AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier
Biology Paper 1H

Tuesday 16 May 2023 Morning Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Information
- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Do not write outside the box

0 1 Communicable and non-communicable diseases are major causes of ill health.

0 1 . 1 Which disease is a **non-communicable** disease?

[1 mark]

Tick (✓) **one** box.

AIDS ☐

Cancer ☐

Gonorrhoea ☐

Malaria ☐

Obesity is a risk factor for many non-communicable diseases.

0 1 . 2 Give **one** non-communicable disease that obesity is a risk factor for.

Do **not** refer to the diseases given in Question **01.1** in your answer.

[1 mark]

_____

0 1 . 3 National policies are used to help people who are obese to lose weight.

One national policy is to reduce the amount of sugar added to food and drinks.

Suggest **one other** national policy that could help people to lose weight.

[1 mark]

_____

_____

Do not write outside the box

0 1 . 4 Body mass index (BMI) is one measure of obesity.

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{body mass in kg}}{(\text{height in m})^2}$$

Table 1 shows how BMI is used to describe an adult's BMI category.

Table 1

BMI	BMI category
<18.5	Underweight
18.5 to 24.9	Healthy weight
25.0 to 29.9	Overweight
>29.9	Obese

A person is 1.64 m tall and has a mass of 69 kg.

Determine the **BMI category** for this person.

Use the BMI equation and **Table 1**.

[3 marks]

The person's BMI category is _____

Question 1 continues on the next page

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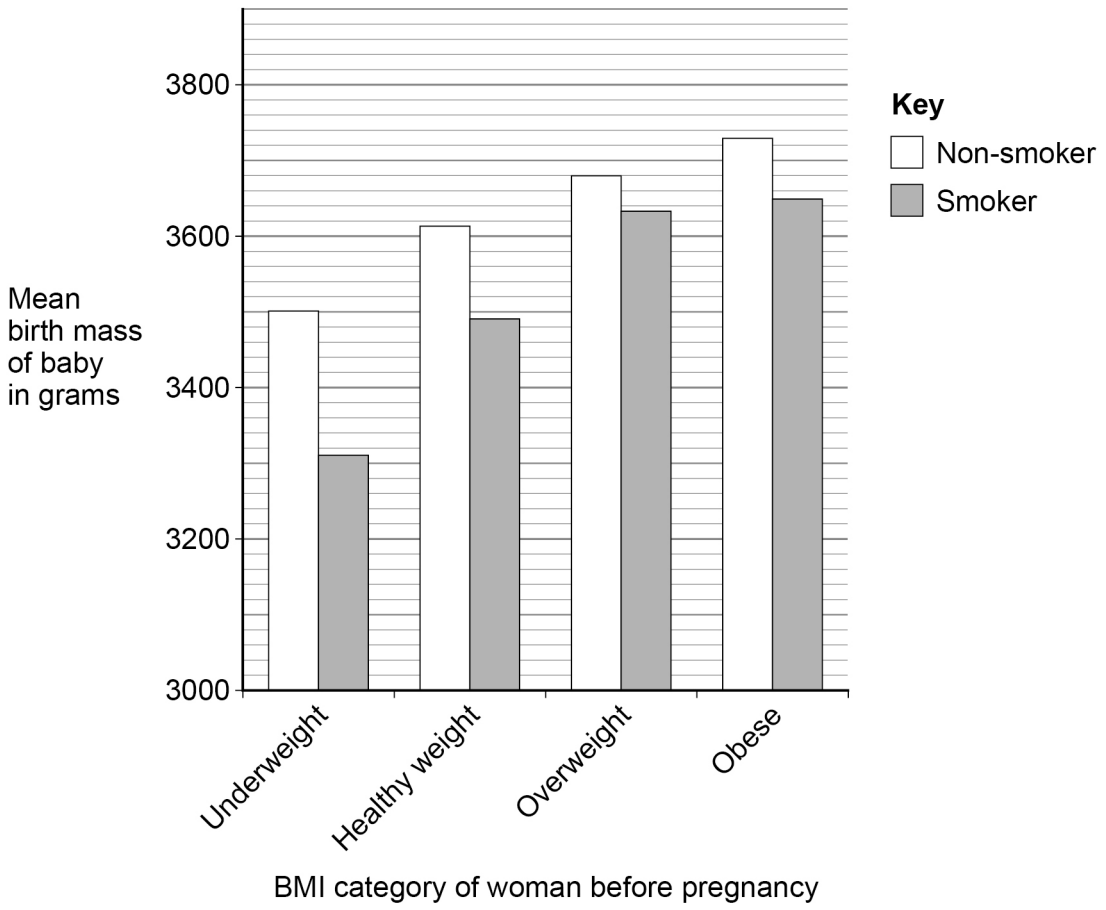
Scientists investigated the effect of smoking and of BMI on the birth mass of babies.

Women's BMI categories were determined before the women became pregnant.

0 1 . 5 Suggest why BMI categories were determined **before** the women became pregnant.
[1 mark]

Figure 1 shows the results.

Figure 1



Do not write outside the box

0 1 . 6 Give **two** conclusions that can be made from **Figure 1**.

[2 marks]

1 _____

_____

2 _____

_____

0 1 . 7 Measles is a communicable disease.

A virus causes measles.

Describe how the measles virus is transferred from person to person.

[2 marks]

_____

_____

_____

_____

Question 1 continues on the next page

Do not write outside the box

Athlete's foot is a communicable disease.

A fungus causes athlete's foot.

The athlete's foot fungus infects the skin on feet.

0 1 . 8 Scientists estimate that 17% of the UK population have athlete's foot.

The estimated UK population is 67 961 900

Calculate how many people are estimated to have athlete's foot.

[2 marks]

Estimated number of people with athlete's foot = _____

0 1 . 9 Athlete's foot fungus grows in moist conditions.

Suggest **one** way a person could reduce their chance of catching athlete's foot.

[1 mark]

14

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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

Figure 2

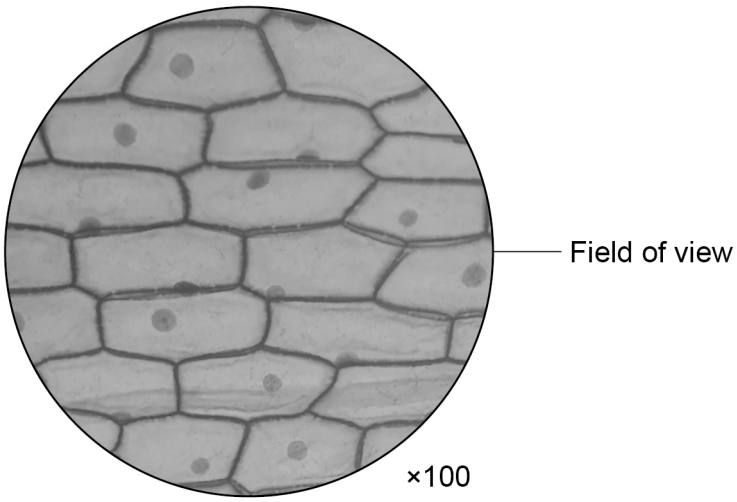
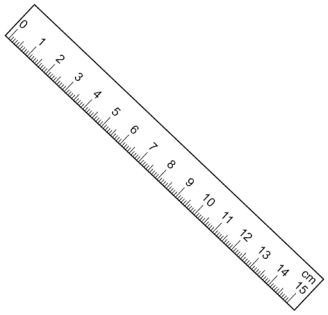


Figure 3 shows the apparatus given to a student.

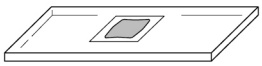
Figure 3



Microscope



15 cm transparent ruler



Prepared slide of onion cells

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

[6 marks]

6

Turn over for the next question

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0 3 The circulatory system includes the heart, blood vessels and blood.

0 3 . 1 The heart pumps the blood in a double circulatory system.

Describe what is meant by a 'double circulatory system'.

[2 marks]

0 3 . 2 Heart rate is controlled by a group of cells that act as a pacemaker.

Where in the heart is the pacemaker found?

[1 mark]

0 3 . 3 Which blood vessel carries deoxygenated blood?

[1 mark]

Tick (✓) **one** box.

- Aorta ☐
- Coronary artery ☐
- Pulmonary artery ☐
- Pulmonary vein ☐

Do not write outside the box

The structure of a vein is different from the structure of an artery.

One difference is that veins have valves but arteries do **not** have valves.

0 3 . 4 Explain why veins have valves, but arteries do not.

[2 marks]

0 3 . 5 Describe **two** structural differences between a vein and an artery.

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

[2 marks]

1

2

8

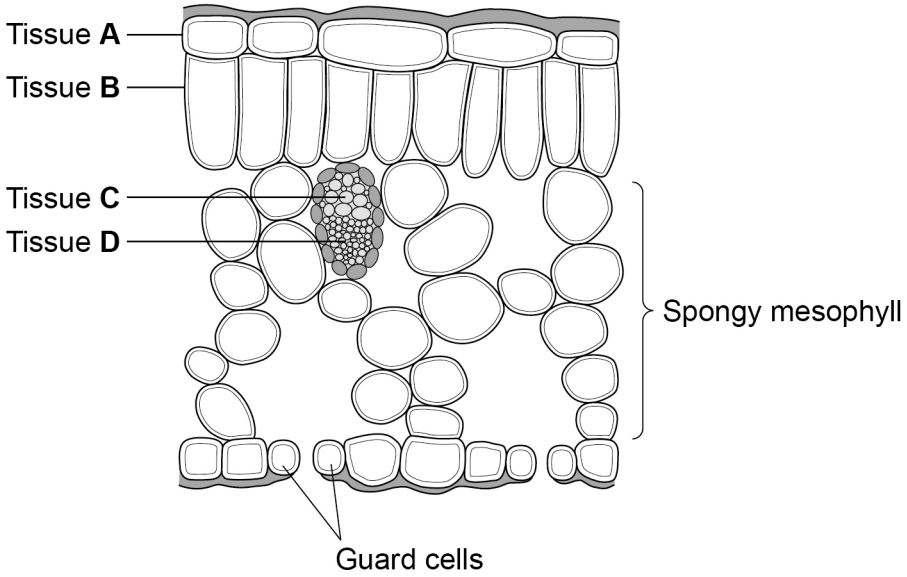
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0 4 A leaf is a plant organ.

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** ☐

Do not write outside the box

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.

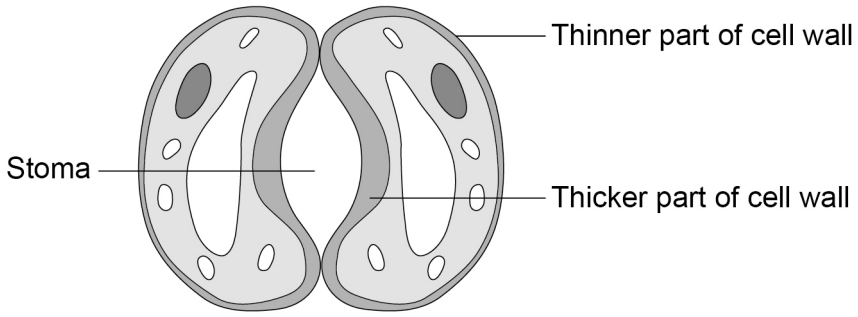
[2 marks]

Question 4 continues on the next page

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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]

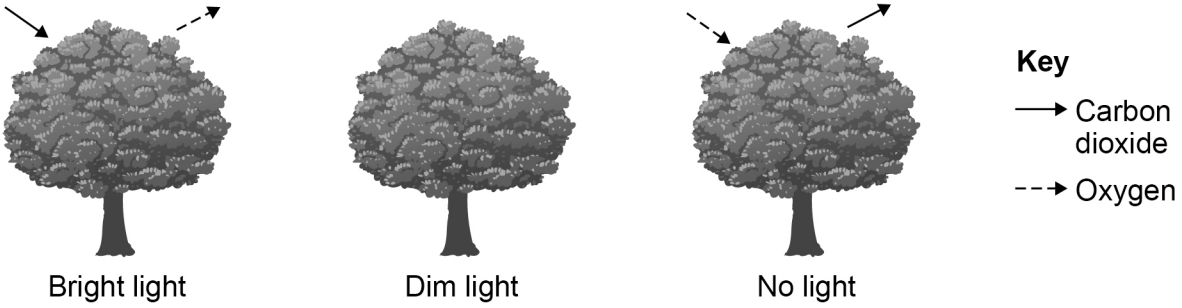
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0 5 Light intensity varies during 24 hours.

Figure 6 shows the overall exchange of carbon dioxide and oxygen for a tree at three different light intensities.

Figure 6



Explain the overall exchange of carbon dioxide and oxygen at the three different light intensities.

[6 marks]

6

Turn over ►

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0 6 Amylase is an enzyme that digests starch in the digestive system.

0 6 . 1 Explain why starch has to be digested.

[2 marks]

Question 6 continues on the next page

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A student used a colorimeter to investigate the rate of starch digestion.

A colorimeter measures the percentage of light passing through a liquid.

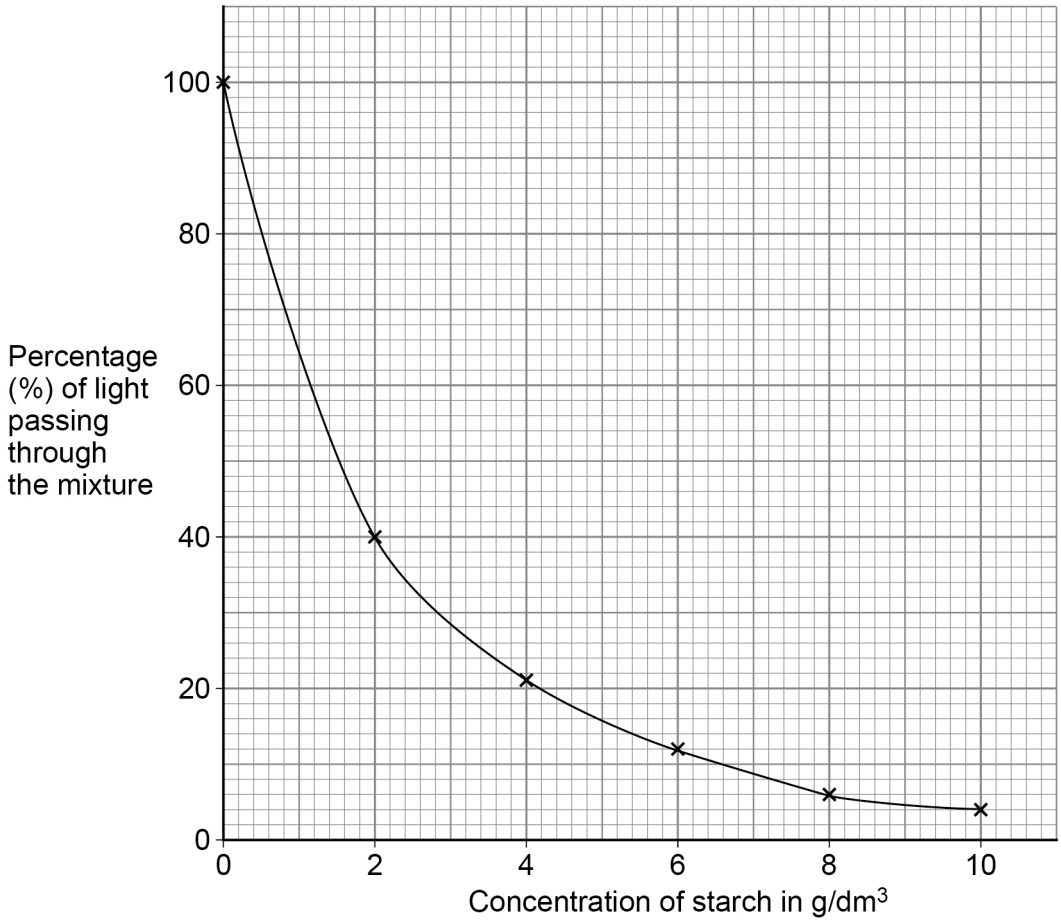
The darker the colour of the liquid, the less light passes through.

The student:

- mixed 1 cm^3 of starch suspension with 10 cm^3 of iodine solution
- measured the percentage of light passing through the mixture
- repeated with different concentrations of starch suspension.

Figure 7 shows the results.

Figure 7



Do not write outside the box

0 6 . 2 Suggest what liquid was used for the test with 0 g/dm^3 starch concentration.

[1 mark]

0 6 . 3 Explain the change in the percentage of light passing through the different concentrations of starch suspension in iodine solution.

Use **Figure 7**.

[3 marks]

Question 6 continues on page 21

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ANSWER IN THE SPACES PROVIDED

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The student then investigated the rate of starch digestion using amylase.

This is the method used.

1. Put 10 cm^3 of starch suspension into a test tube.

2. Put 5 cm^3 of amylase solution into a separate test tube.

3. Put both test tubes into a water bath at 37 °C for 10 minutes.

4. Mix the contents of both test tubes together in a beaker.

5. Put the beaker into the water bath.

6. Remove 1 cm^3 of the mixture and add it to 10 cm^3 of iodine solution.

7. Measure the percentage of light passing through the liquid.

8. Repeat steps 6 and 7 every minute for 5 minutes.

0 6 . 4 The starch suspension and the amylase solution were kept in the water bath for 10 minutes before being mixed together.

Give the reason why.

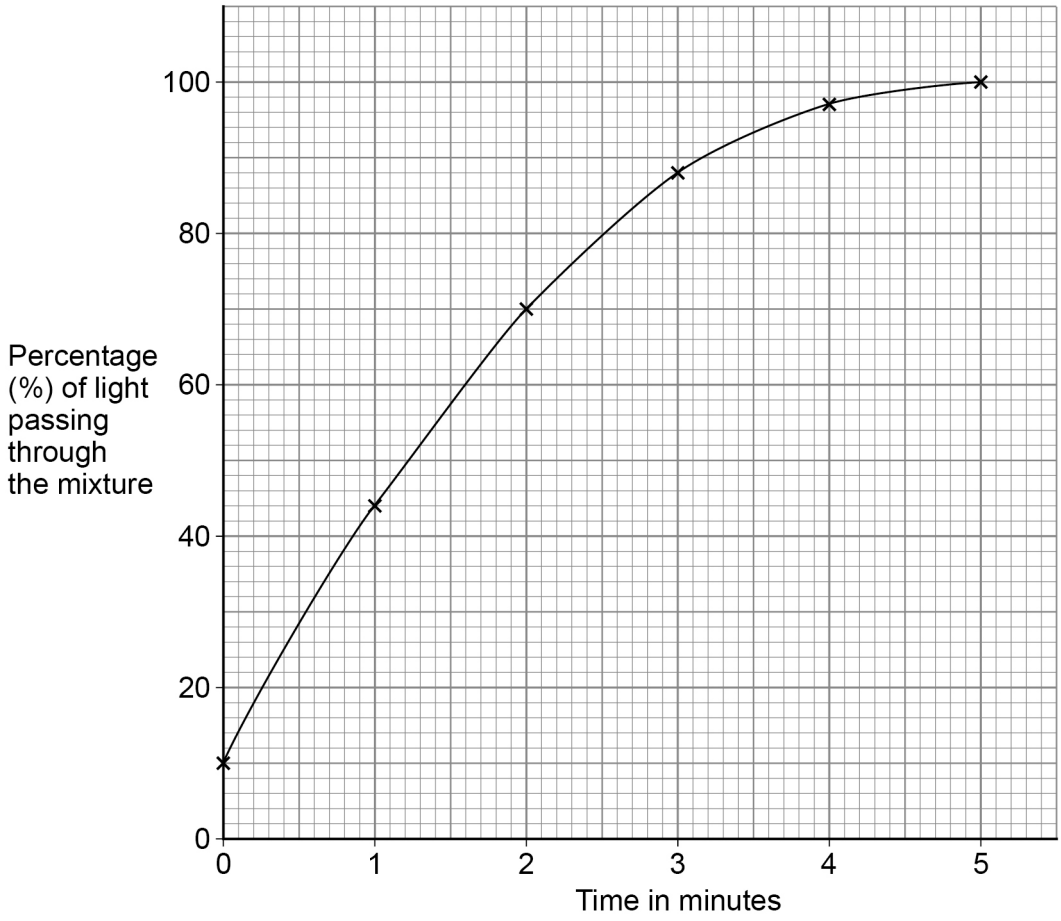
[1 mark]

Question 6 continues on the next page

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Figure 8 shows the results.

Figure 8



Do not write outside the box

0 6 . 5 The concentration of starch at 3 minutes was 0.3 g/dm^3.

Calculate the mean rate of starch digestion for the first 3 minutes.

Use **Figure 7** on page 18 and **Figure 8** on page 22.

[4 marks]

Mean rate = _____ g/dm^3 per minute

0 6 . 6 The investigation was carried out at pH 7

Explain how the results would be different if the investigation was carried out at pH 1

Use **Figure 8**.

[3 marks]

14

Turn over for the next question

Do not write outside the box

0 7 Antibiotics are drugs used to treat bacterial infections.

Mutations in bacteria produce new strains.

Some strains of bacteria are resistant to antibiotics.

0 7 . 1 Where do mutations happen in a **bacterial** cell?

[1 mark]

A scientist investigated which antibiotics (**A**, **B**, **C**, **D** and **E**) killed *Staphylococcus aureus* (*S. aureus*) bacteria.

This is the method used.

1. Grow *S. aureus* bacteria in a Petri dish.

2. Cut five small discs of paper.

3. Soak each paper disc in a different antibiotic solution.

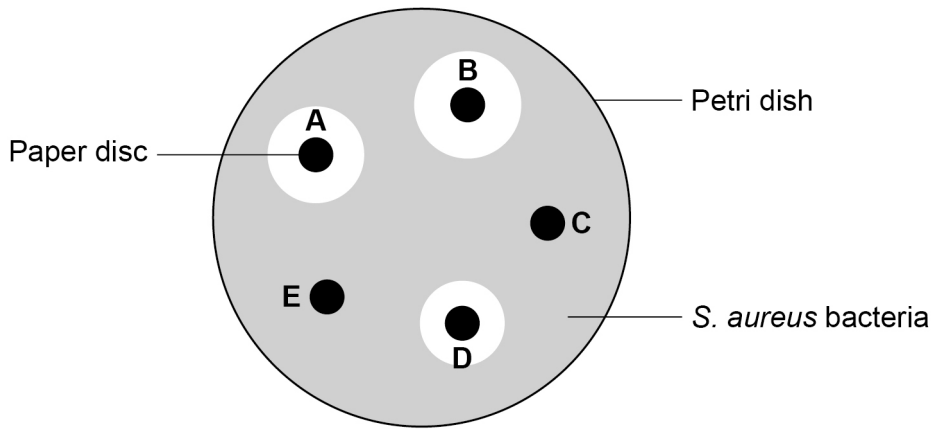
4. Put the five paper discs into the Petri dish.

5. Keep the Petri dish at 37 °C for 24 hours.

Figure 9 shows the results.

A clear area around a disc shows where the bacteria have been killed.

Figure 9



Do not write outside the box

0 7 . 2 The scientist concluded:

'*S. aureus* is resistant to antibiotics **C** and **E**'.

Explain the evidence for this conclusion.

Use **Figure 9**.

[2 marks]

0 7 . 3 The scientist later discovered that *S. aureus* is **not** resistant to antibiotic **E**.

Suggest how the method was developed and showed that *S. aureus* is **not** resistant to antibiotic **E**.

[2 marks]

Question 7 continues on the next page

Do not write outside the box

Broken bones are sometimes repaired using a metal implant.

The area around an implant can become infected with *S. aureus* bacteria.
The infection is usually treated with a long-term course of antibiotics.

Long-term use of antibiotics has led to the development of antibiotic resistant bacteria.
Research is being carried out into alternative treatments.

Stem cells from bone marrow and from fat tissue have antimicrobial properties.

A scientist investigated the effect of four treatments on the area of infection around metal implants. Each treatment was injected into the area around the implant.

The four treatments were:

- unreactive solution
- antibiotic solution
- stem cells from fat tissue
- stem cells from fat tissue containing antibiotic.

Each treatment was tested on 5 patients where an infection had developed around their metal implant.

After 7 days of treatment, the scientist calculated the ratio:

area of infection **:** total tissue area

0 7 . 4 What was the independent variable in this investigation?

[1 mark]

Tick (✓) **one** box.

The ratio of area of infection **:** total tissue area ☐

The treatment injected around the implant ☐

The type of antibiotic used ☐

The type of bacterial infection ☐

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0 7 . 5 Suggest **one** advantage of using stem cells from fat tissue, rather than using stem cells from bone marrow.

[1 mark]

0 7 . 6 Stem cells containing antibiotic were produced by growing the cells for 24 hours in a solution containing the antibiotic.

How did the antibiotic enter the stem cells from the solution?

Give a reason for your answer.

[2 marks]

Tick (✓) **one** box.

By active transport ☐

By diffusion ☐

By osmosis ☐

By translocation ☐

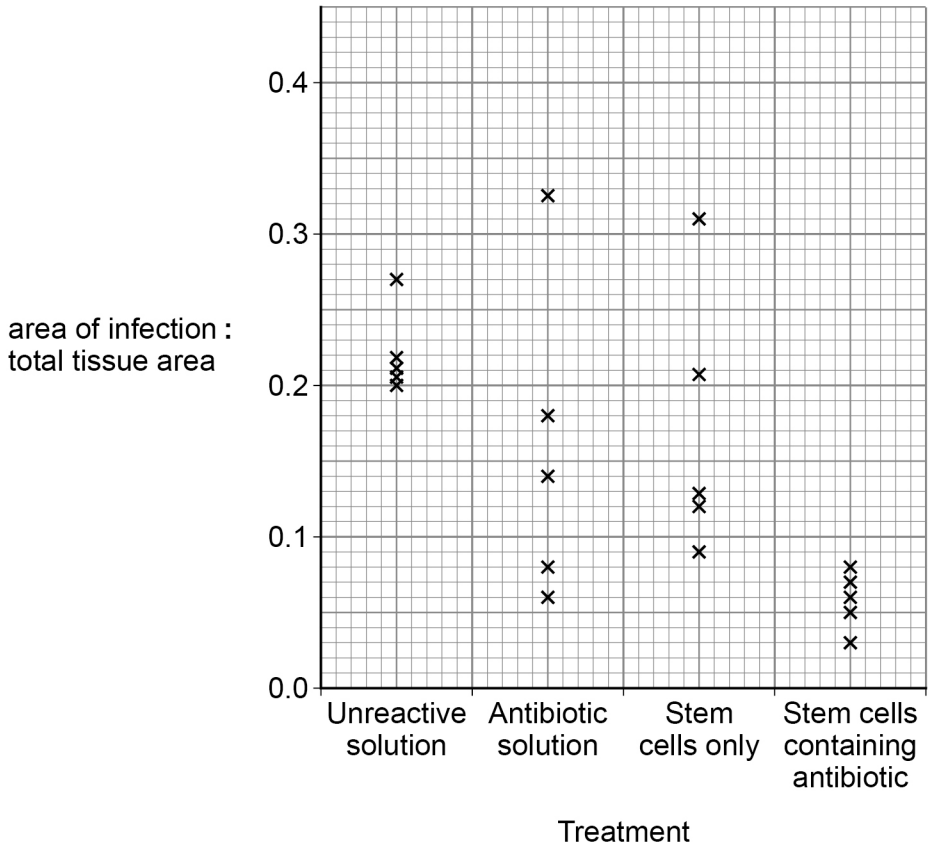
Reason

Question 7 continues on the next page

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Figure 10 shows the results.

Figure 10



0 7 . 7 What is the range of results for the treatment with stem cells only?

[1 mark]

From _____ to _____

Do not write outside the box

0 7 . 8 A student looked at the results and concluded:

'Injections of stem cells containing antibiotic should be used to treat **all** implant-related infections'.

Evaluate the student's conclusion.

Use **Figure 10**.

[4 marks]

14

END OF QUESTIONS

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