A

Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Higher Tier

Biology Paper 1H

H

8464/B/1H

Tuesday 16 May 2023 Morning

Time allowed: 1 hour 15 minutes

[Turn over]

JUN238464B1H01

At the front of this book, write your surname and forename(s), your centre number, your candidate number and add your signature.

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.**
- **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.**

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 TURN OVER UNTIL TOLD TO DO SO

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]

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[Turn over]

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

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]

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[Turn over]

FIGURE 1, on the opposite page, shows the results. A key for FIGURE 1 is provided below.

0 1 . 6

Give TWO conclusions that can be made from FIGURE 1. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

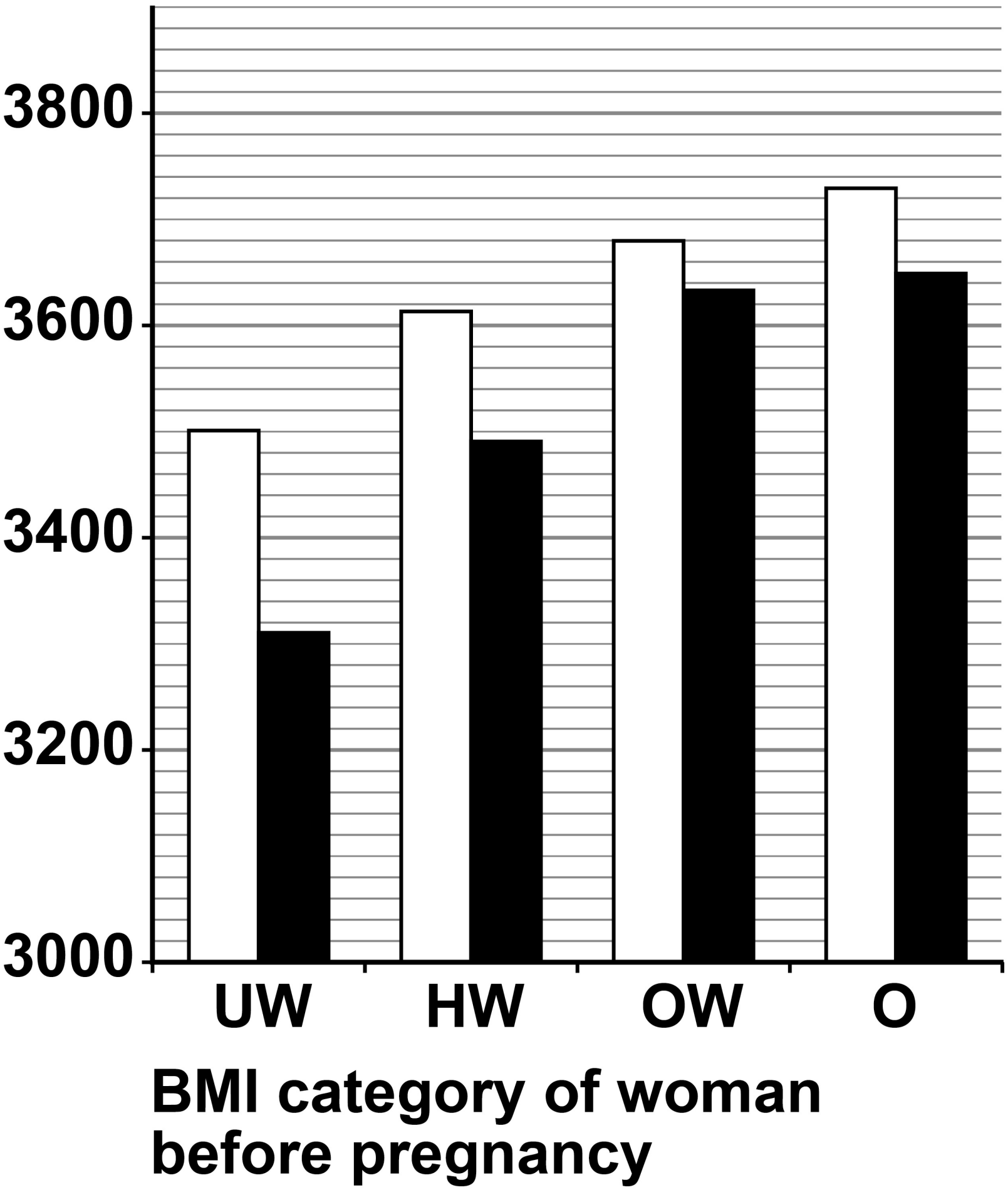
KEY

□ Non-smoker

■ Smoker

UW = Underweight
HW = Healthy weight
OW = Overweight
O = Obese

FIGURE 1



[Turn over]

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]

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 = _____

[Turn over]

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]

0 2

FIGURE 2 shows onion cells viewed using a light microscope.

FIGURE 2

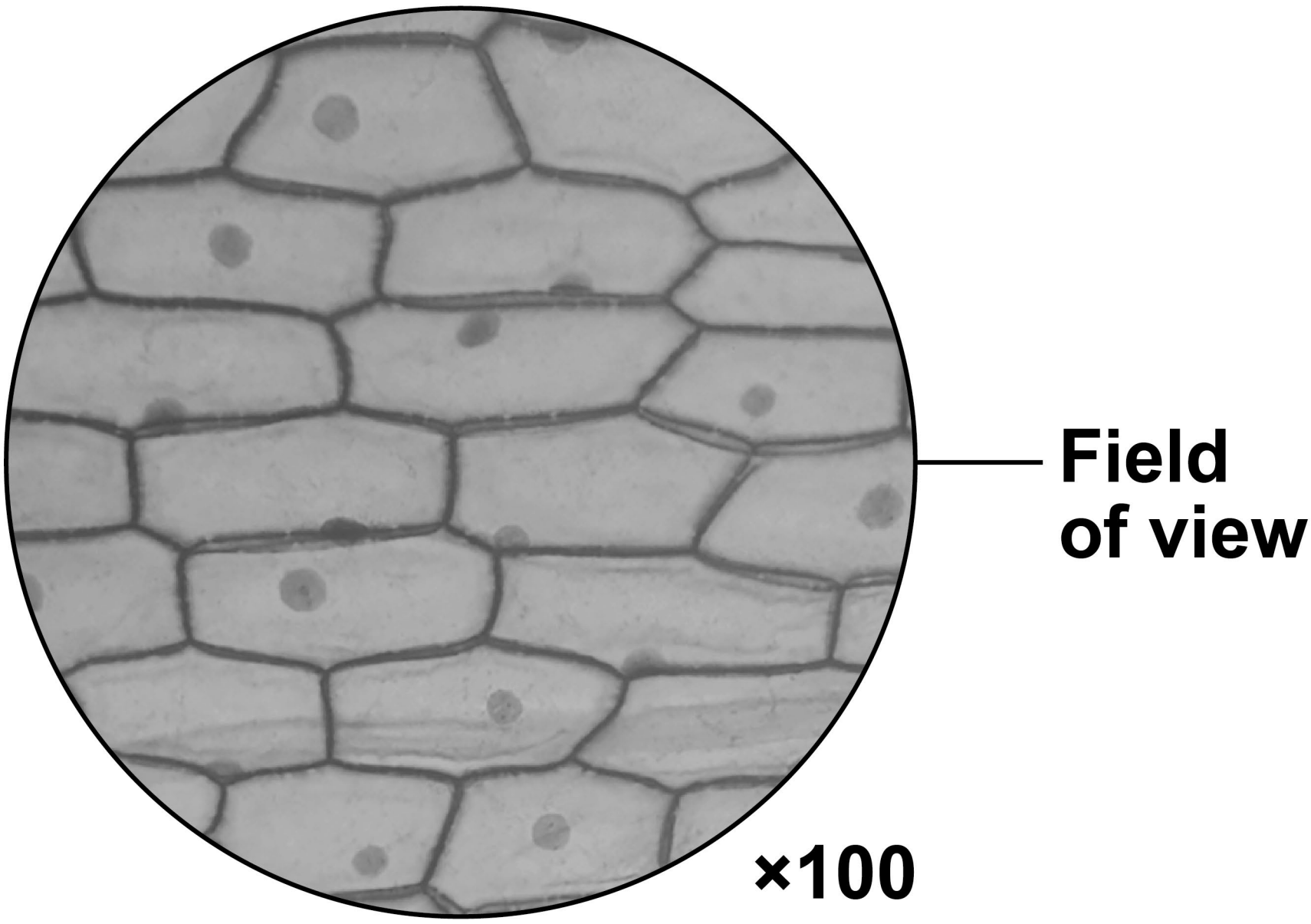
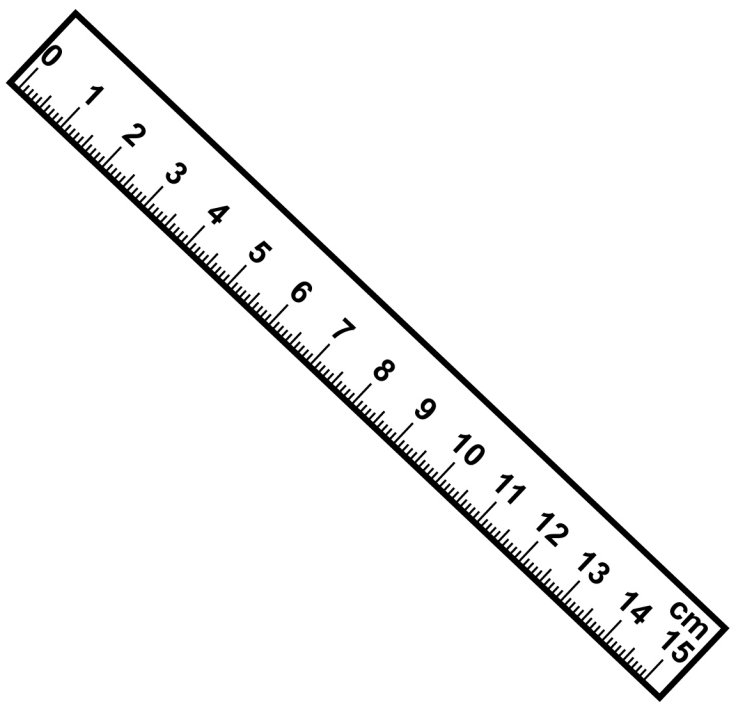


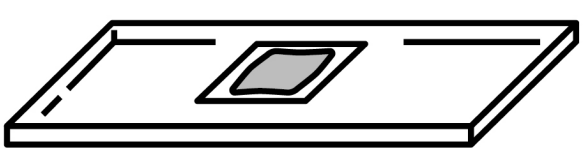
FIGURE 3 shows the apparatus given to a student.

FIGURE 3

Microscope



15 cm transparent ruler



Prepared slide of onion cells

[Turn over]

BLANK PAGE

Describe how the student could use the apparatus to estimate the MEAN length of onion cells on the slide. [6 marks]

6

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**

[Turn over]

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

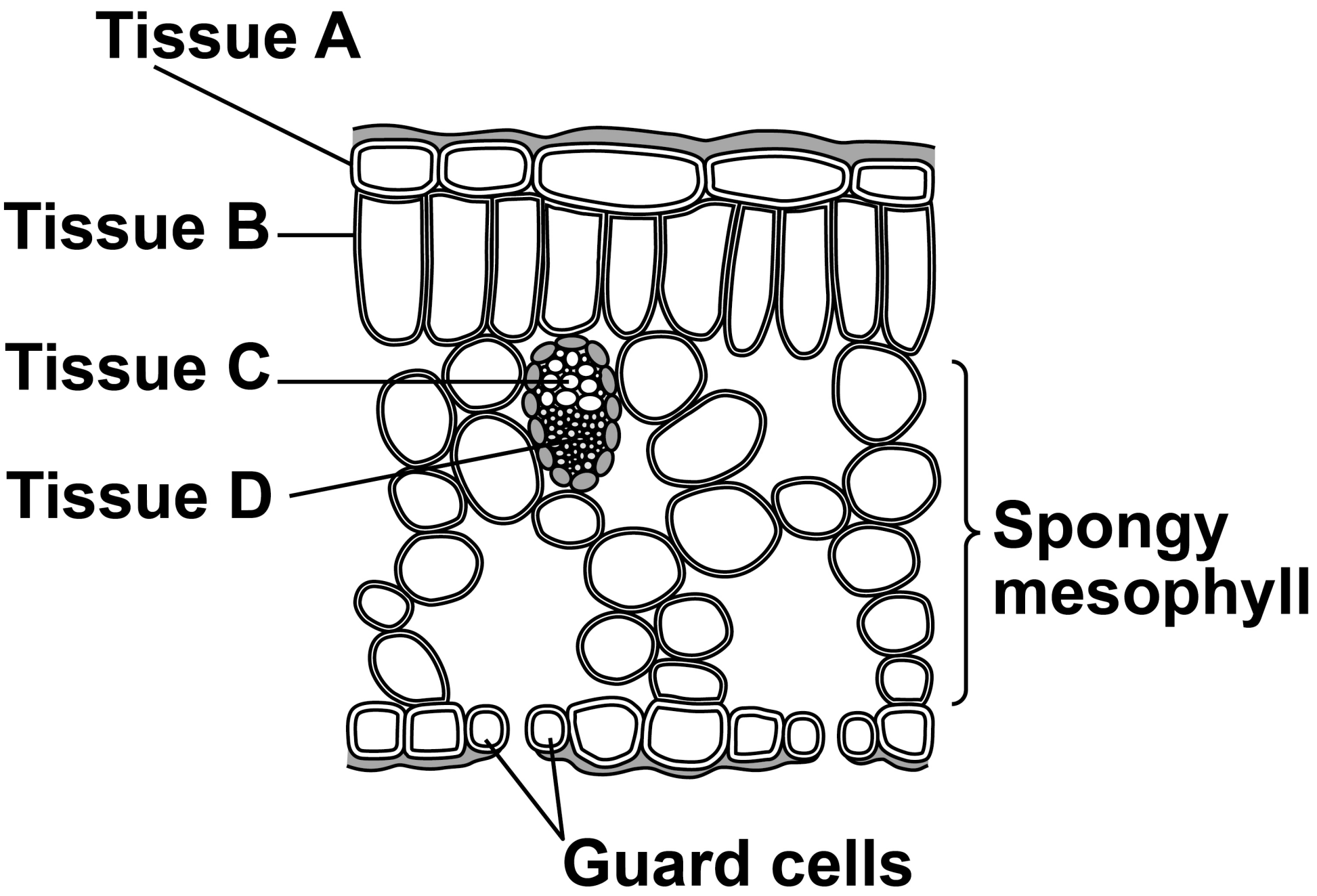
8

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**

[Turn over]

0 4 . 2

Explain how the spongy mesophyll is adapted for its function.

Use FIGURE 4, on page 28. [3 marks]

0 4 . 3

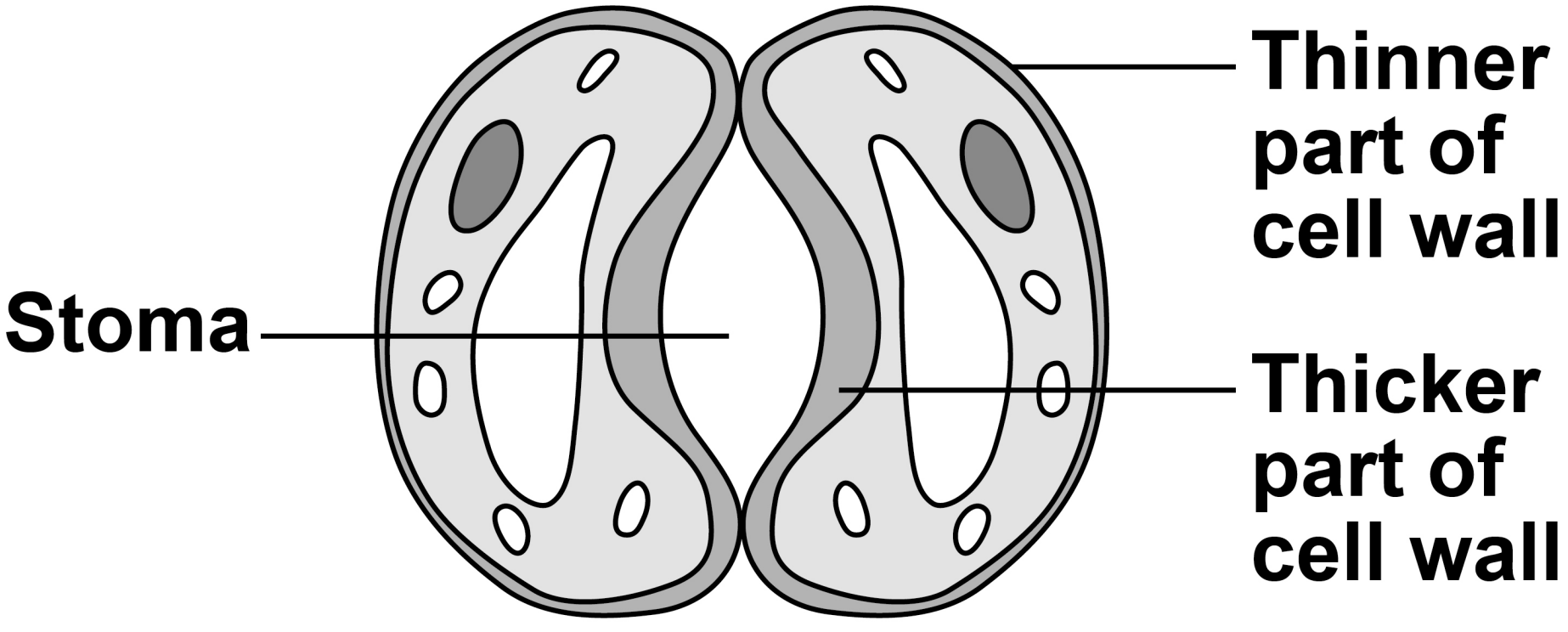
The xylem is adapted to transport water through a plant.

Explain ONE way that xylem is adapted for its function. [2 marks]

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]

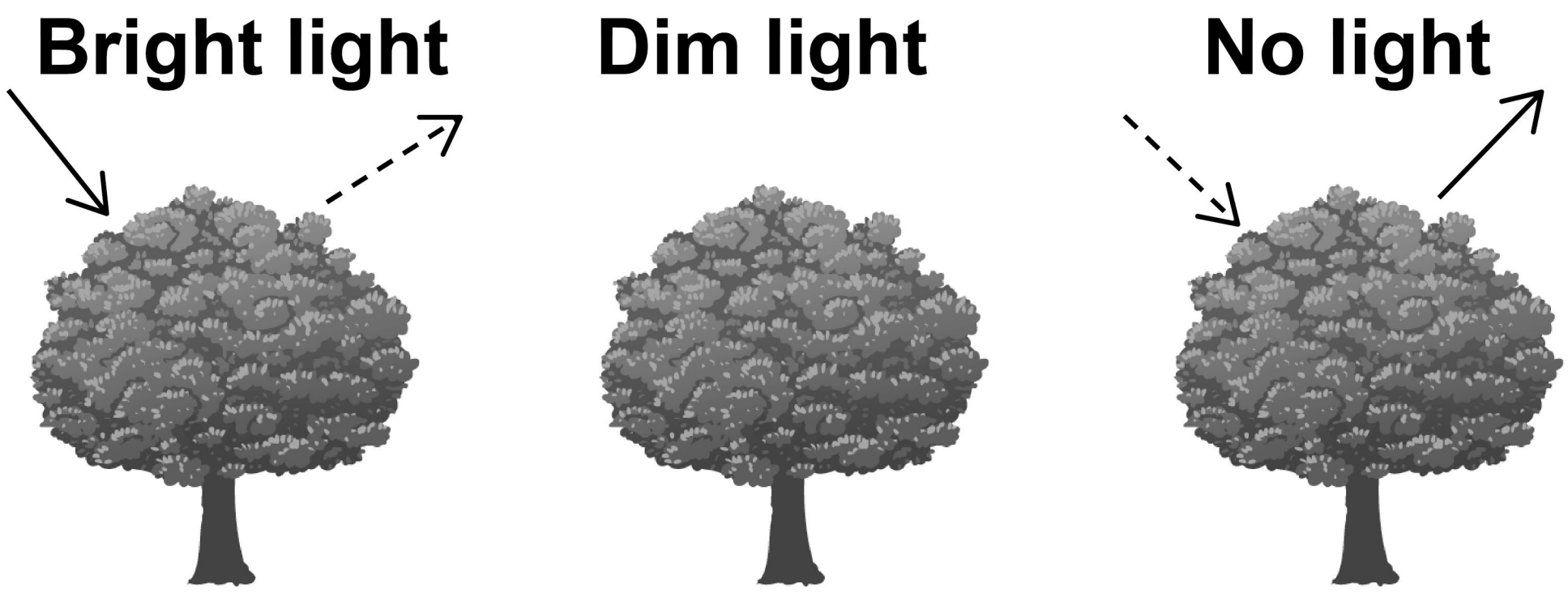
[Turn over]

0 5

Light intensity varies during 24 hours.

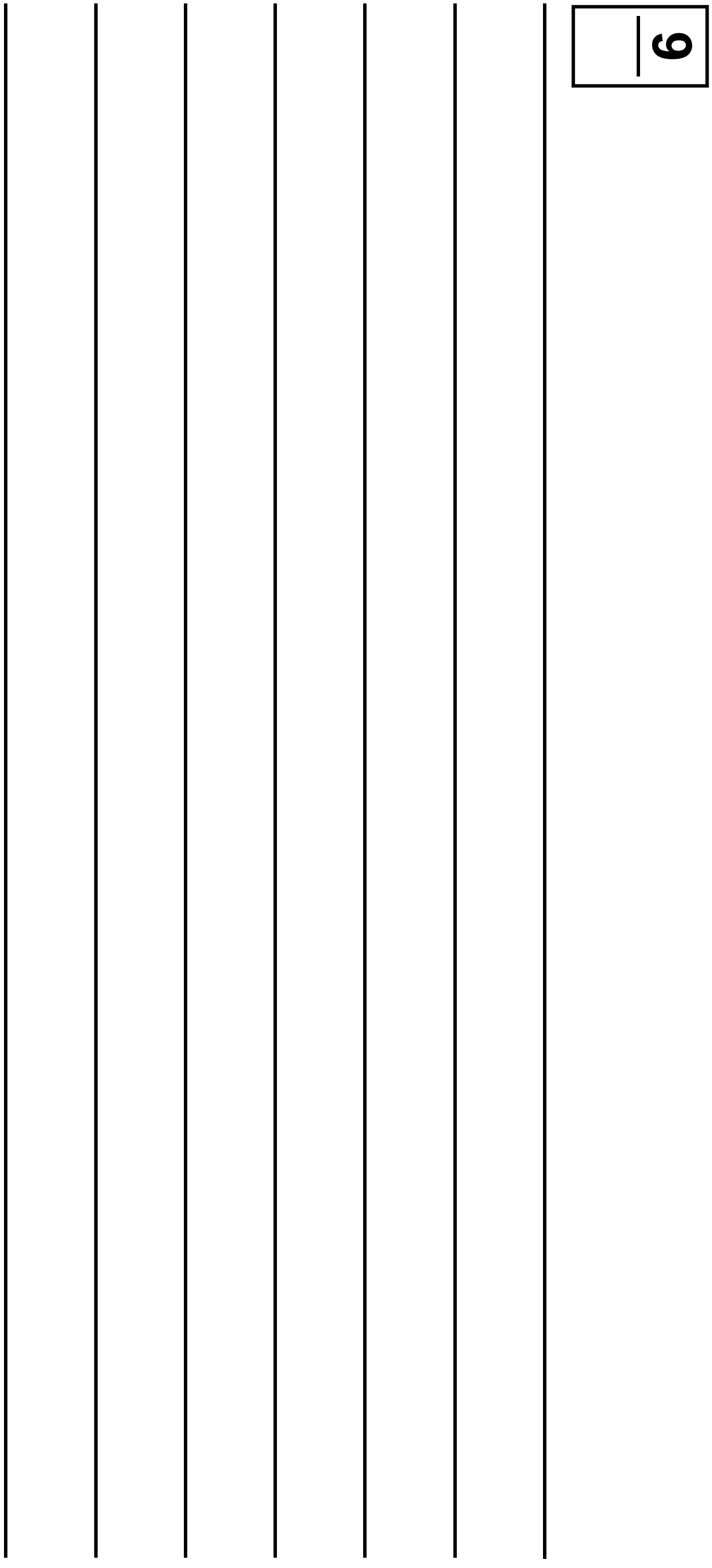
FIGURE 6 shows the overall exchange of carbon dioxide and oxygen for a tree at three different light intensities.

FIGURE 6



Explain the overall exchange of carbon dioxide and oxygen at the three different light intensities. [6 marks]

[Turn over]


6

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]

[Turn over]

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, on page 40, shows the results.

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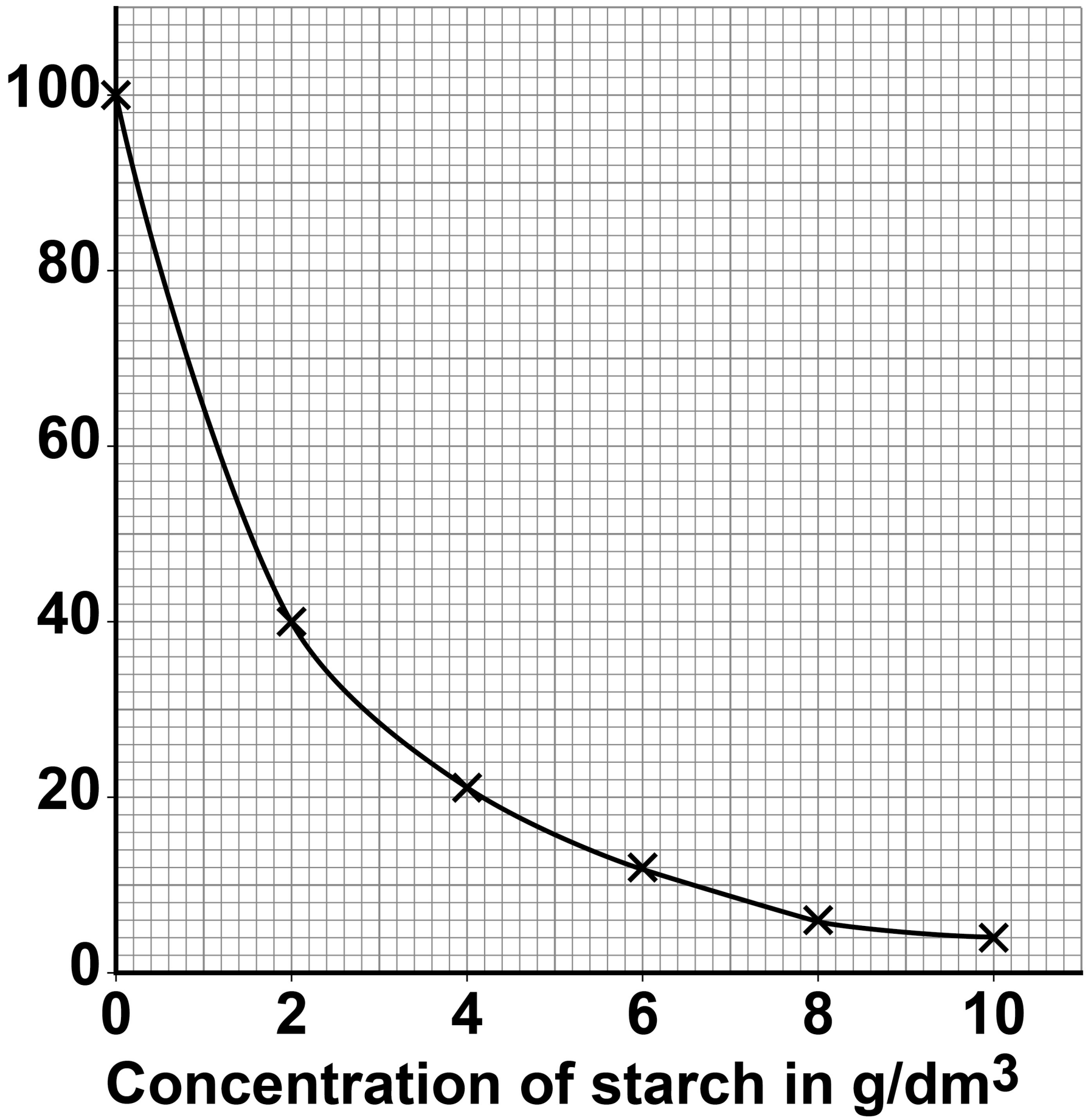
[Turn over]

FIGURE 7


Percentage (%) of light passing through the mixture
100
80
60
40
20
0
0
2
4
6
8
10
Concentration of starch in g/dm3

0 6 . 2

Suggest what liquid was used for the test with 0 g/dm^3 starch concentration.
[1 mark]

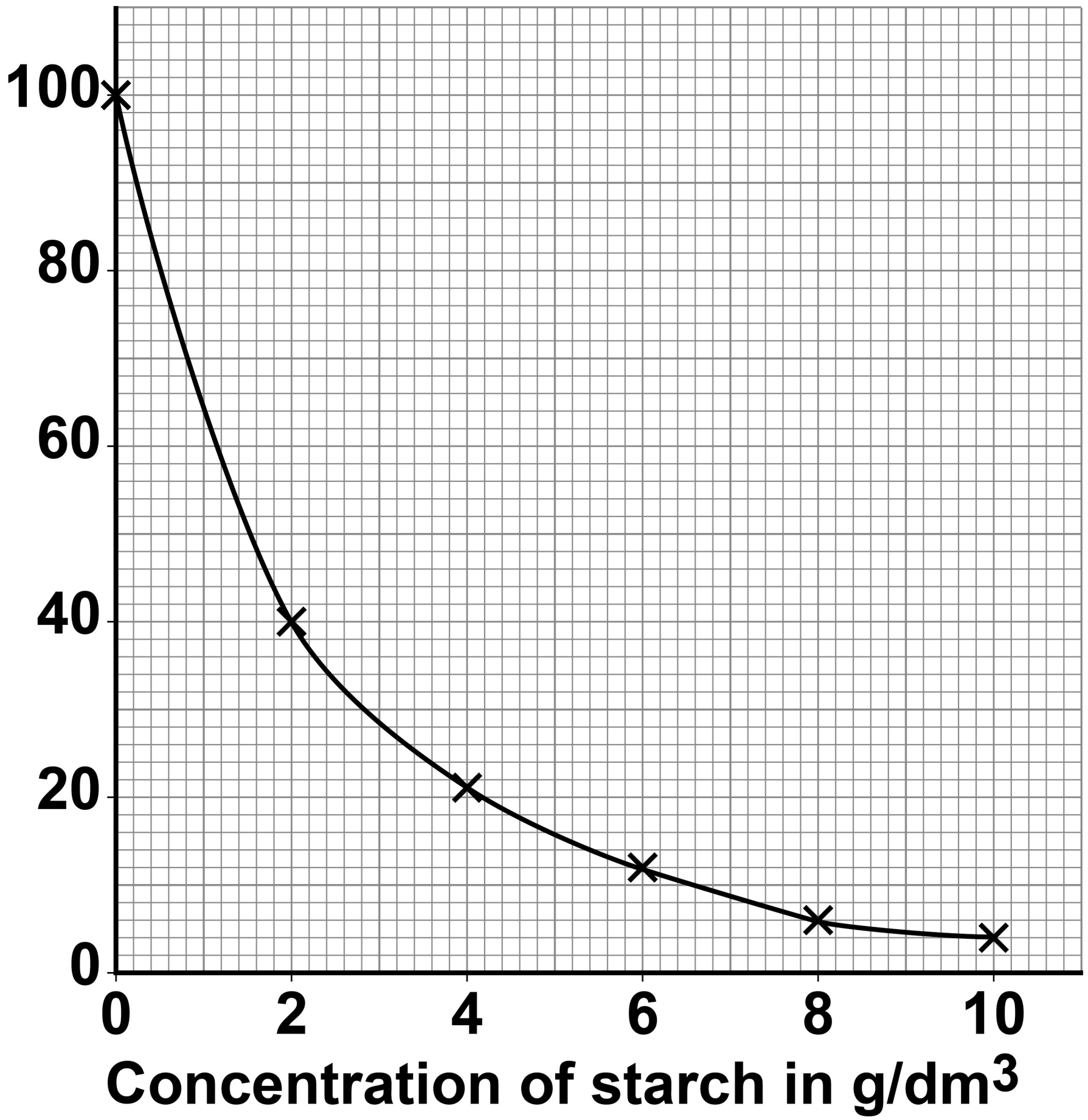
_____

_____

_____

[Turn over]

REPEAT OF FIGURE 7



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]

[Turn over]

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.**

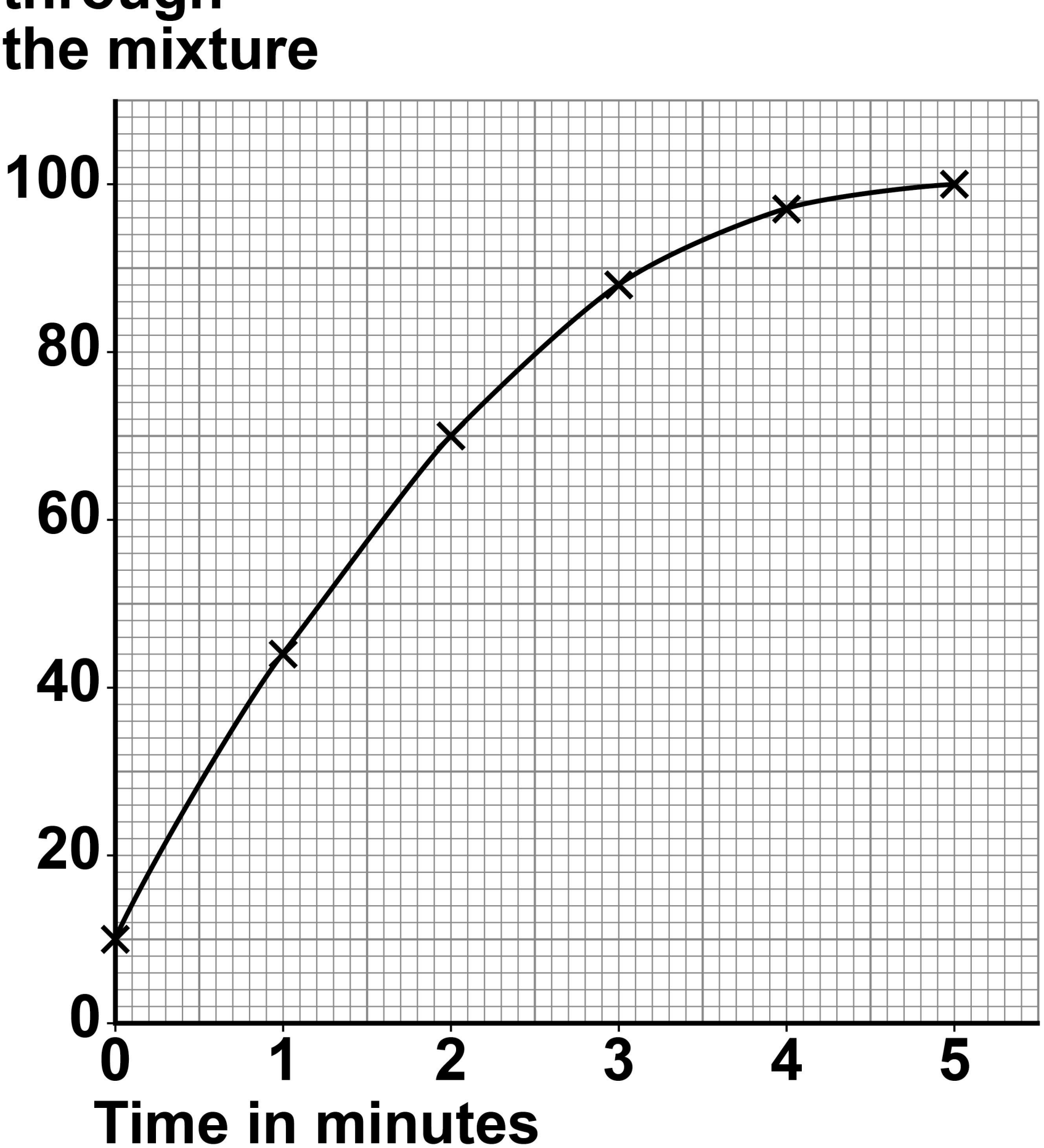
0 6 . 4

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]

FIGURE 8 shows the results.

FIGURE 8



0 6 . 5

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

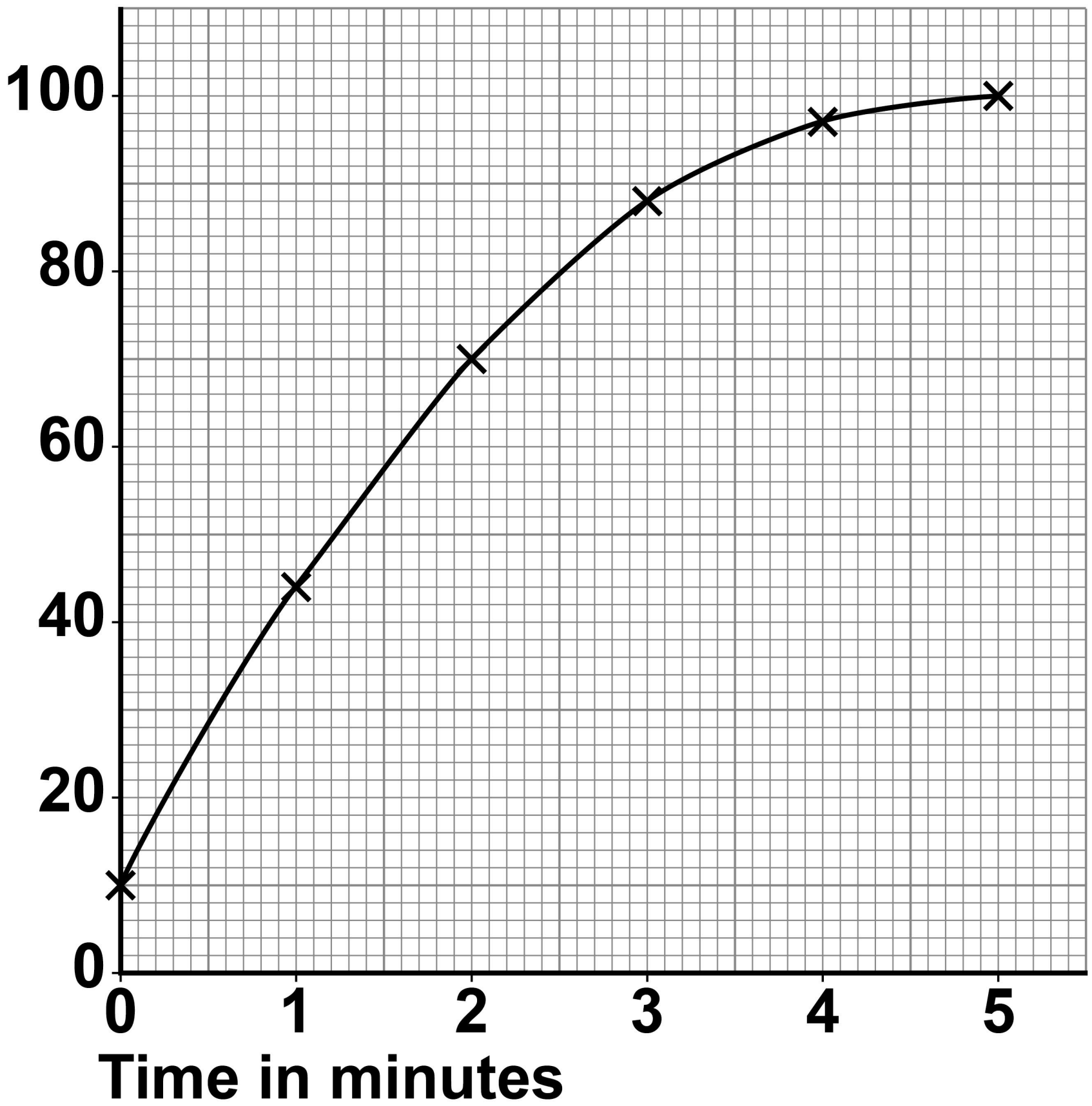
Calculate the mean rate of starch digestion for the first 3 minutes.

Use FIGURE 7 on page 42 and FIGURE 8 on page 46. [4 marks]

Mean rate = _____ g/dm^3 per minute

[Turn over]

REPEAT OF FIGURE 8



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]

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.

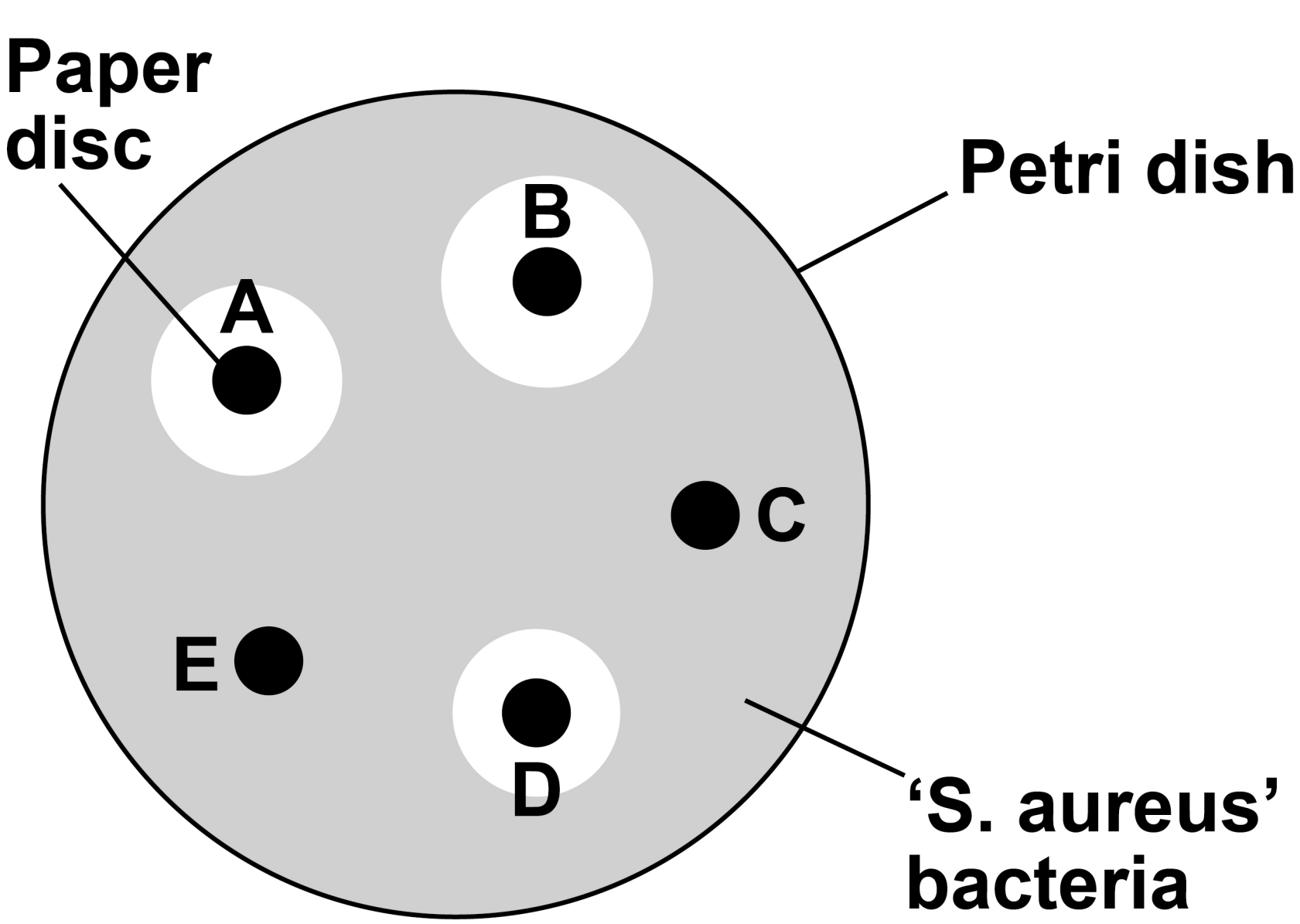
1. Grow ‘S. aureus’ bacteria in a Petri dish.
2. Cut five small discs of paper.
3. Soak each paper disc in a different antibiotic solution.
4. Put the five paper discs into the Petri dish.
5. Keep the Petri dish at 37 °C for 24 hours.

[Turn over]

FIGURE 9 shows the results.

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

FIGURE 9



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]

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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]

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

[Turn over]

BLANK PAGE

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**

[Turn over]

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 on the opposite page.

☐ By active transport

☐ By diffusion

☐ By osmosis

☐ By translocation

Reason _____

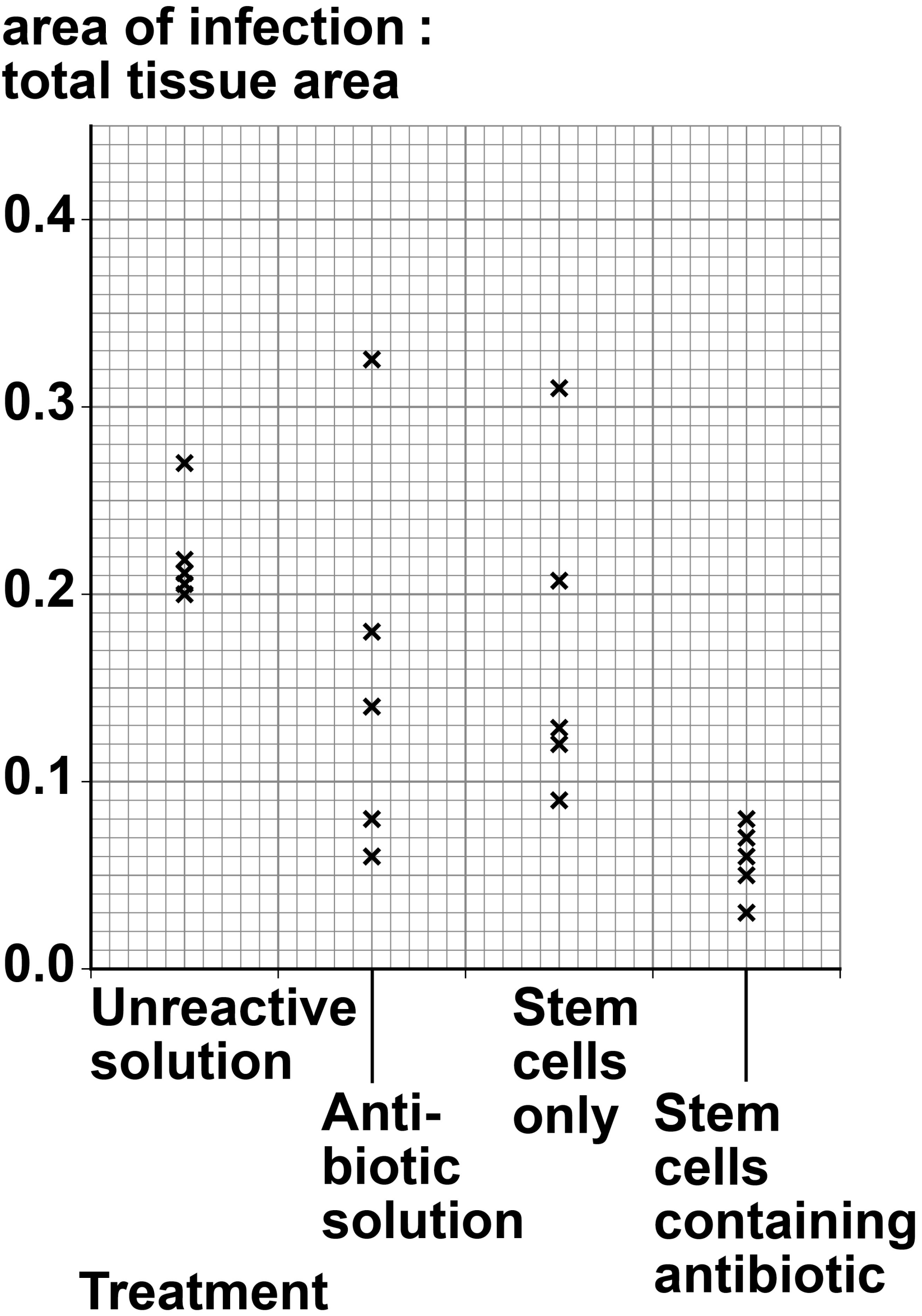
_____

_____

[Turn over]

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 _____

[Turn over]

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, on page 62. [4 marks]

END OF QUESTIONS

14

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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