

A



Surname _____

Other Names _____

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 12 May 2020

Afternoon

Time allowed: 1 hour 15 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



J U N 2 0 8 4 6 4 B 1 H 0 1

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



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A student investigated the effect of different concentrations of sugar solution on pieces of potato.

This is the method used.

- 1. Cut five pieces of potato.**
- 2. Record the starting mass of each piece of potato.**
- 3. Place each piece of potato in a different concentration of sugar solution.**
- 4. After 24 hours remove the pieces of potato from the solutions.**
- 5. Record the final mass of each piece of potato.**
- 6. Calculate the change in mass for each piece of potato.**



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What is the independent variable?
[1 mark]

Tick (✓) ONE box.

Change in mass of the pieces of potato

Concentration of the sugar solution

Length of time the pieces of potato are in the solution

Starting mass of the pieces of potato

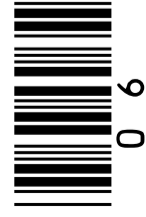
[Turn over]



TABLE 1 shows the results.

TABLE 1

Concentration of sugar solution in mol/dm³	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	-0.40
0.4	7.93	7.18	-0.75
0.5	7.95	7.00	-0.95

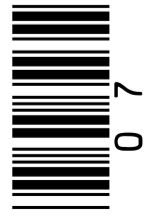


01.2

Explain why the potato in 0.0 mol/dm^3 sugar solution increased in mass. [2 marks]

7

[Turn over]



01.3

Complete FIGURE 1 on page 9.

Some of the results have been plotted for you.

You should:

- **plot the data from TABLE 1, on page 6**
- **draw a line of best fit through all the points.**

[2 marks]

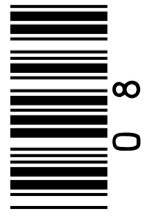
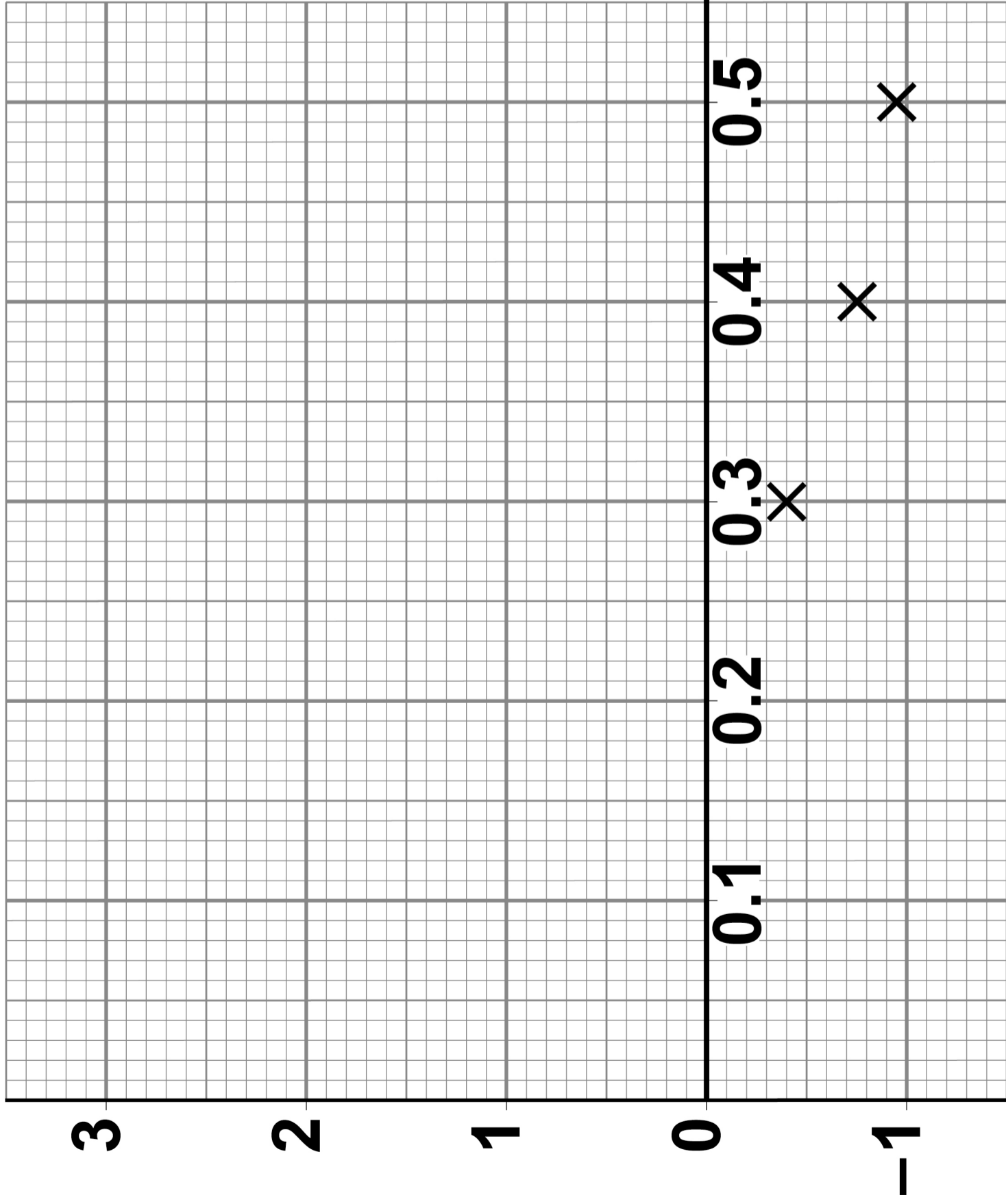
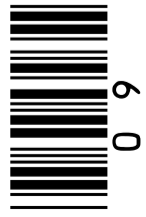


FIGURE 1

Change in mass in grams



Concentration of sugar solution in mol/dm³



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10



0 1 . 4

**The mass of a piece of potato does NOT change when:
concentration of solution inside cells = concentration of
solution outside cells**

**Determine the concentration of sugar solution inside the
potato cells.**

11

Use FIGURE 1 on page 9. [1 mark]

Concentration = _____ mol/dm³

[Turn over]



TABLE 1 is repeated below.

TABLE 1

Concentration of sugar solution in mol/dm³	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	-0.40
0.4	7.93	7.18	-0.75
0.5	7.95	7.00	-0.95



0 1 . 5

Calculate the percentage change in mass for the potato in 0.2 mol/dm³ sugar solution.

Use TABLE 1 on the opposite page.

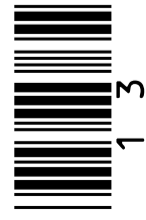
Use the equation:

$$\text{percentage change in mass} = \frac{\text{change in mass}}{\text{mass of potato at start}} \times 100$$

Give your answer to 3 significant figures. [3 marks]

Percentage change in mass (3 significant figures) = _____ %

9



[Turn over]

02

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

02.1

What is the name of the enzyme that digests starch? [1 mark]

02.2

Where are most food molecules absorbed? [1 mark]

Tick (✓) ONE box.

Large intestine

Liver

Small intestine

Stomach

[Turn over]



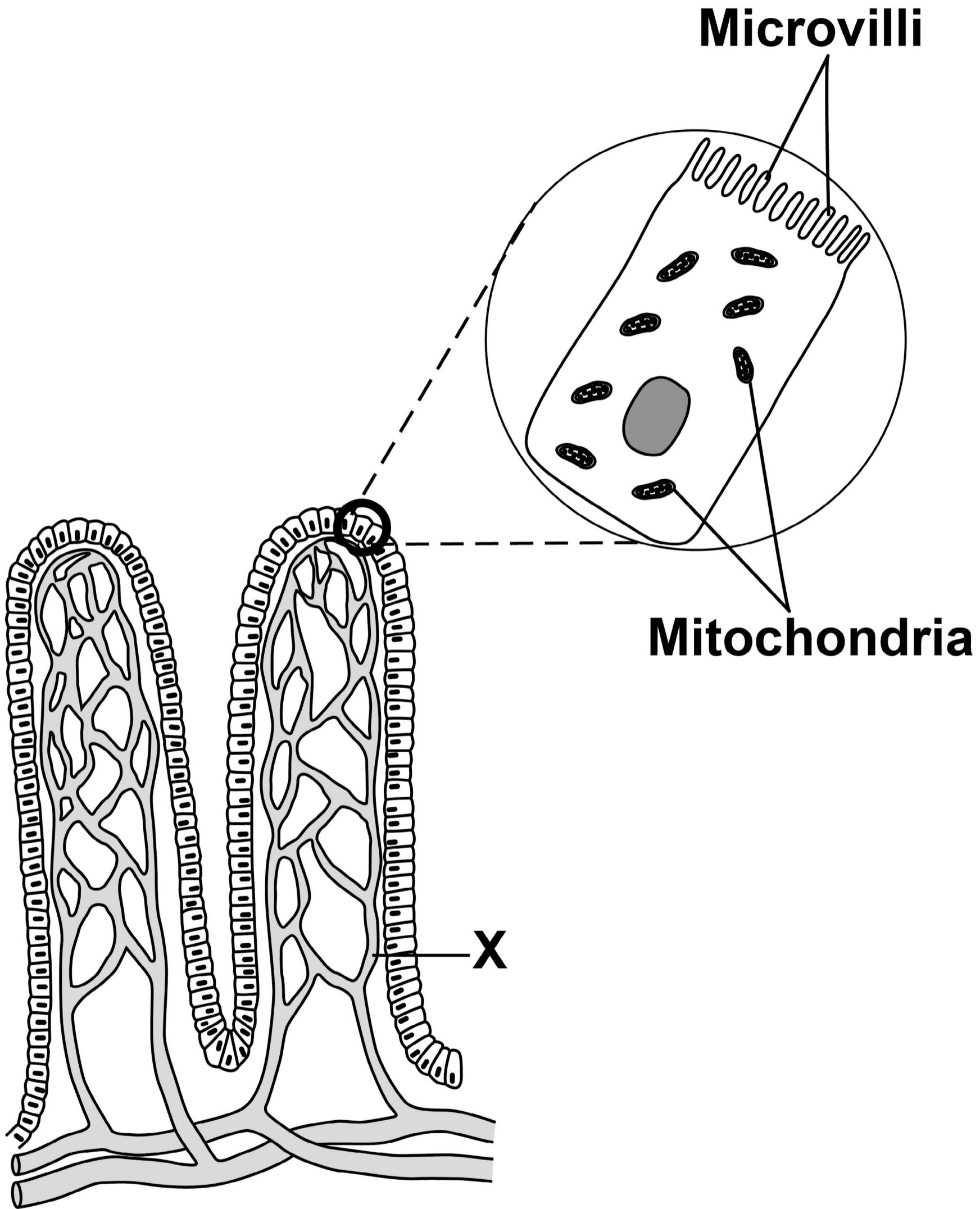
FIGURE 2, on the opposite page, shows two villi.

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

0 2 . 3

Give ONE advantage of using an electron microscope compared with using a light microscope. [1 mark]

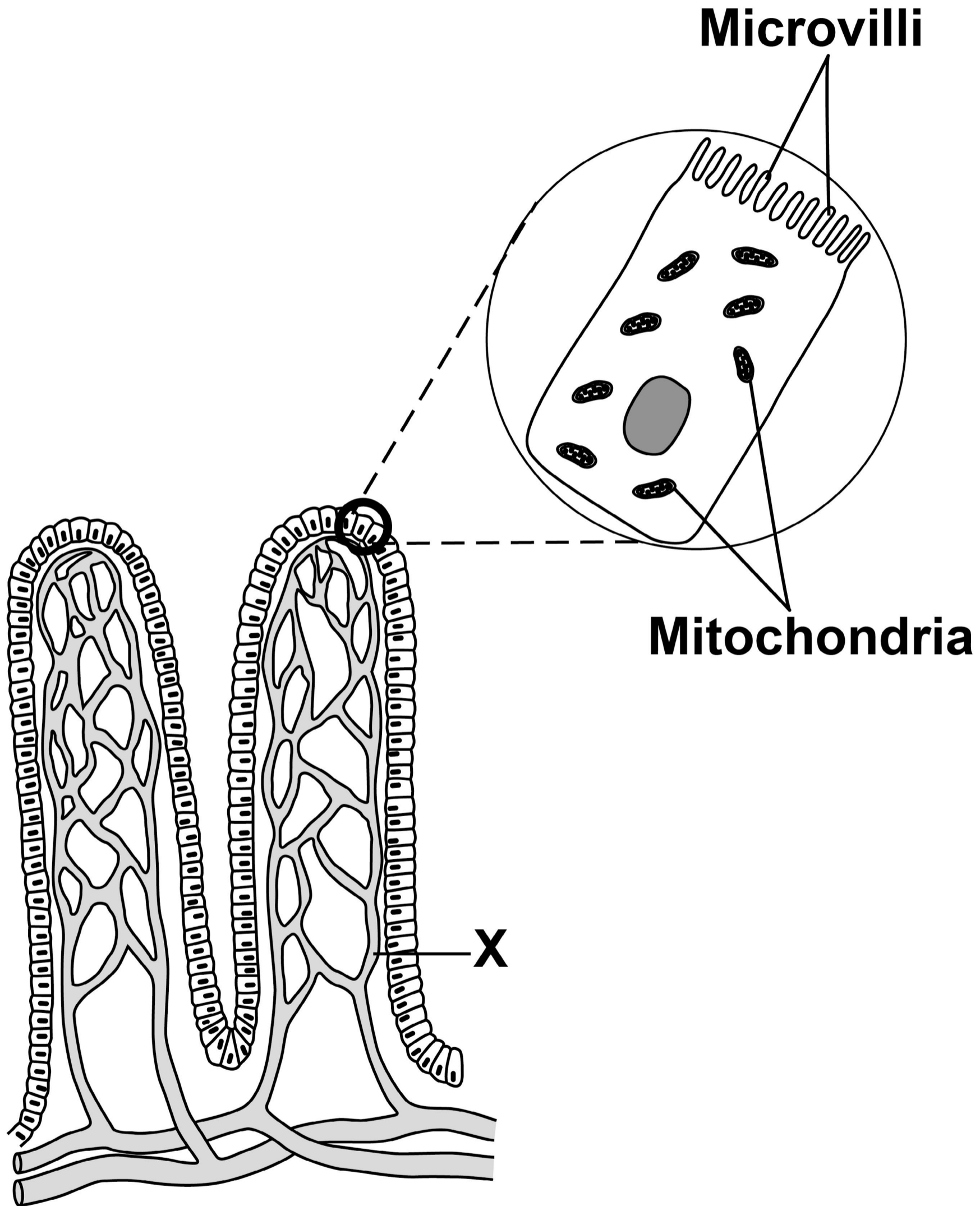
FIGURE 2



[Turn over]



REPEAT OF FIGURE 2



0 2 . 4

What type of blood vessel is labelled X?
[1 mark]

Tick (✓) ONE box.

Artery

Capillary

Vein

[Turn over]



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 $\times 20$

Use the equation:

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

[3 marks]

Image length = _____ mm



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[Turn over]

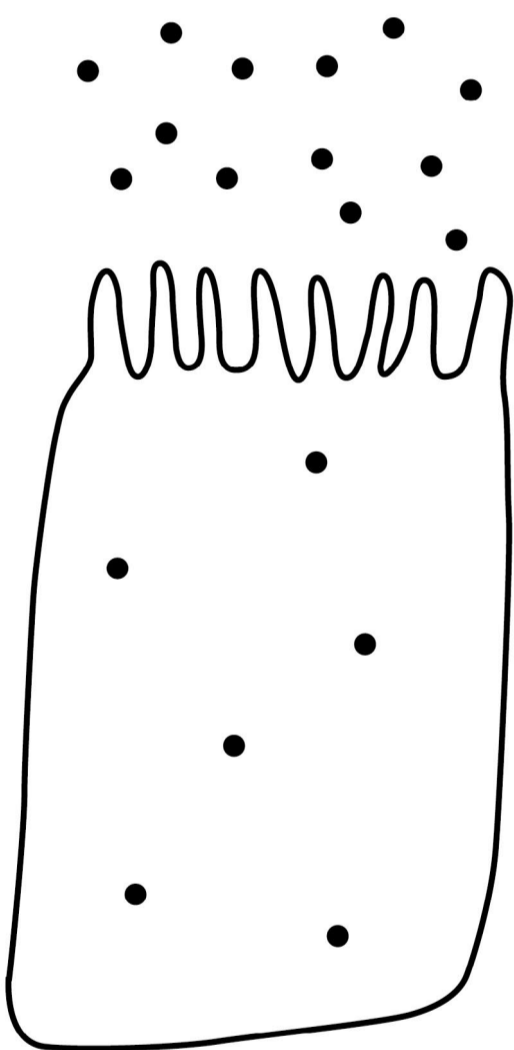


FIGURE 3 shows two cells from the surface of a villus.

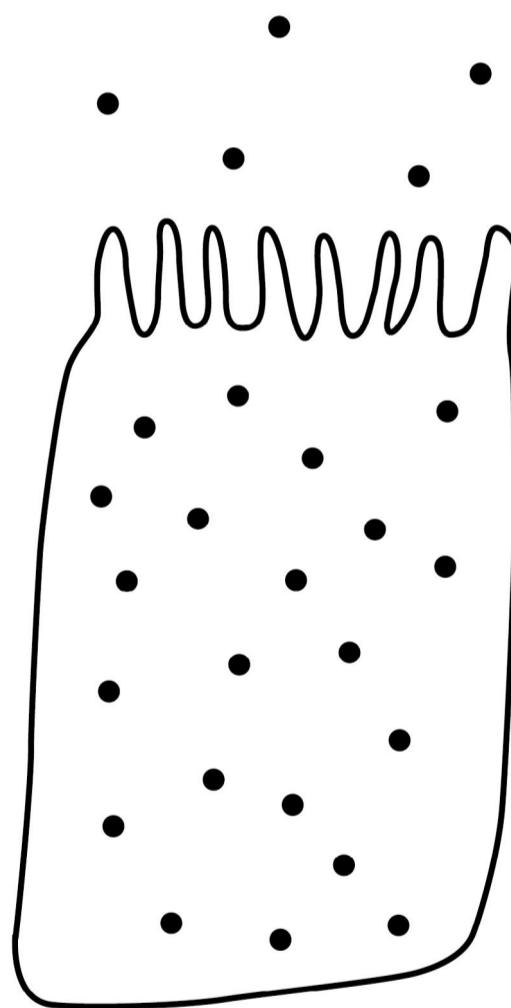
There are sugar molecules inside and next to each cell.

FIGURE 3

Cell A



Cell B



KEY

- **Sugar molecule**



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]

[Turn over]



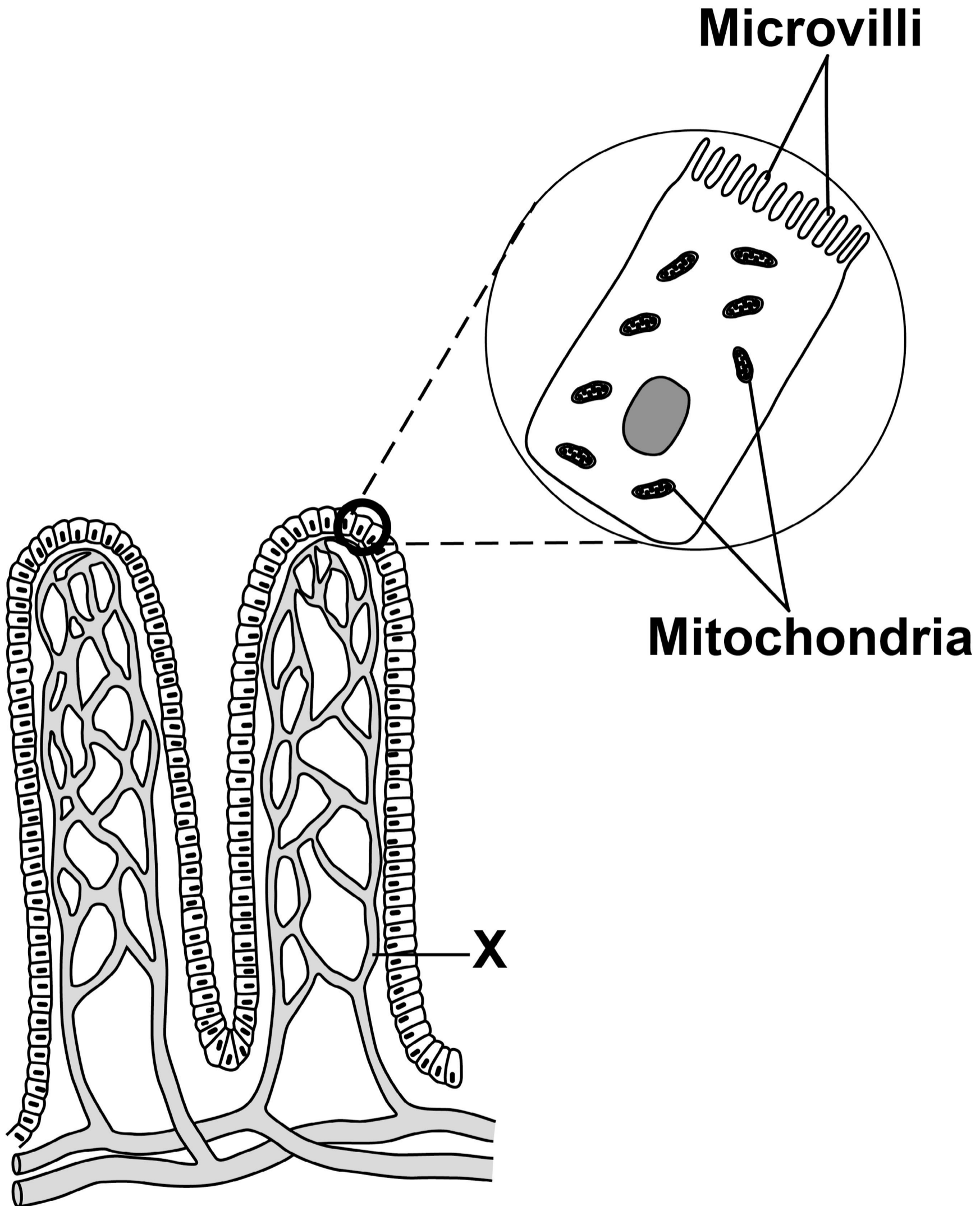
02.9

FIGURE 2 is repeated on the opposite page.

Explain how villi are adapted for efficient absorption of sugar molecules. [4 marks]



FIGURE 2



[Turn over]



0 3

Being overweight can affect the health and life expectancy of a person.

0 3 . 1

Give ONE disease related to being overweight. [1 mark]

0 3 . 2

Body mass index (BMI) helps to show if a person has a healthy body mass for their height.

BMI is calculated using the equation:

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



27

A woman has a BMI of 27 and a body mass of 68.1 kg

**Calculate the woman's height in metres.
[3 marks]**

Height = _____ m

[Turn over]



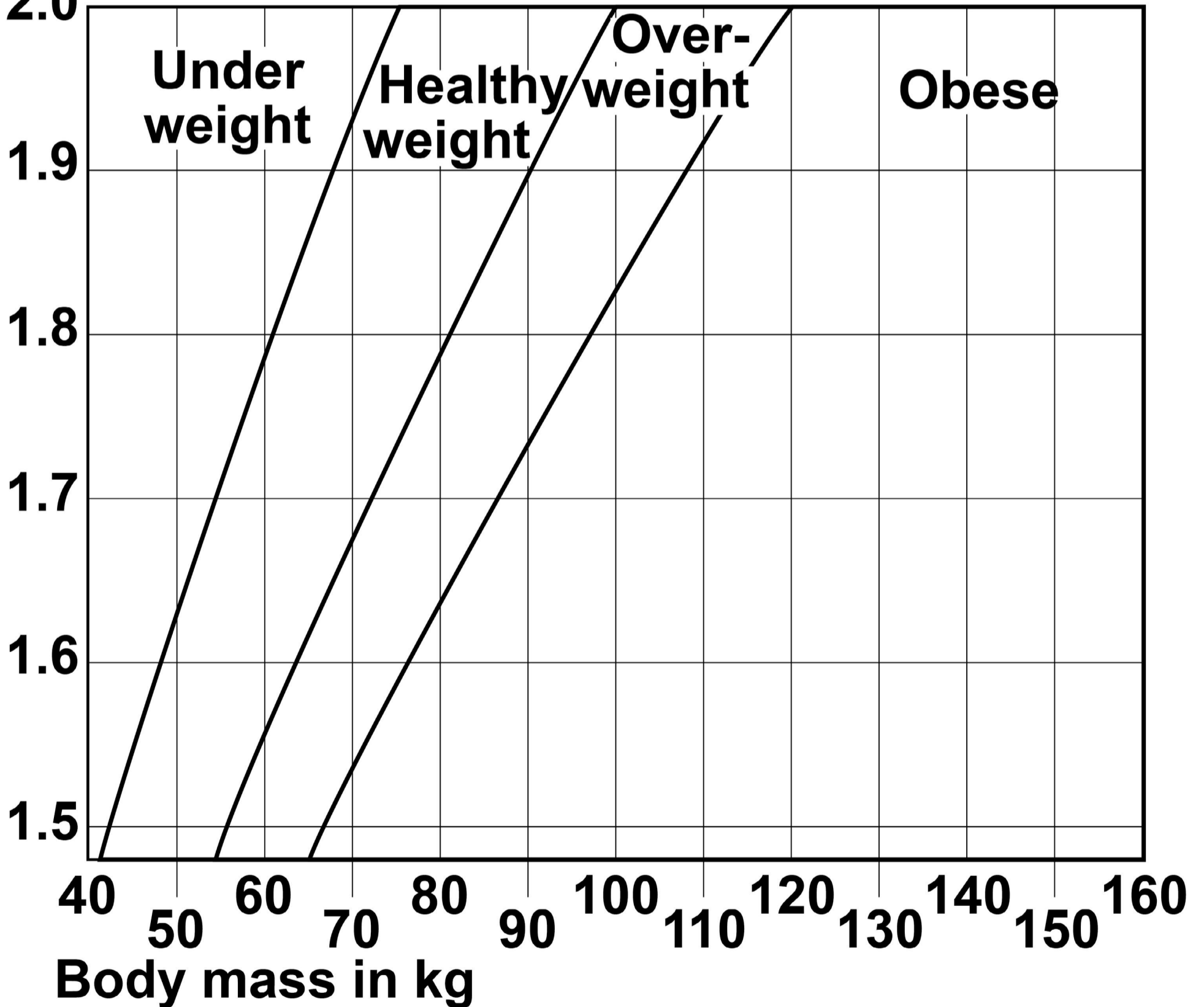
03.3

FIGURE 4 shows a height-body mass chart for adults.

FIGURE 4

Height in m

2.0



Which weight category describes the woman in Question 03.2, on pages 26 to 27? [1 mark]

Tick (✓) ONE box.

Underweight

Healthy weight

Overweight

Obese

[Turn over]



0	3	.	4
---	---	---	---

People are encouraged to control their body mass with diet and exercise.

Describe how the balance between the mass of food eaten and the amount of exercise a person does controls body mass. [3 marks]

03.5

During long periods of vigorous exercise the body respire anaerobically.

Explain the changes that happen in the body during AND after vigorous exercise. [6 marks]

[Turn over]





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[Turn over]



0 4

Cells are the basic units of all forms of life.

0 4 . 1

Describe FOUR differences between a bacterial cell and a plant cell. [4 marks]

1 _____

2 _____

3 _____



4

[Turn over]



04.2

Gonorrhoea is a bacterial disease.

A new vaccine is being developed against gonorrhoea.

Describe how a vaccine would work to prevent gonorrhoea. [4 marks]

[Turn over]



Another disease caused by bacteria is salmonella food poisoning.

In the UK, chickens are vaccinated against Salmonella bacteria to reduce the number of cases of food poisoning in humans.

0 4 . 3

Explain how vaccinating chickens reduces the number of cases of salmonella food poisoning. [2 marks]

0 4 . 4

Give ONE way that the spread of salmonella food poisoning from one human to another is controlled.

Do NOT refer to vaccination in your answer. [1 mark]

0 4 . 5

The number of cases of salmonella food poisoning is usually higher in summer than in winter.

Suggest ONE reason why. [1 mark]

[Turn over]



12

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0	5
---	---

This question is about photosynthesis and food production.

0	5	.	1
---	---	---	---

**How can oxygen production be used to show the RATE of photosynthesis?
[1 mark]**

[Turn over]



Scientists investigated factors affecting the rate of photosynthesis in tomato plants.

The tomato plants were growing in a commercial greenhouse in the UK during winter.

FIGURE 5, on the opposite page, shows the results.

The percentage of carbon dioxide in the Earth's atmosphere is 0.04%

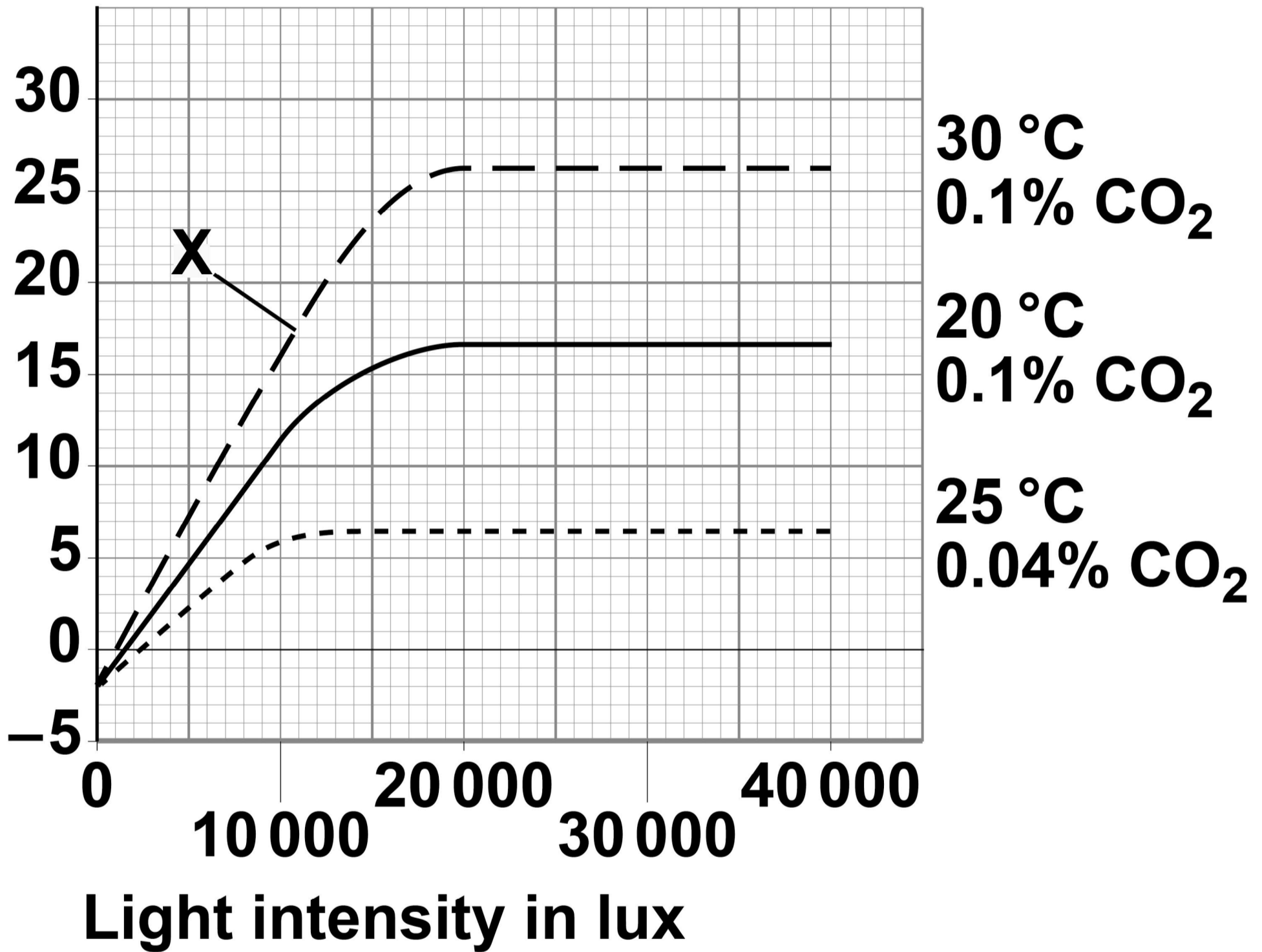
0 5 . 2

Name the factor that is limiting the rate of photosynthesis at point X. [1 mark]



FIGURE 5

**Rate of oxygen
production in
arbitrary units**



[Turn over]



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Farmers growing tomatoes commercially try to control the rate of photosynthesis and make maximum profit.

A farmer can control the temperature and carbon dioxide concentration in a greenhouse.

0 5 . 3

What is the MINIMUM light intensity a farmer should use to get the maximum rate of photosynthesis shown in FIGURE 5, on page 43? [1 mark]

Light intensity = _____ lux

[Turn over]



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05.4

The light intensity you gave in Question 05.3, on page 45, may NOT give the farmer maximum profit.

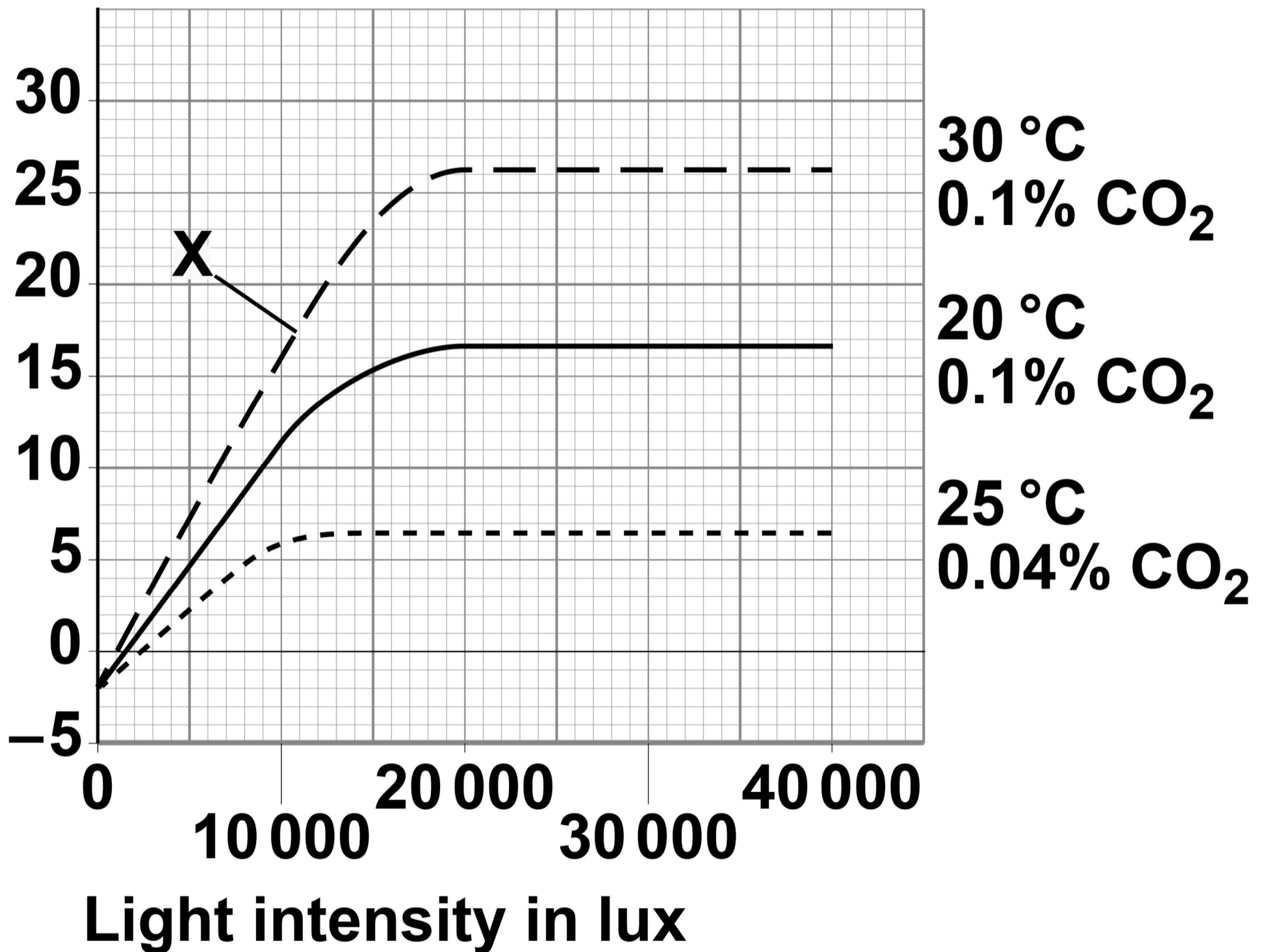
Explain why. [3 marks]

[Turn over]



REPEAT OF FIGURE 5

Rate of oxygen
production in
arbitrary units



0 5 . 5

Explain the results when the light intensity was 0 lux.

**Use FIGURE 5, on the opposite page.
[4 marks]**

[Turn over]

10



06

New drugs are tested and trialled before they can be licensed to treat patients.

FIGURE 6, on the opposite page, shows how much time the different stages of testing took for one new drug.

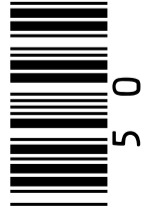
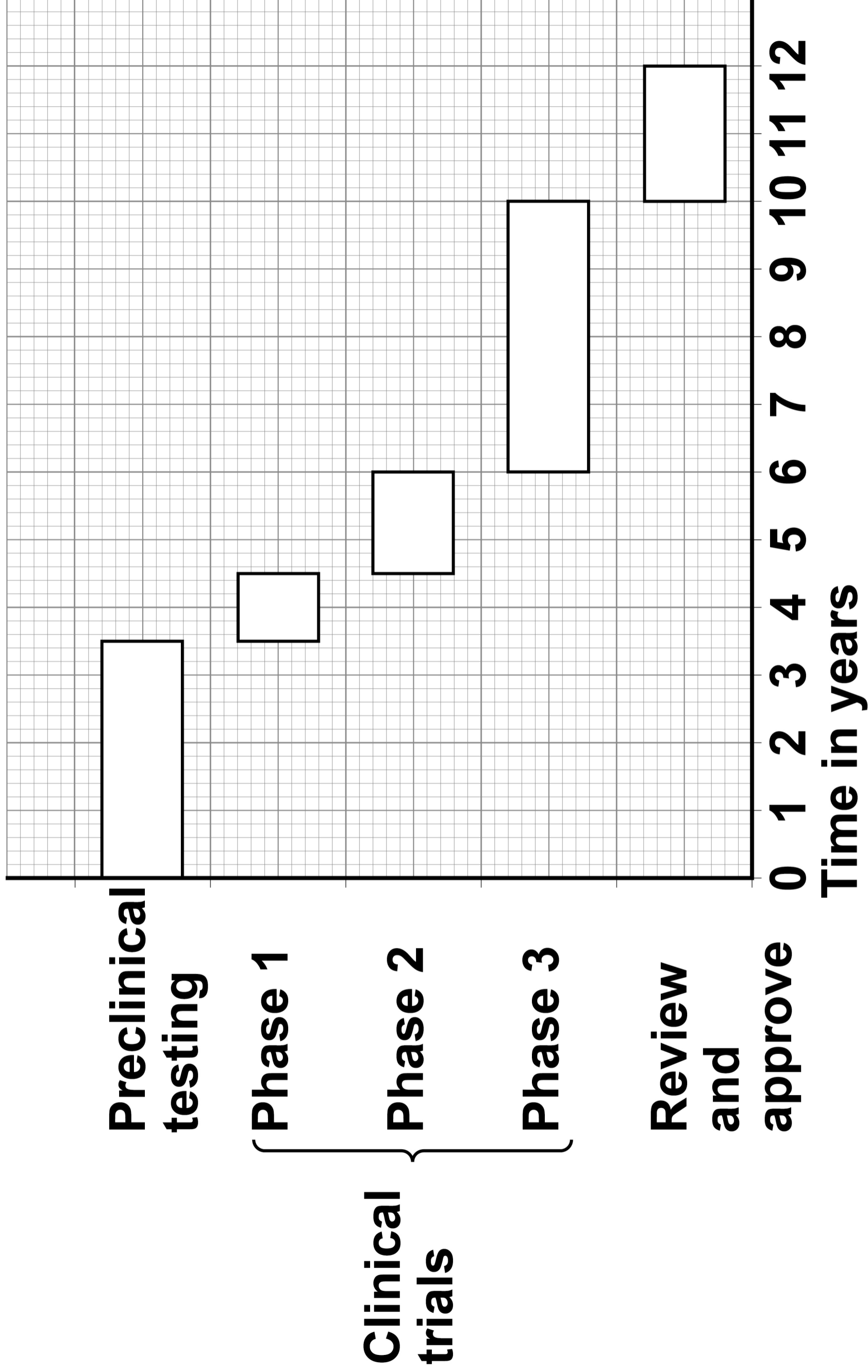
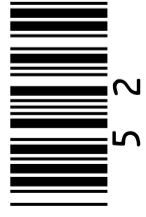


FIGURE 6



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06.1

How much more time did the clinical trials take compared with the preclinical testing? [1 mark]

Tick (✓) ONE box.

3 years

3.5 years

5 years

6.5 years

[Turn over]

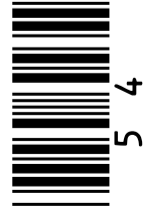


During Phase 1 clinical trials low doses of the drug are tested on healthy volunteers.

0 6 . 2

Suggest ONE reason why LOW DOSES of the drug are used in Phase 1 clinical trials. [1 mark]

54



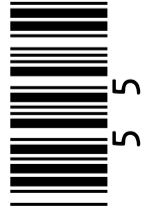
06.3

Suggest TWO reasons why HEALTHY volunteers are used in Phase 1 clinical trials. [2 marks]

1

2

[Turn over]

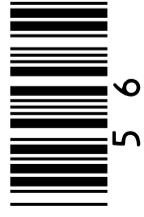


06.4

The results of clinical trials can only be published after peer review by other scientists.

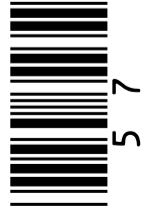
Suggest ONE reason why the results must be reviewed by other scientists. [1 mark]

56



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[Turn over]



06.5

A drug is only licensed for the medical conditions it was tested to treat in the clinical trials.

Drug regulations:

- control what drugs a doctor can prescribe**
- ensure doctors can prescribe a drug with confidence**
- protect patients.**

AMD is an eye condition that can result in very poor vision.

Doctors treat approximately 40 000 new cases of AMD each year.

Two drugs licensed to treat AMD in the UK are drug A and drug B.

In many other countries drug C is used to treat AMD. Drug C is only licensed in the UK to treat cancer.



The cost per injection for each drug is:

- **drug A £561**
- **drug B £800**
- **drug C £28**

The number of injections required to treat AMD is the same for each drug.

In 2018 the High Court in the UK gave permission for drug C to be used to treat AMD.

Evaluate the decision to allow the use of drug C to treat AMD in the UK. [6 marks]

[Turn over]



END OF QUESTIONS

11



**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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Question	Mark
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TOTAL	

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