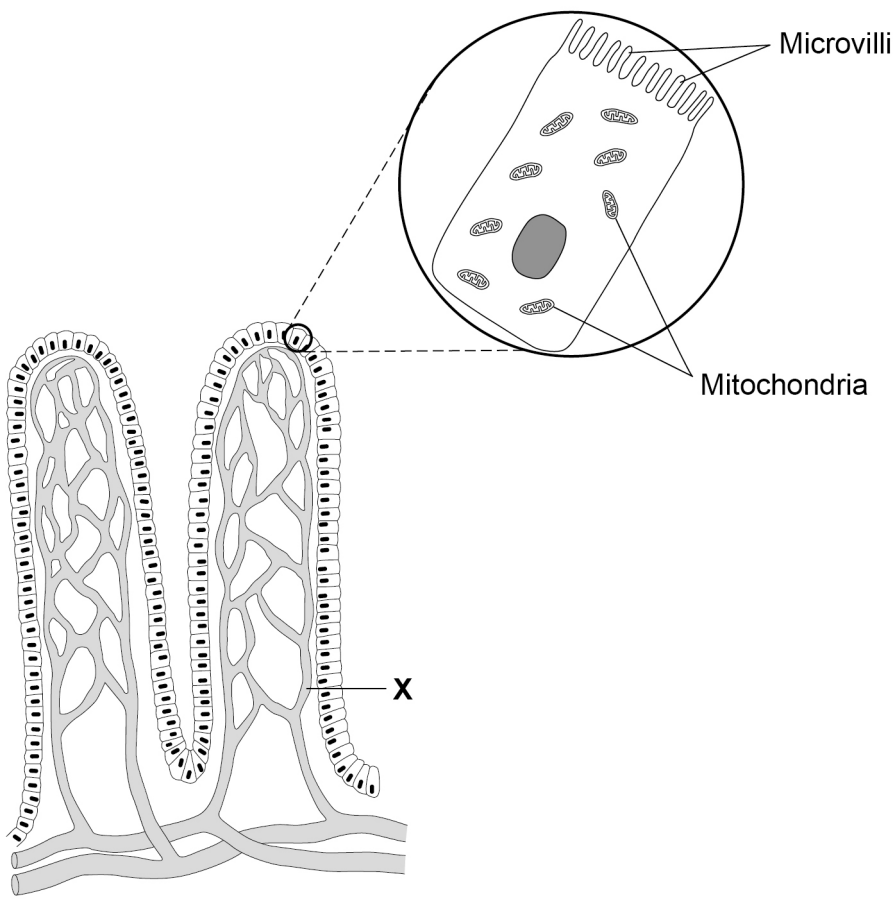
4.1.1.5 Microscopy

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]

4.1.1.5 Microscopy

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

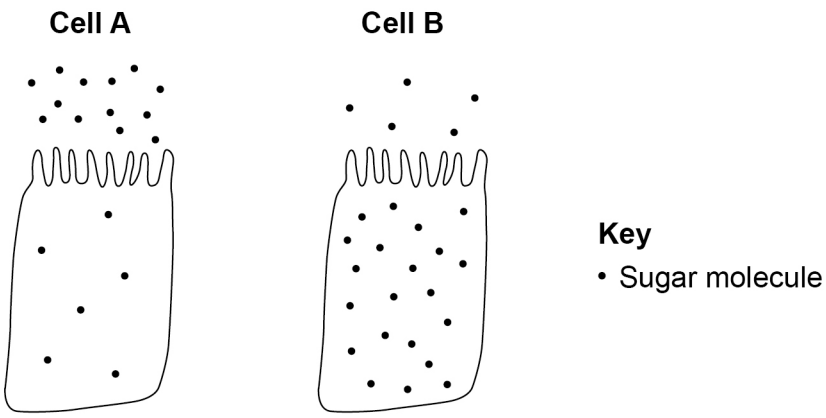
4.1.1.5 Microscopy

Question 03 · continued

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.

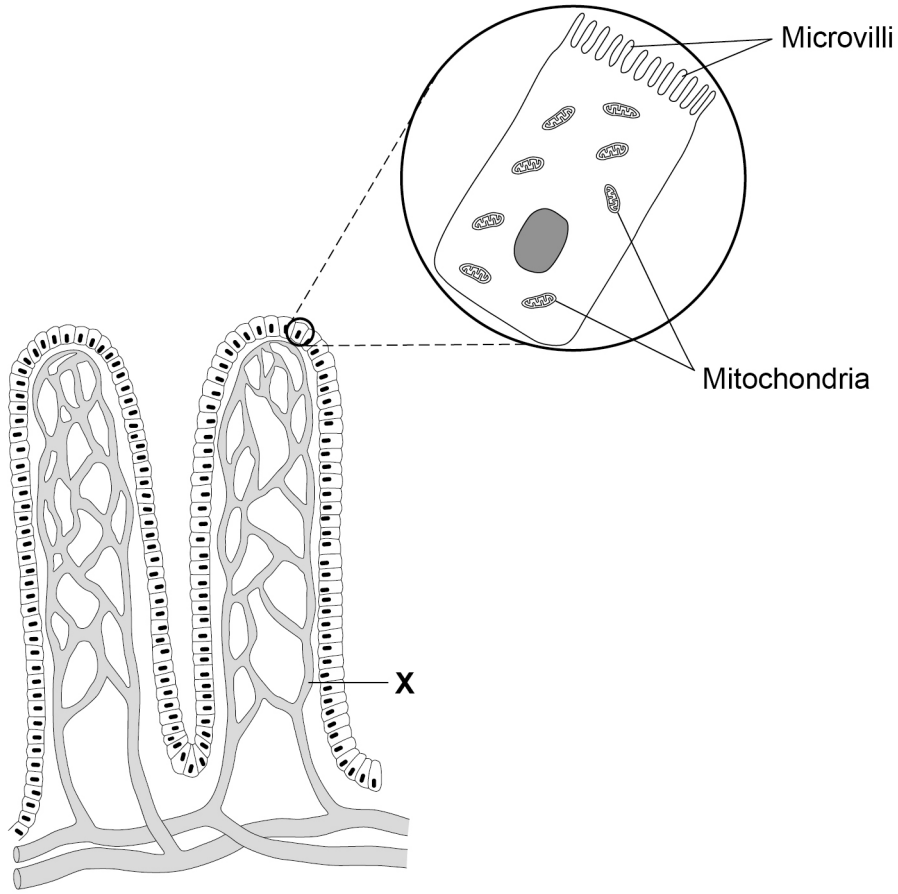
[1 mark]

4.1.1.5 Microscopy

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]

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4.1.1.5 Microscopy

Question 04

June 2022 | 8464/B/1H | Original Q1

0 1 Bacteria can cause a variety of diseases in humans.

0 1 . 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 1 . 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 1 continues on the next page

Question 04 · continued

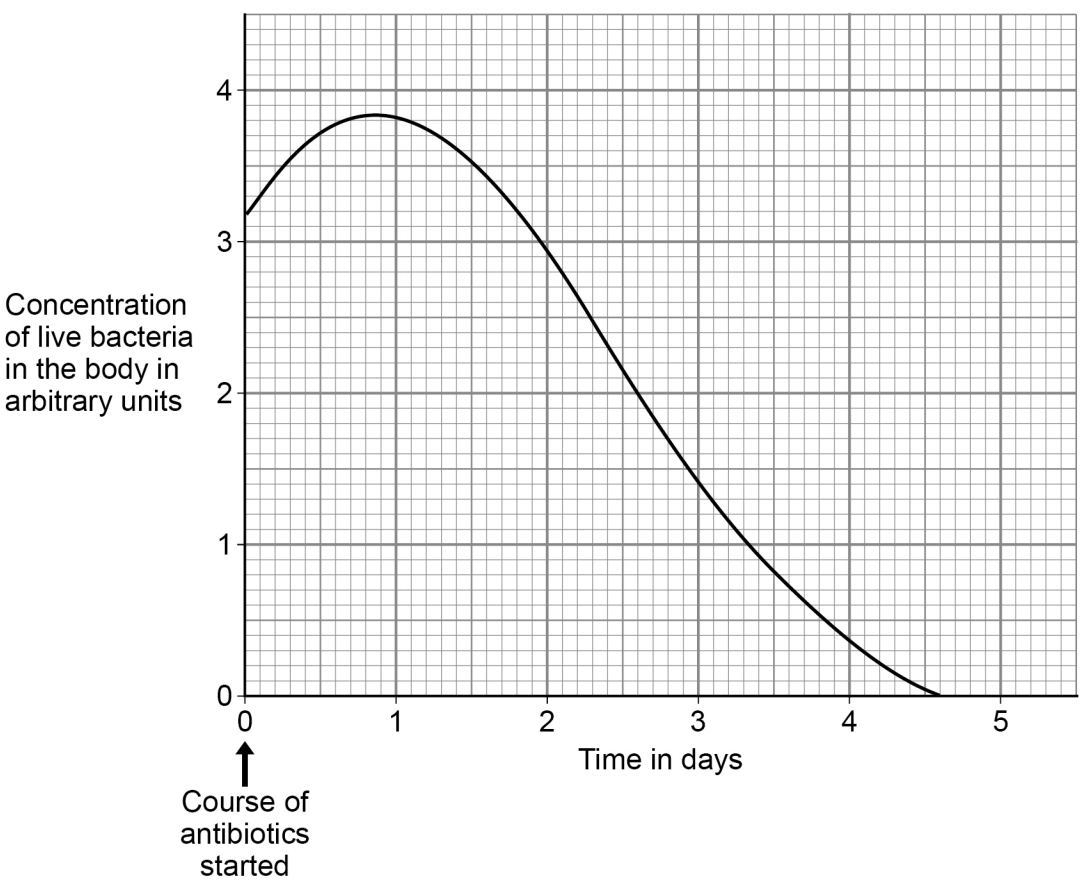
0 1 . 3 What is the name of the first antibiotic developed?

[1 mark]

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

Figure 1 shows how the concentration of live bacteria in the child's body changed when taking the course of antibiotics.

Figure 1



4.1.1.5 Microscopy

Question 04 · continued

0 1 . 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 1 . 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 1 . 6 Suggest why doctors do **not** give antibiotics to patients with minor infections.

[1 mark]

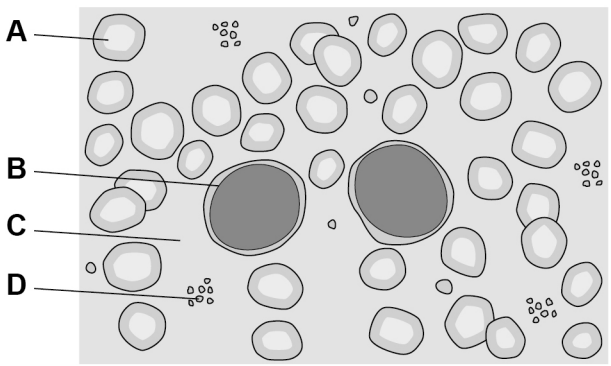
Question 1 continues on the next page

4.1.1.5 Microscopy

Question 04 · continued

Figure 2 shows blood viewed using a microscope.

Figure 2



0 1 . 7 A vaccine will stimulate the production of antibodies.

Which part of the blood in **Figure 2** produces antibodies?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 1 . 8 Which part of the blood in **Figure 2** starts the clotting process?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

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4.1.1.5 Microscopy

Question 05

June 2023 | 8464/B/1H | Original Q2

0 2 **Figure 2** shows onion cells viewed using a light microscope.

Figure 2

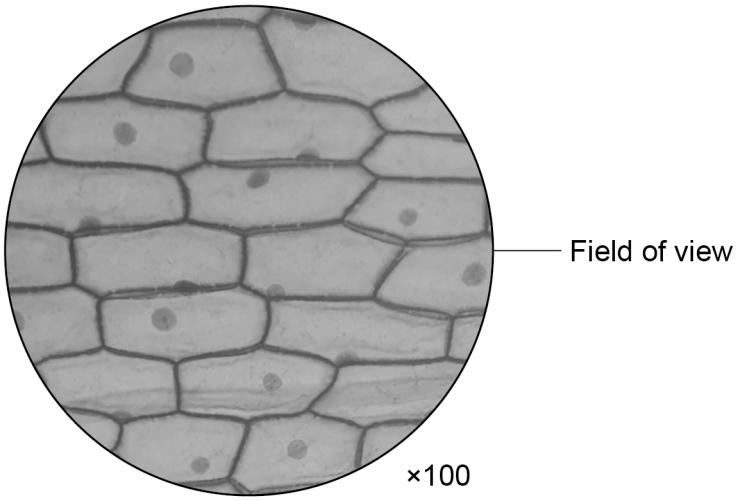
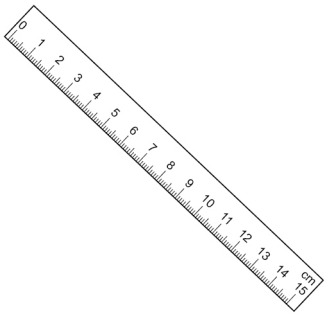


Figure 3 shows the apparatus given to a student.

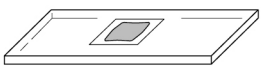
Figure 3



Microscope



15 cm transparent ruler



Prepared slide of onion cells

4.1.1.5 Microscopy

Question 05 · 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 06

June 2023 | 8464/B/2H | Original Q5

0 5 In Vitro Fertilisation (IVF) can be used to treat infertility.

0 5 . 1 Which hormones are given to women having IVF treatment?

[1 mark]

Tick (✓) **one** box.

- FSH and LH ☐
- FSH and oestrogen ☐
- LH and oestrogen ☐

0 5 . 2 Name the target organ of the hormones used for IVF.

[1 mark]

_____

0 5 . 3 Describe why microscopes are needed in the process of IVF.

[1 mark]

_____

_____

Question 5 continues on the next page

4.1.1.5 Microscopy

0 5 . 4 Describe how the hormones given to women during IVF treatment **interact** with other hormones to prepare the body for pregnancy.

[3 marks]

Scientists studied women who had IVF treatment.

Table 1 shows the results.

Table 1

	Number of women
Received IVF treatment	450
Successful IVF treatment	135

4.1.1.5 Microscopy

Question 06 · continued

0 5 . 5 Calculate the **simplest** ratio of the number of women who had successful IVF to the number of women who had unsuccessful IVF.

Give the ratio in whole numbers.

[2 marks]

Ratio (whole numbers) = _____ : _____

0 5 . 6 Suggest **one** factor that can affect the probability of a woman having a child as a result of IVF treatment.

[1 mark]

0 5 . 7 Give **two** arguments against the use of IVF treatment.

Do **not** refer to cost or to religion in your answer.

[2 marks]

1

2

11

4.1.1.5 Microscopy

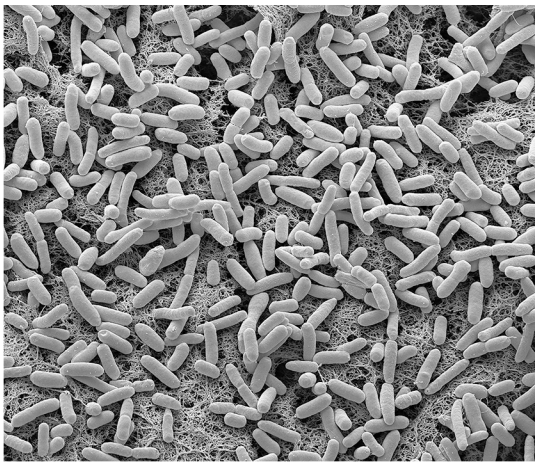
Question 07

June 2024 | 8464/B/1H | Original Q5

0 5 This question is about microscopy.

0 5 . 1 **Figure 3** shows bacteria viewed using a microscope.

Figure 3



What type of microscope was used to view the bacteria in **Figure 3**?

Give a reason for your answer.

[1 mark]

Type of microscope _____

Reason _____

_____

_____

Question 5 continues on the next page

4.1.1.5 Microscopy

Question 07 · continued

0 5 . 2 Bacterial cells are prokaryotic cells.

Give **three** ways that a prokaryotic cell is different from a eukaryotic cell.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

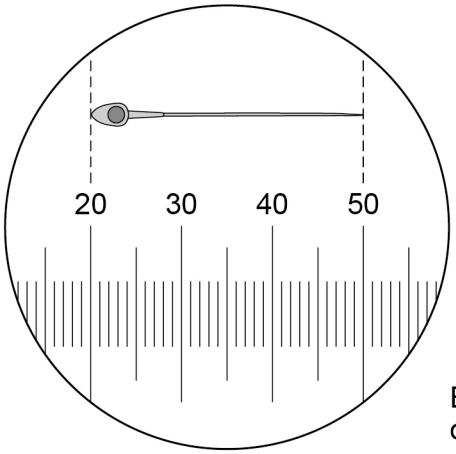
_____

4.1.1.5 Microscopy

Question 07 · continued

0 5 . 3 **Figure 4** shows a special slide used to determine the size of a cell viewed using a microscope.

Figure 4



Each small division on the scale is 1.5 µm

Calculate the magnification of the cell shown in **Figure 4**.

[5 marks]

Magnification = ×

9

4.1.1.5 Microscopy

Question 08

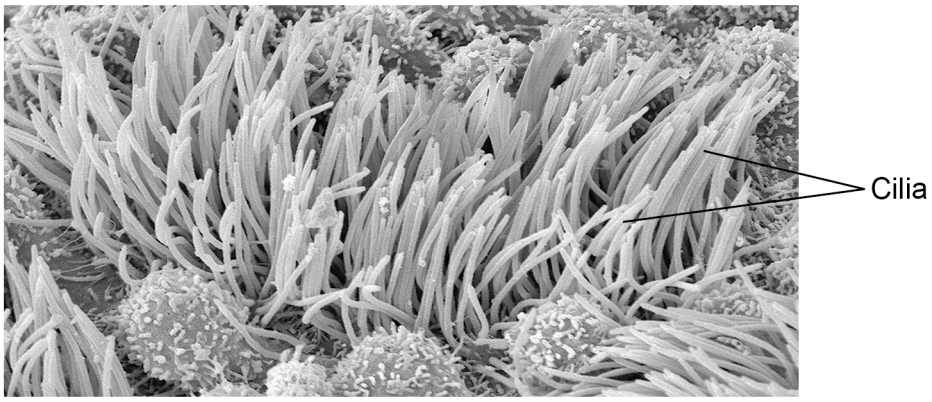
0 6 Ciliated cells have small hair-like structures called cilia on the cell surface.

Ciliated cells are found in the trachea and in the oviducts.

Oviducts are part of the female reproductive system.

Figure 7 shows cilia lining an oviduct.

Figure 7



0 6 . 1 Give **one** piece of evidence that an electron microscope was used to produce the image shown in **Figure 7**.

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

[1 mark]

0 6 . 2 Describe the function of ciliated cells in the **oviduct**.

[1 mark]

4.1.1.5 Microscopy

Question 08 · continued

0 6 . 3 The mean length of the cilia in an image was 6 mm.

The cilia were viewed at a magnification of 1.5×10^3

Calculate the real mean length of the cilia.

Give your answer in micrometres (μm).

[5 marks]

Real mean length = _____ μm

Question 6 continues on the next page

4.1.1.5 Microscopy

Question 08 · continued

Red blood cells are a type of cell found in humans.

People with anaemia do **not** have enough red blood cells.

0 6 . 4 Explain why a person with anaemia is likely to experience muscle fatigue.

[2 marks]

4.1.1.5 Microscopy

Question 08 · continued

Scientists have produced red blood cells from stem cells in a laboratory.

The scientists:

- collected a sample of blood from a donor
- extracted 5×10^5 stem cells from the sample.

Each stem cell was developed into 100 000 red blood cells.

35% of the red blood cells made from stem cells are suitable to use in a patient.

0 6 . 5 Calculate the number of red blood cells made from the donor's sample that could be used in a patient.

Give your answer in standard form.

[4 marks]

Number of red blood cells (in standard form) = _____

Question 6 continues on the next page

Question 08 · continued

0 6 . 6 Patients with anaemia are sometimes given a blood transfusion.

A blood transfusion is when a patient is given blood.

The patient can be given red blood cells:

- produced from stem cells in a laboratory

  or

- from a whole blood donation.

Table 2 gives information about the two sources of red blood cells.

Table 2

Red blood cells produced from stem cells	Red blood cells from a whole blood donation
• A small sample of blood is collected from the patient. • The total cost is £15 per 10 cm^3 of cells produced. • All of the new cells can function for 120 days.	• 470 cm^3 of blood is collected from a donor. • The blood donation is separated into its different parts. • Red blood cells make up 45% of whole blood. • The total cost of a blood donation is £130. • The cells can function for between 1 and 120 days.

4.1.1.5 Microscopy

Question 08 · continued

Evaluate the use of red blood cells:

- produced from stem cells in a laboratory
- from a whole blood donation.

You should refer to costs in your answer.

[6 marks]

Extra Space

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