A

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE

BIOLOGY

F

Foundation Tier Paper 1F

8461/1F

Tuesday 14 May 2019 Afternoon

Time allowed: 1 hour 45 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]

For this paper you must have:

- **a ruler**
- **a scientific calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions in the spaces provided.**
- **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 100.**
- **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

Answer ALL questions in the spaces provided.

0 1

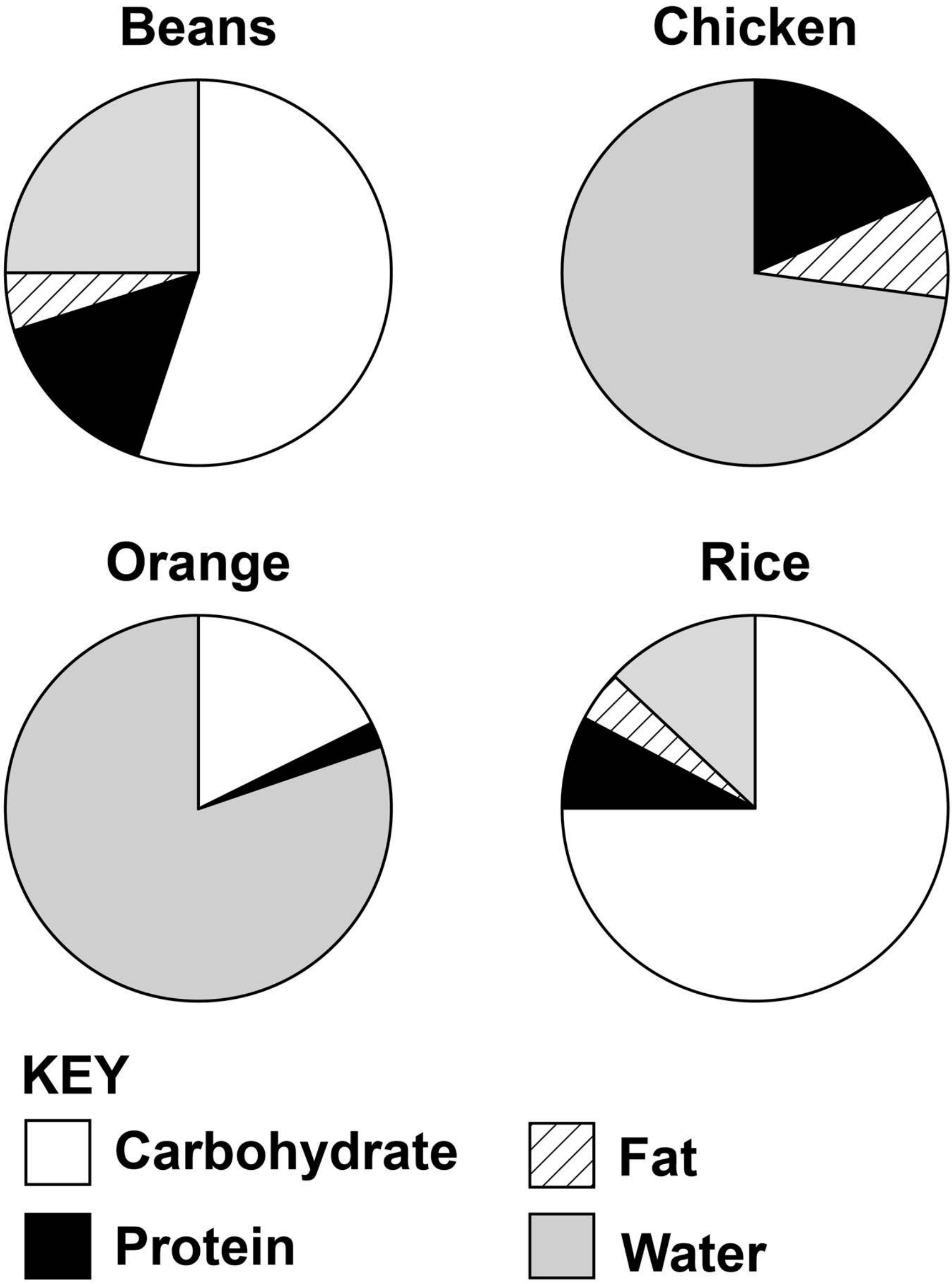
Many foods contain carbohydrates.

FIGURE 1, on page 6, shows information about four different foods.

BLANK PAGE

[Turn over]

FIGURE 1


Beans
Chicken
Orange
Rice
KEY
Carbohydrate
Fat
Protein
Water

0 1 . 1

Which food contains the highest percentage of carbohydrate? [1 mark]

Tick (✓) ONE box.

- ☐ **Beans**
- ☐ **Chicken**
- ☐ **Orange**
- ☐ **Rice**

[Turn over]

0 1 . 2

Estimate the percentage of water found in beans. [1 mark]

Percentage = _____ %

0 1 . 3

Look at FIGURE 1 on page 6.

Why would eating only beans provide a more balanced diet than eating only chicken? [1 mark]

0 1 . 4

Sugars are produced when enzymes break down starch.

What is the name of the enzyme which breaks down starch to produce sugars?
[1 mark]

Tick (✓) ONE box.

- ☐ **Amylase**
- ☐ **Bile**
- ☐ **Lipase**
- ☐ **Protease**

[Turn over]

0 1 . 5

Which chemical could be used to test for glucose? [1 mark]

Tick (✓) ONE box.

- ☐ **Benedict's reagent**
- ☐ **Biuret reagent**
- ☐ **Iodine solution**
- ☐ **Sulfuric acid**

0 1 . 6

What colour change would be seen in a positive test for glucose? [1 mark]

From blue to _____ .

[Turn over]

0 1 . 7

People with diabetes have difficulty controlling the concentration of glucose in their blood.

The blood of four people was tested.

TABLE 1 shows the results.

TABLE 1

Person	Concentration of glucose in blood in arbitrary units
A	4.2
B	6.9
C	7.1
D	5.1

TABLE 2 shows the information used to help decide if a person has diabetes.

TABLE 2

Concentration of glucose in blood in arbitrary units	Conclusion
<5.6	No diabetes
5.6 to 7.0	Mild diabetes
>7.0	Severe diabetes

BLANK PAGE

Use the tables on pages 12 and 13 to answer this question.

Which person has severe diabetes?
[1 mark]

Tick (✓) ONE box.

☐ **A**

☐ **B**

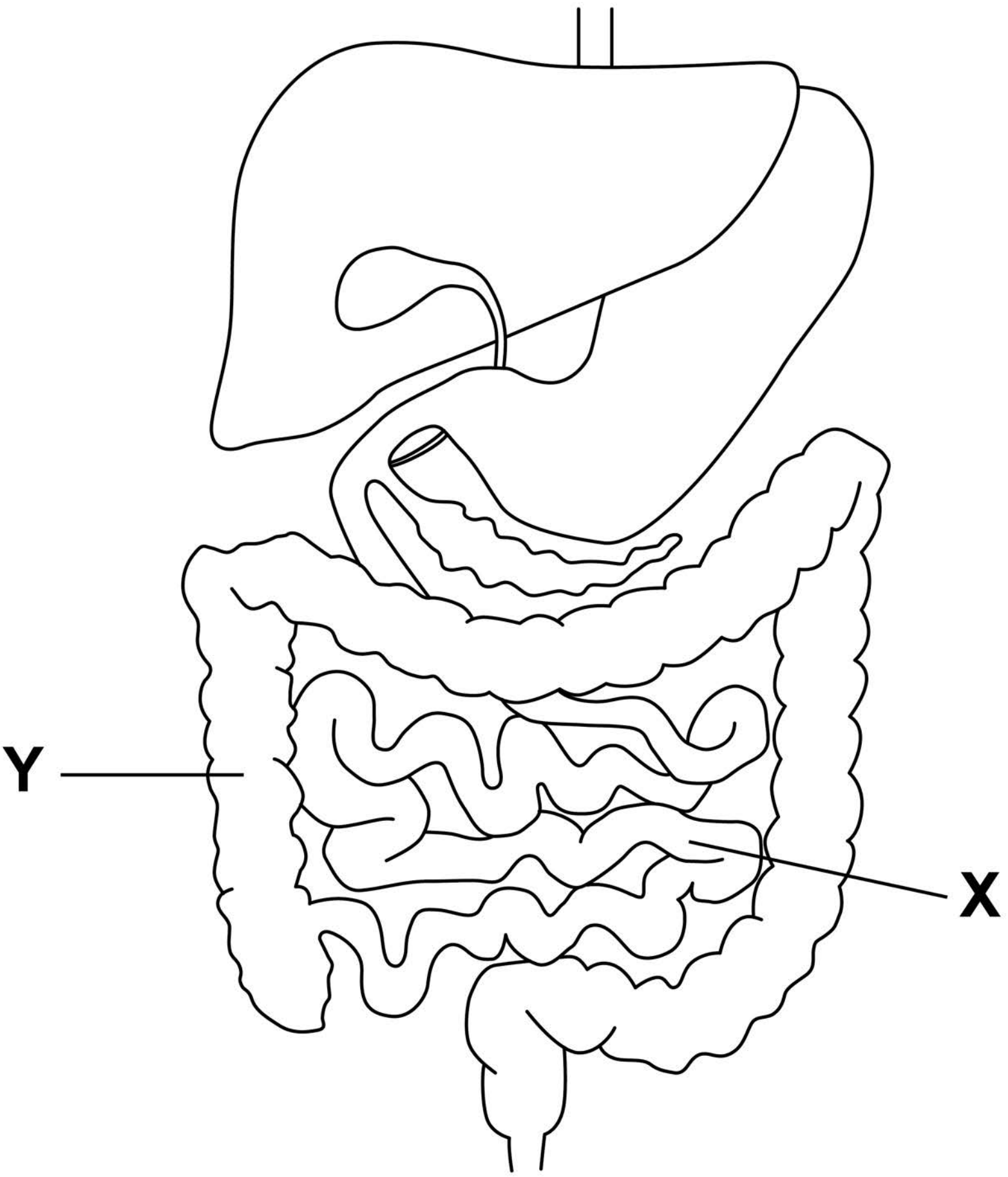
☐ **C**

☐ **D**

[Turn over]

FIGURE 2 shows part of the human digestive system.

FIGURE 2



BLANK PAGE

[Turn over]

0 1 . 8

Look at FIGURE 2 on page 16.

Glucose is absorbed into the bloodstream in part X.

Name part X. [1 mark]

---

0 1 . 9

Complete the sentences opposite.
[2 marks]

Choose answers from the list below.

- **active transport**
- **digestion**
- **excretion**
- **osmosis**
- **respiration**

Some glucose is absorbed into the bloodstream against the concentration gradient by the process of

_____ .

Water moves out of part Y and into the bloodstream by the process of

_____ .

[Turn over]

10

0 2

An animal called an axolotl lives in water.

FIGURE 3 shows an axolotl.

FIGURE 3

Oxygen enters the axolotl's bloodstream through the gills by diffusion.

0 2 . 1

What is diffusion? [1 mark]

Tick (✓) ONE box.

- ☐ **The movement of particles from a high concentration to a low concentration**
- ☐ **The movement of particles from a low concentration to a high concentration**
- ☐ **The movement of water from a concentrated solution to a more dilute solution**

[Turn over]

0 2 . 2

Describe how ONE feature of the axolotl's gills increases the rate of diffusion of oxygen.

Use information from FIGURE 3 on page 20. [2 marks]

Feature _____

Description _____

_____

_____

_____

If a gill of an axolotl is removed, stem cells in the damaged area will divide and a new gill will grow.

0 2 . 3

Complete the sentence. [1 mark]

Choose the answer from the list below.

- **adaptation**
- **differentiation**
- **evolution**
- **variation**

When stem cells specialise to produce gill cells, this process is known as

_____ .

[Turn over]

0 2 . 4

Complete the sentence. [1 mark]

Choose the answer from the list below.

- **binary fission**
- **mitosis**
- **mutation**

To grow a new gill the stem cells divide by _____ .

0 2 . 5

Which ONE of the following does NOT contain stem cells? [1 mark]

Tick (✓) ONE box.

- ☐ **Bone marrow**
- ☐ **Embryos**
- ☐ **Hair**
- ☐ **Meristem tissue**

[Turn over]

0 2 . 6

Axolotls are small animals. Axolotls are used in stem cell research.

What are TWO advantages of using axolotls in stem cell research? [2 marks]

Tick (✓) TWO boxes.

- ☐ **Axolotls are cheap to feed.**
- ☐ **Axolotls are easy to breed.**
- ☐ **Axolotls are endangered.**
- ☐ **Axolotls live in water.**
- ☐ **Axolotl research is cruel.**

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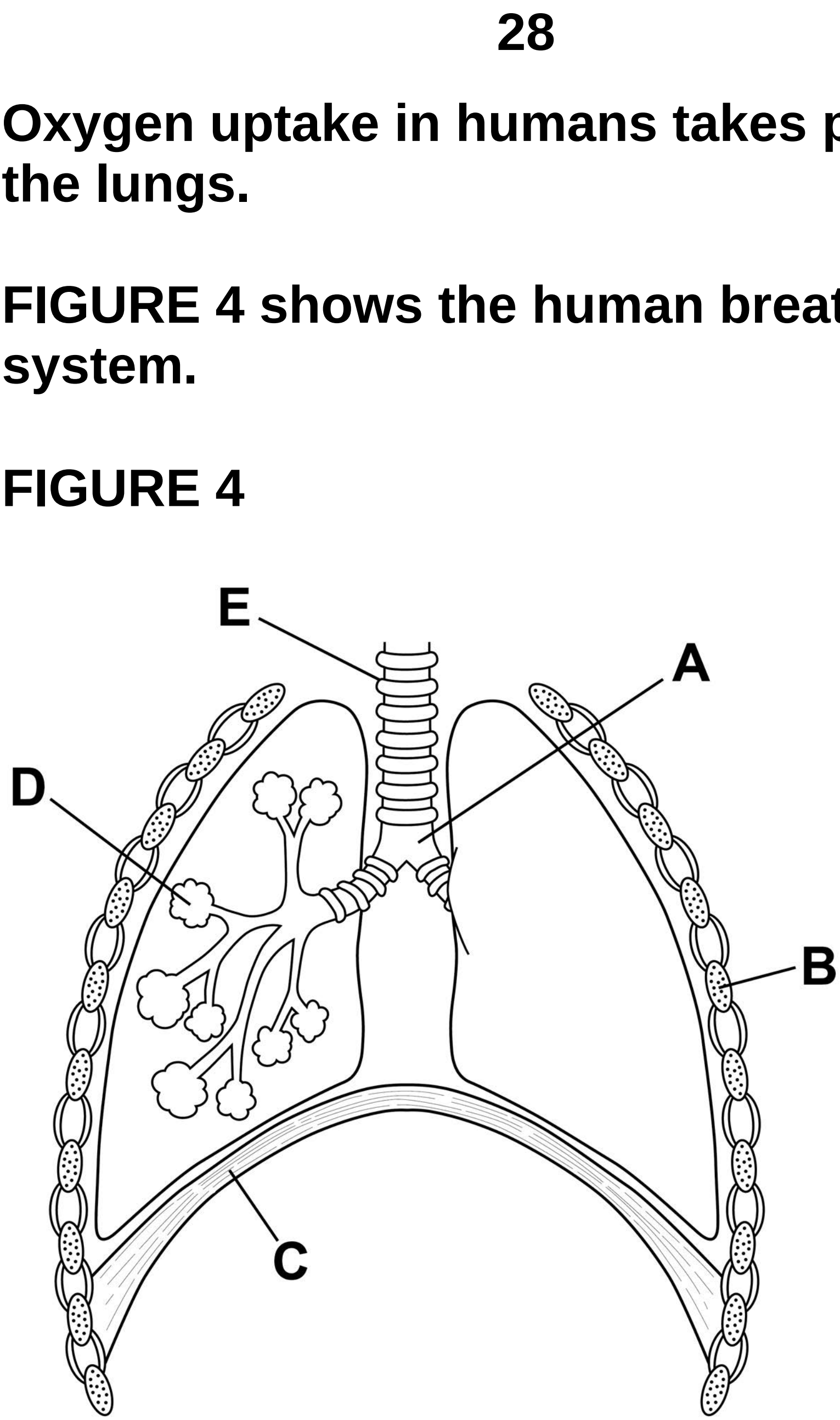
[Turn over]

Oxygen uptake in humans takes place in the lungs.

FIGURE 4 shows the human breathing system.

FIGURE 4



0 2 . 7

Where does oxygen enter the bloodstream? [1 mark]

Tick (✓) ONE box.

☐ **A**

☐ **B**

☐ **C**

☐ **D**

0 2 . 8

Name part E on FIGURE 4. [1 mark]

0 2 . 9

Which blood vessel carries blood to the lungs? [1 mark]

Tick (✓) ONE box.

- ☐ **Aorta**
- ☐ **Pulmonary artery**
- ☐ **Vena cava**

11

BLANK PAGE

[Turn over]

0 3

This question is about leaves.

0 3 . 1

Complete the sentences opposite.

Choose answers from the list below.
[3 marks]

- **epidermis**
- **phloem**
- **palisade mesophyll**
- **waxy cuticle**
- **xylem**

The layer of cells lining the upper surface and lower surface of a leaf is the _____ .

The part of the leaf where most photosynthesis occurs is the _____ .

Water is transported to the leaf in the _____ .

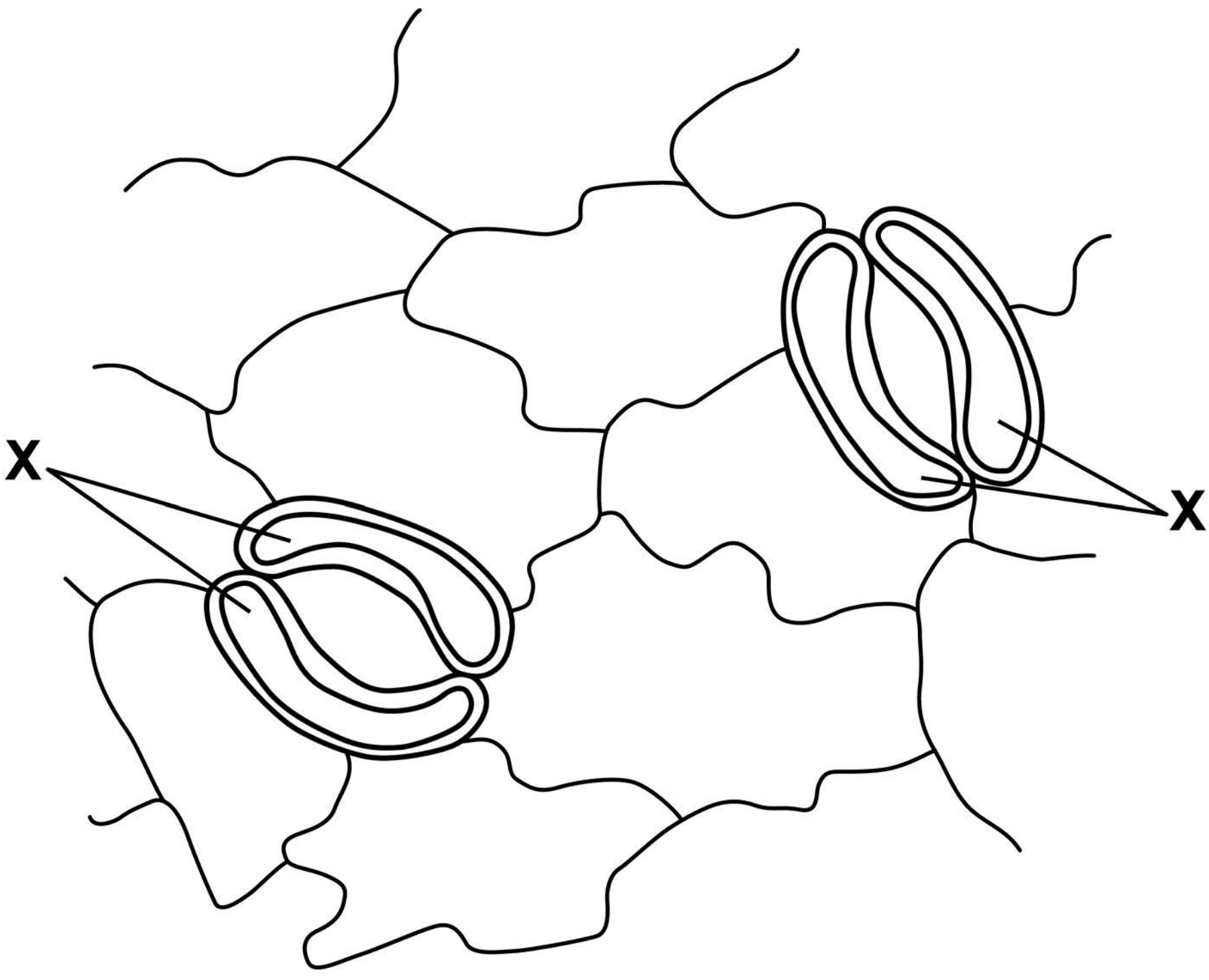
[Turn over]

Water is lost through small openings on the lower surface of plant leaves.

These small openings are called stomata.

FIGURE 5 shows two stomata on the lower surface of a leaf.

FIGURE 5



0 3 . 2

The cells labelled X control the width of the stomata.

What are the cells labelled X? [1 mark]

Tick (✓) ONE box.

- ☐ **Guard cells**
- ☐ **Mesophyll cells**
- ☐ **Root hair cells**
- ☐ **Stem cells**

[Turn over]

0 3 . 3

What is the function of the stomata?
[1 mark]

Tick (✓) ONE box.

- ☐ **To allow light into the leaf**
- ☐ **To let carbon dioxide into the leaf**
- ☐ **To let sugars out of the leaf**
- ☐ **To protect the leaf from pathogens**

0 3 . 4

How is water lost from a leaf? [1 mark]

Tick (✓) ONE box.

- ☐ **By evaporation**
- ☐ **By respiration**
- ☐ **By translocation**

A student investigated the volume of water lost from two plants.

The plants were different species.

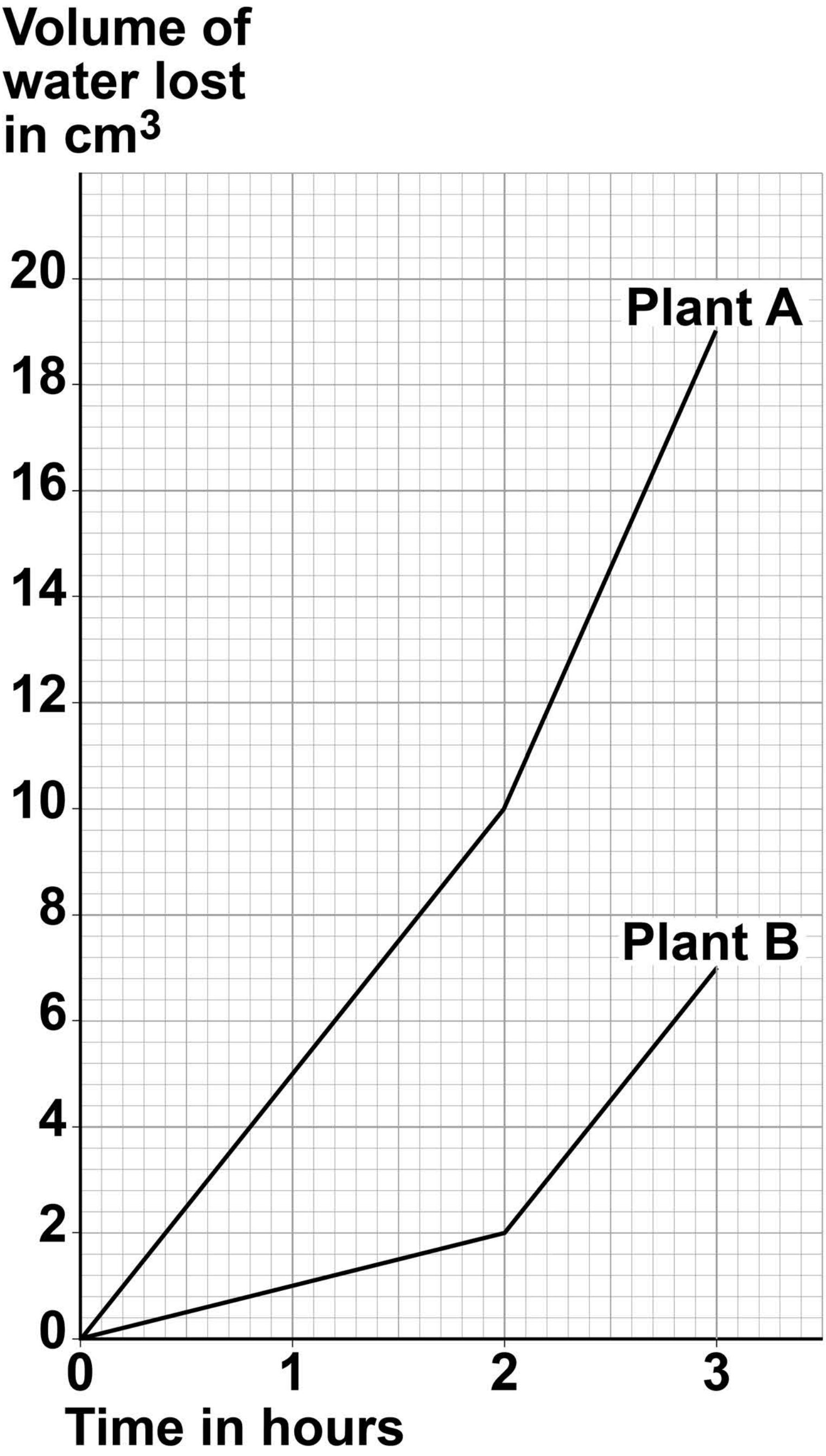
FIGURE 6, on the opposite page, shows the student's results.

0 3 . 5

Calculate the difference in the volume of water lost by plant A compared to plant B in the first hour. [2 marks]

Difference in volume = _____ cm^3

FIGURE 6


Volume of water lost in cm3
20
18
16
14
12
10
8
6
4
2
0
Plant A
Plant B
0
1
2
3
Time in hours

0 3 . 6

What could cause plant A to lose water at a faster rate than plant B? [1 mark]

Tick (✓) ONE box.

- ☐ **Plant A has fewer stomata per leaf.**
- ☐ **Plant A is smaller.**
- ☐ **Plant A has more leaves.**
- ☐ **Plant A has smaller leaves.**

0 3 . 7

After the first 2 hours, both plants were moved to a new room.

Suggest ONE reason why both plants lost water at a faster rate in the new room. [1 mark]

_____

_____

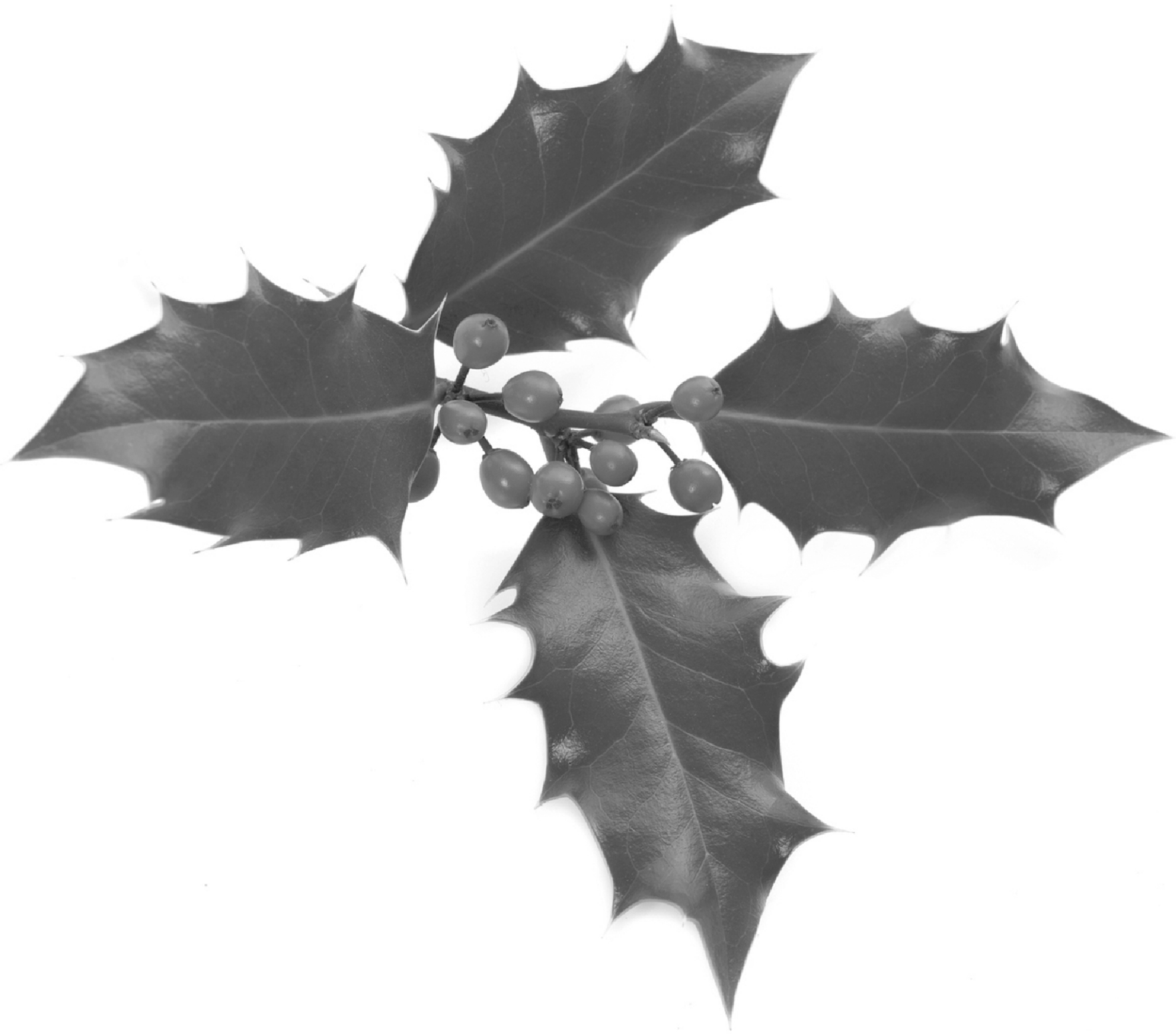
_____

0 3 . 8

Some plants have adaptations to stop them from being eaten by animals.

FIGURE 7 shows part of a holly plant.

FIGURE 7



Describe ONE way the holly plant is adapted to stop it being eaten by animals. [1 mark]

_____

_____

0 4

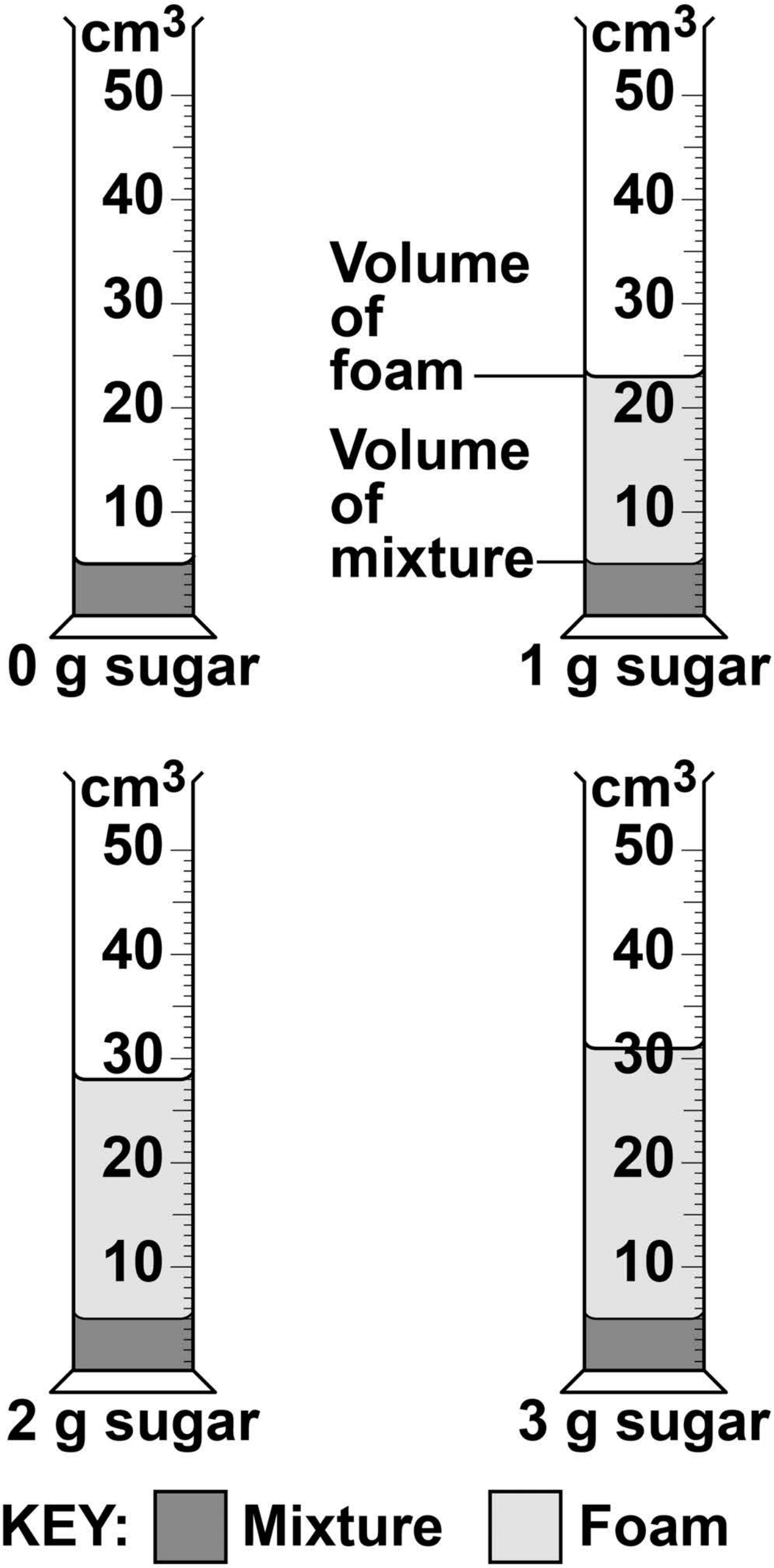
A student investigated respiration in yeast.

This is the method used.

1. **Add 5 cm^3 of a yeast and water mixture to each measuring cylinder.**
2. **Add different masses of sugar to each measuring cylinder.**
3. **Mix the contents of each measuring cylinder gently for 5 seconds.**
4. **Put the measuring cylinders in a water bath at 25 °C**
5. **Over the next 20 minutes, record the maximum volume the foam reaches in each measuring cylinder.**

FIGURE 8, on the opposite page, shows the student's results.

FIGURE 8



[Turn over]

0 4 . 1

Which TWO variables did the student control in the method? [2 marks]

Tick (✓) TWO boxes.

- ☐ **Mass of sugar**
- ☐ **pH of the mixture**
- ☐ **Temperature**
- ☐ **Volume of foam**
- ☐ **Volume of yeast and water**

TABLE 3 shows the results.

TABLE 3

Mass of sugar in g	Maximum volume in cm^3
0	5
1	23
2	X
3	31

0 4 . 2

What is value X in TABLE 3?

Use FIGURE 8, on page 45. [1 mark]

X = _____ cm^3

[Turn over]

In the investigation, the yeast respires and releases a gas which causes the foam to rise.

0 4 . 3

Which gas causes the foam to rise?
[1 mark]

Tick (✓) ONE box.

- ☐ **Carbon dioxide**
- ☐ **Hydrogen**
- ☐ **Nitrogen**
- ☐ **Oxygen**

0 4 . 4

What conclusion can you make about the relationship between the mass of sugar used and the volume of gas produced?
[1 mark]

0 4 . 5

Why was no foam produced in the mixture with 0 g of sugar? [1 mark]

0 4 . 6

Why was the measuring cylinder with 0 g of sugar included in the investigation? [1 mark]

0 4 . 7

The top of the mixture can be covered with a layer of oil after step 3 in the method.

Suggest why the layer of oil stops the yeast respiring aerobically. [1 mark]

_____

_____

_____

0 4 . 8

What other substance is produced during ANAEROBIC respiration in yeast? [1 mark]

Tick (✓) ONE box.

- ☐ **Ethanol**
- ☐ **Hydrochloric acid**
- ☐ **Lactic acid**
- ☐ **Water**

9

0 5

A man has the following symptoms:

- **yellow discharge from his penis**
- **pain when urinating.**

0 5 . 1

The man has a bacterial infection.

What is the most likely cause of the man's symptoms? [1 mark]

Tick (✓) ONE box.

☐ **Gonorrhoea**

☐ **HIV**

☐ **Measles**

☐ **Salmonella poisoning**

[Turn over]

0 5 . 2

The man took a full course of antibiotics.

The man's symptoms did NOT improve.

Why did the antibiotics NOT cure the symptoms? [1 mark]

Tick (✓) ONE box.

- ☐ **The bacteria are immune to the antibiotics.**
- ☐ **The bacteria are resistant to the antibiotics.**
- ☐ **The man is immune to the antibiotics.**
- ☐ **The man is resistant to the antibiotics.**

0 5 . 3

Using a condom can stop the bacteria being passed to another person during sexual intercourse.

Suggest a different way the man could avoid passing the bacteria on to someone else. [1 mark]

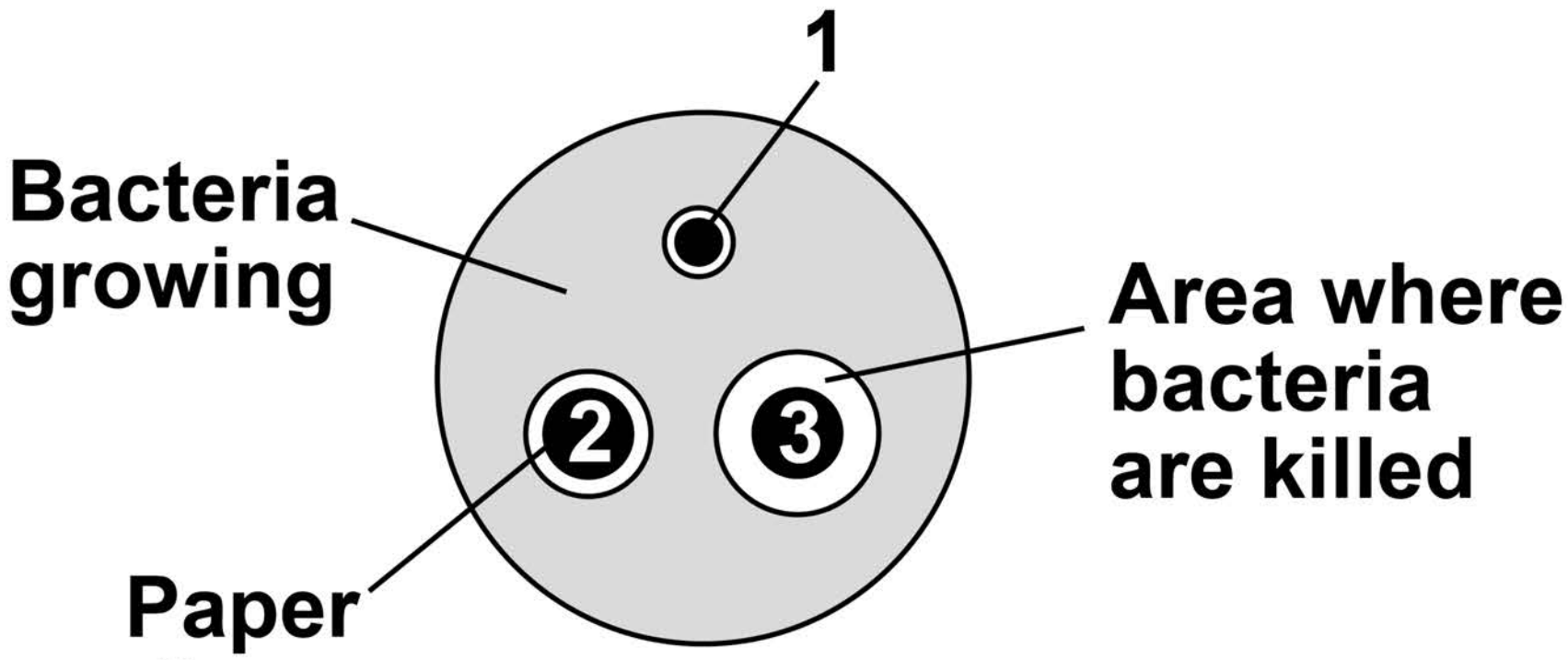
A scientist investigated the effect of three different antibiotics on three different types of bacteria, A, B and C.

This is the method used.

1. Grow bacteria A on an agar plate.
2. Put three separate paper discs each containing one of the antibiotics (1, 2 and 3) onto the agar plate.
3. Put the agar plate into an incubator for 48 hours.
4. Repeat steps 1–3 for bacteria B and for bacteria C.

FIGURE 9, on the opposite page, shows the scientist's results.

FIGURE 9



[Turn over]

0 5 . 4

Compare the effectiveness of the three antibiotics at killing the different types of bacteria. [6 marks]

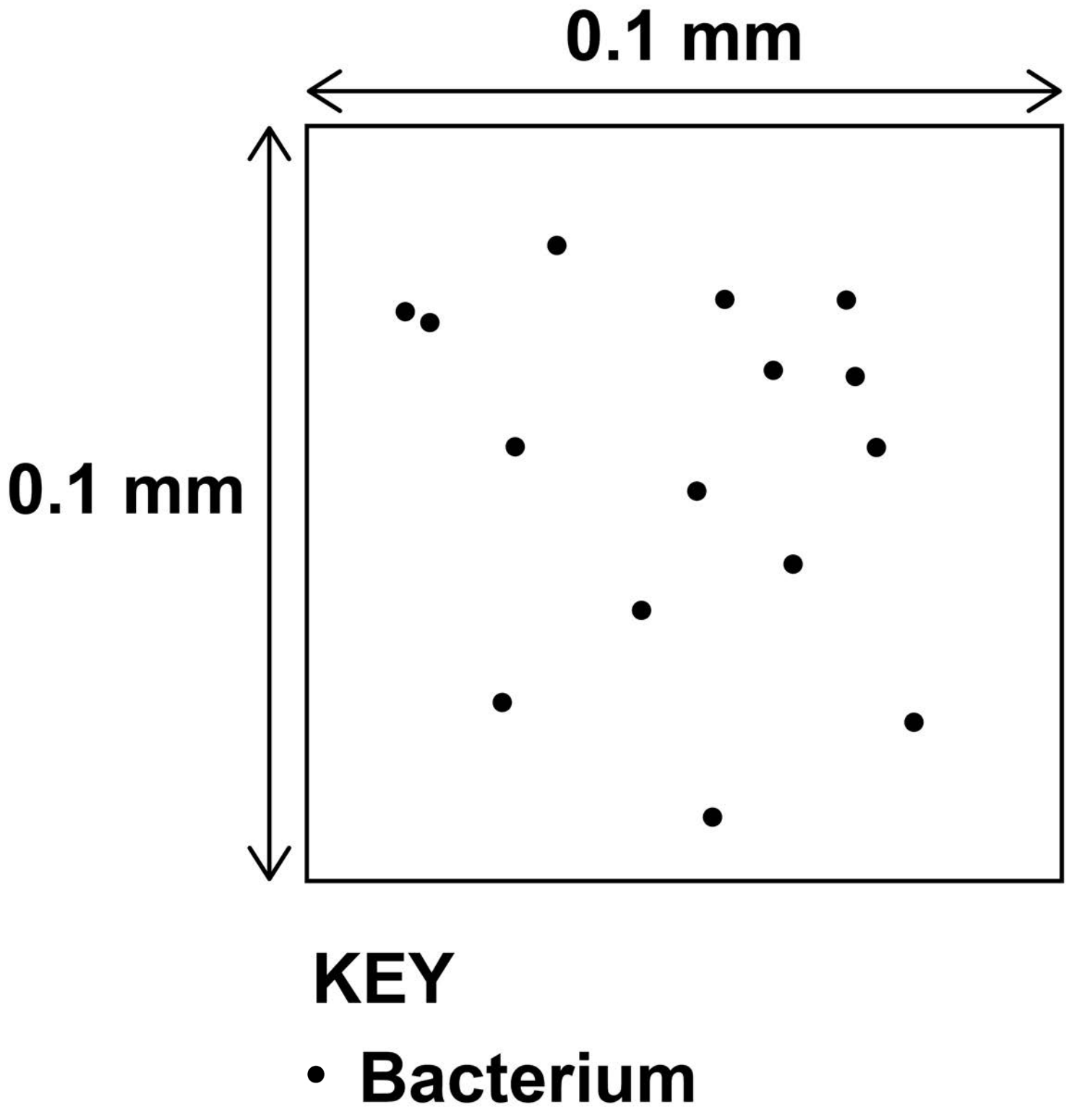
[Turn over]

Milk contains bacteria.

A small volume of raw milk was placed in a counting chamber in a special type of microscope slide.

FIGURE 10 shows what the counting chamber looked like when viewed using a microscope.

FIGURE 10



A scientist counted the number of bacteria in four samples of raw milk.

TABLE 4 shows the results.

TABLE 4

Milk sample	Number of bacteria in counting chamber
E	15
F	12
G	13
H	16

[Turn over]

0 5 . 5

Which milk sample is shown in FIGURE 10 on page 60? [1 mark]

Tick (✓) ONE box.

- ☐ **Sample E**
- ☐ **Sample F**
- ☐ **Sample G**
- ☐ **Sample H**

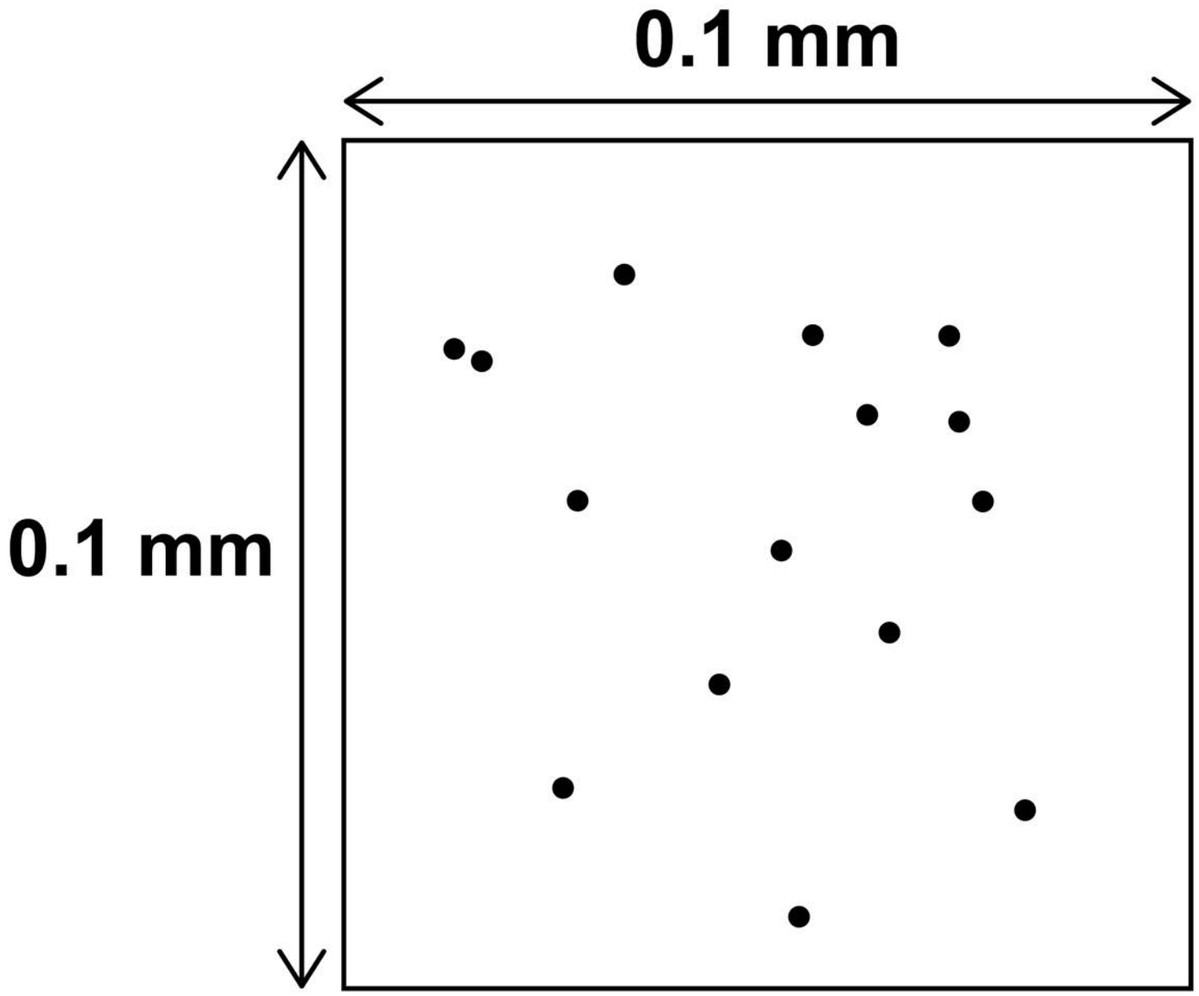
0 5 . 6

Calculate the mean number of bacteria in the four samples in TABLE 4 on page 61. [2 marks]

Mean number of bacteria = _____

[Turn over]

Repeat of FIGURE 10



KEY

- **Bacterium**

0 5 . 7

Calculate the mean number of bacteria per mm^3 of milk in the samples.

Complete the following steps. [3 marks]

Calculate the total area of the counting chamber in FIGURE 10 on page 64.

65

_____

_____

Total area of counting chamber = _____ mm^2

[Turn over]

The depth of the counting chamber is 0.01 mm

Calculate the volume of the counting chamber in FIGURE 10 on page 64.

Use the equation: volume = area × depth

Volume of counting chamber = _____ mm^3

Calculate the mean number of bacteria per mm^3 of milk in the samples. You will need to use the answers in question 05.6 and 05.7

Use the equation:

mean number of bacteria per mm^3 of milk =

$$\frac{\text{mean number of bacteria from Question 05.6}}{\text{volume of counting chamber}}$$

Mean number of bacteria per mm^3 of milk =

[Turn over]

Milk is heated to reduce the number of bacteria it contains before it is sold for humans to drink.

Milk with more than 20 000 bacteria per cm^3 cannot be sold for humans to drink.

TABLE 5 shows the number of bacteria per cm^3 in four different samples of milk.

TABLE 5

Milk sample	Number of bacteria per cm^3 of milk
P	1.8×10^4
Q	2.2×10^4
R	2.2×10^{-5}
S	1.8×10^3

0 5 . 8

Which of the milk samples could NOT be sold for humans to drink? [1 mark]

Tick (✓) ONE box.

- ☐ **P**
- ☐ **Q**
- ☐ **R**
- ☐ **S**

[Turn over]

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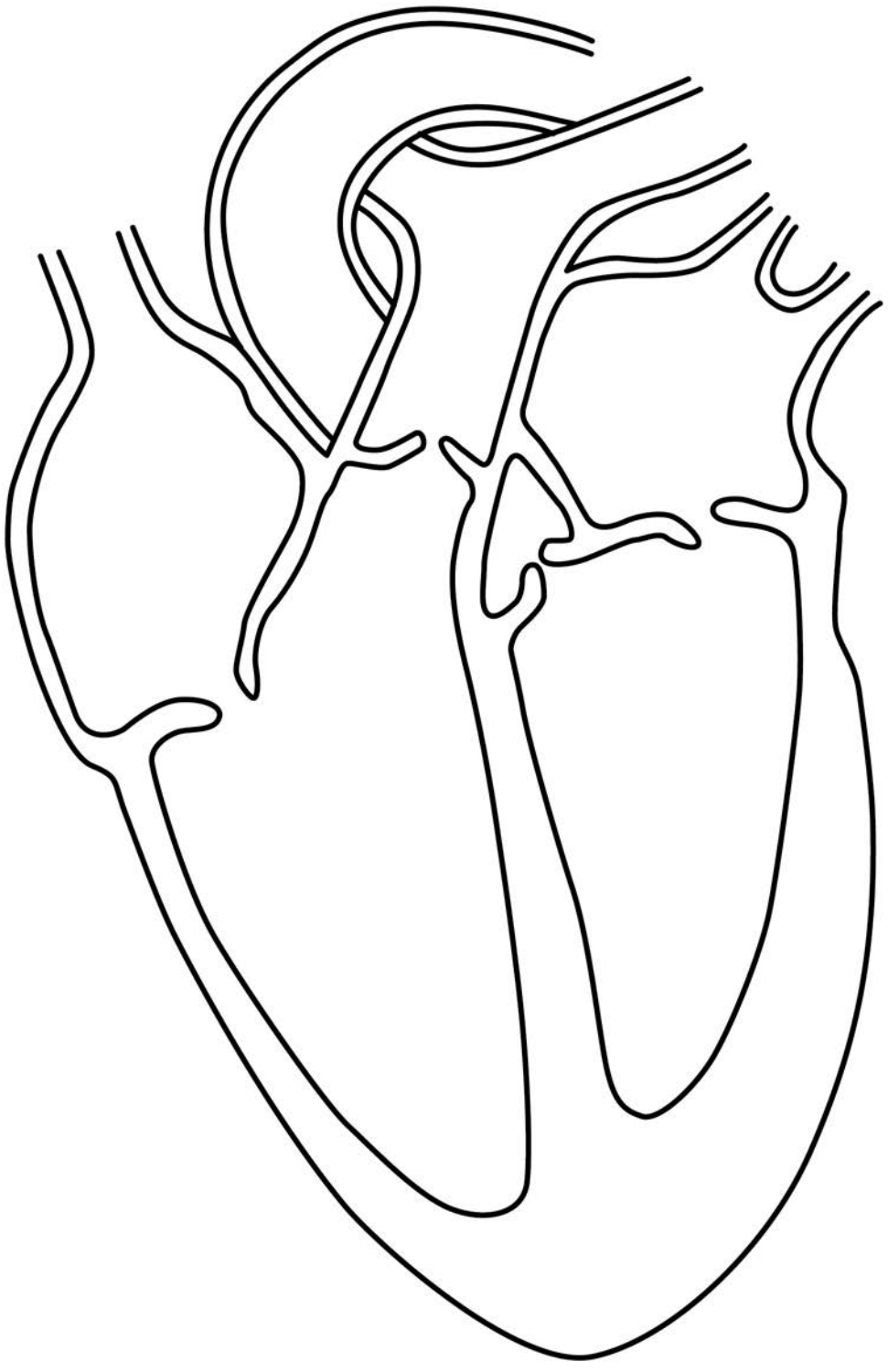
0 5 . 9

Why should milk sold for humans to drink NOT contain large numbers of bacteria? [1 mark]

0	6

FIGURE 11 shows the internal structure of the human heart.

FIGURE 11



0 6 . 1

Which organ system is the heart a part of? [1 mark]

0 6 . 2

Draw a ring around ONE valve on FIGURE 11 on page 72. [1 mark]

0 6 . 3

What is the function of the valves in the heart? [1 mark]

[Turn over]

0 6 . 4

Valves are also found inside some blood vessels.

Which type of blood vessel contains valves? [1 mark]

_____

_____

Sometimes a valve in the heart can begin to leak.

A leaking heart valve may be replaced with either:

- **a mechanical valve**
- **a biological valve from a pig.**

TABLE 6, on the opposite page, shows information about the replacement valves.

TABLE 6

Mechanical valve	**Biological valve from a pig**
Made of plastic or metal	**Made from living tissue**
Can cause the blood to clot around the valve	**No risk of blood clotting around the valve**
No need for another replacement valve after 5 years	**Sometimes another replacement valve is needed after 5 years**

[Turn over]

0 6 . 5

Suggest TWO reasons why a patient may choose a mechanical valve and NOT a biological valve from a pig. [2 marks]

1 _____

_____

2 _____

_____

_____

0 6 . 6

Suggest ONE reason why a patient may choose a biological valve from a pig and NOT a mechanical valve. [1 mark]

_____

_____

_____

0 6 . 7

A person may develop other medical conditions.

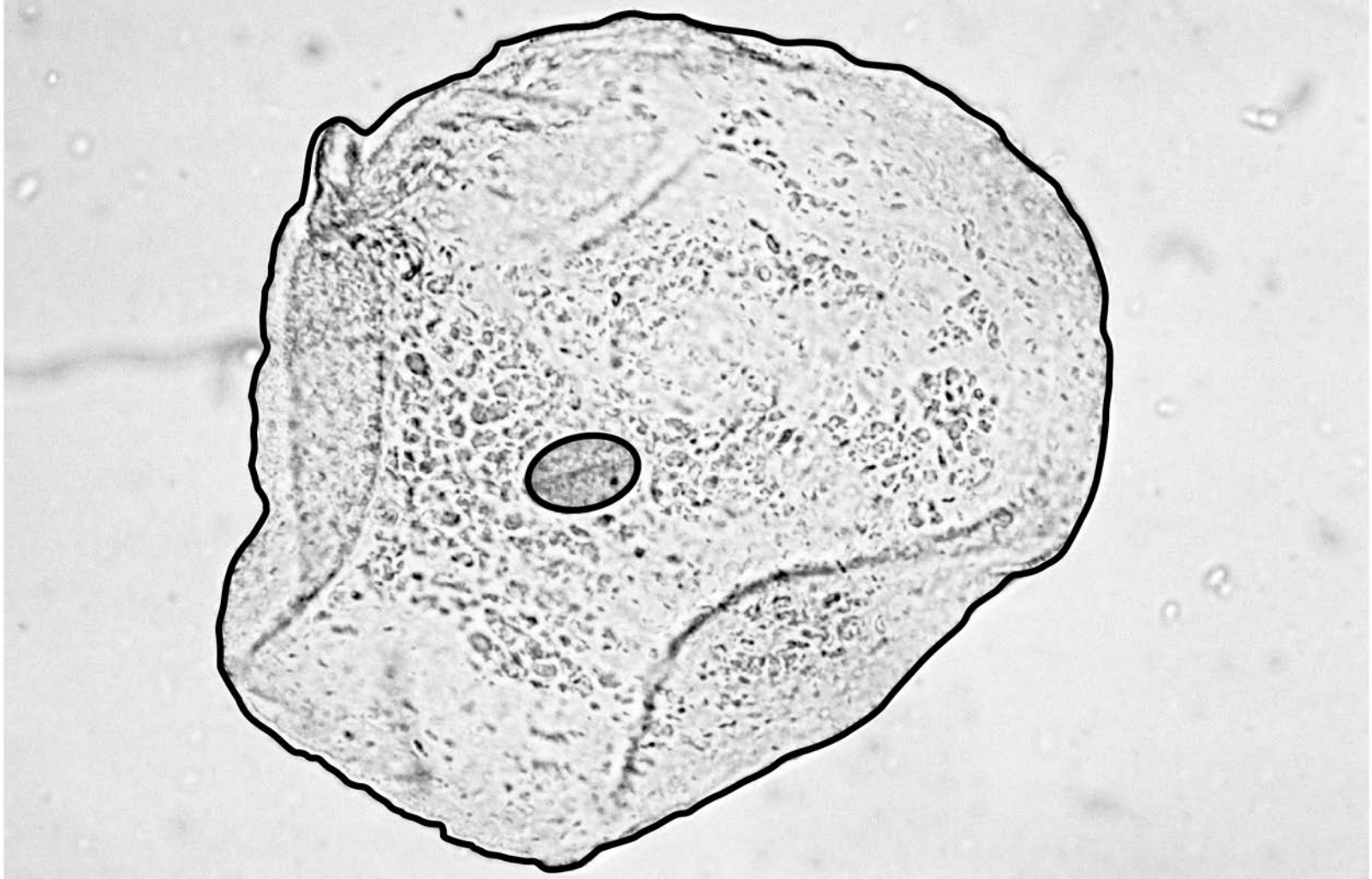
Draw ONE line from each medical condition to the correct treatment.
[2 marks]

MEDICAL CONDITION	TREATMENT
High blood cholesterol	Antibiotics
Irregular heart rate	Artificial pacemaker
	Insulin
	Statins

0	7

FIGURE 12 shows an animal cell viewed using a microscope.

FIGURE 12



0 7 . 1

The cell contains a nucleus.

What is the function of the nucleus?
[1 mark]

---

0 7 . 2

Name ONE type of cell that does NOT contain a nucleus. [1 mark]

[Turn over]

0 7 . 3

In the space below, draw a simple diagram of the cell in FIGURE 12 on page 78.

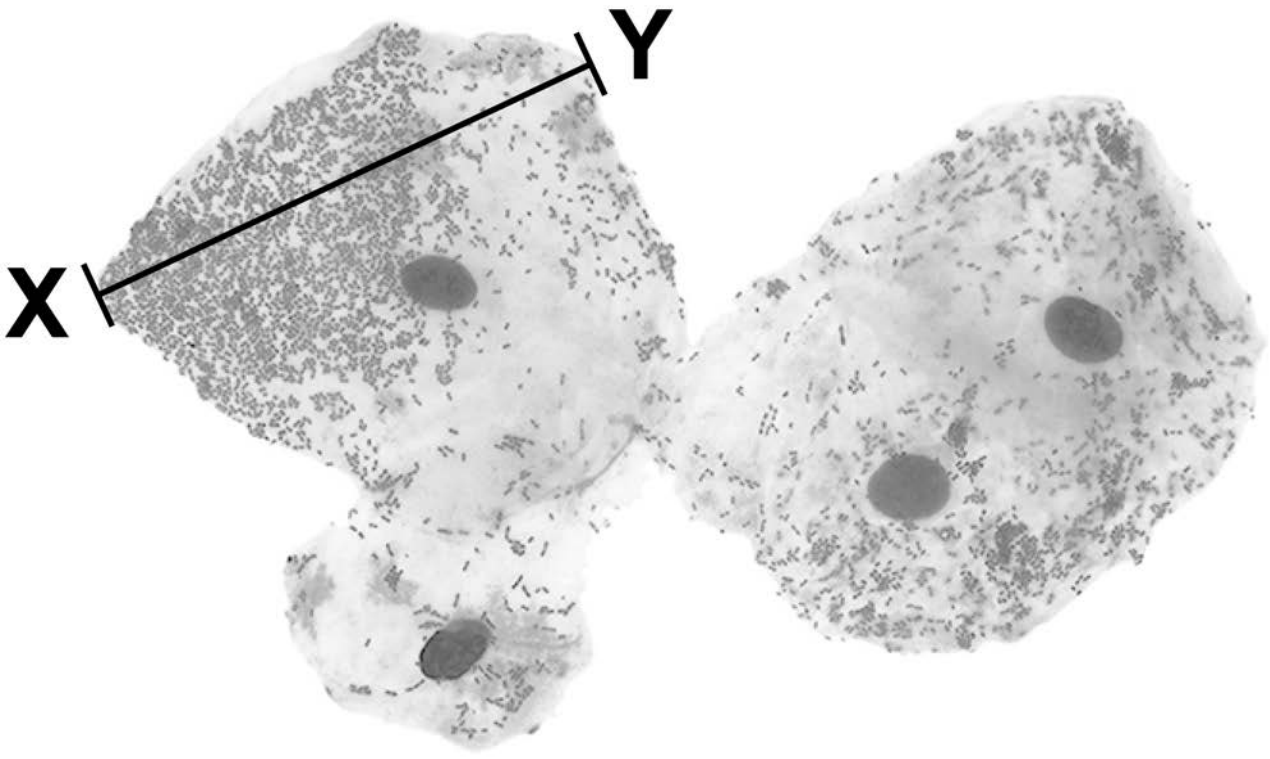
Label TWO parts of the cell. [2 marks]

0 7 . 4

Name ONE structure found in a plant cell but NOT found in an animal cell.
[1 mark]

FIGURE 13 shows some different cells.

FIGURE 13



0 7 . 5

The real length from point X to point Y is 0.06 mm

Take the image length from point X to point Y to be 24 mm

Calculate the magnification.

Use the equation:

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

[3 marks]

Magnification = × _____

[Turn over]

0 7 . 6

The cells shown in FIGURE 13, on page 82, were viewed using a light microscope.

Give TWO advantages of using an electron microscope instead of a light microscope. [2 marks]

1 _____

_____

_____

2 _____

_____

10

0 8

Mosquitoes carry a pathogen that causes malaria.

0 8 . 1

What type of pathogen causes malaria?

[1 mark]

Tick (✓) ONE box.

- ☐ **A bacterium**
- ☐ **A fungus**
- ☐ **A protist**
- ☐ **A virus**

[Turn over]

Mosquito nets can help prevent the spread of malaria.

TABLE 7 shows the results of a study in one area of Africa.

TABLE 7

Total number of people in the study	Number of people who use mosquito nets when sleeping	Percentage of people with malaria	
		Who use mosquito nets when sleeping	Who do NOT use mosquito nets when sleeping
476	426	1.2	40

A newspaper made the following statement:

‘Study shows mosquito nets are scientifically proven to prevent malaria.’

0 8 . 2

Give ONE piece of evidence that supports the statement.

[1 mark]

_____

_____

_____

87

BLANK PAGE

0 8 . 3

Suggest ONE reason why the statement on page 87 may NOT be valid. [1 mark]

TABLE 8 shows information about the number of deaths from malaria in the same area of Africa.

TABLE 8

Year	Number of deaths from malaria per 100 000 people
2005	161
2007	136
2009	114
2011	97
2013	94
2015	92

0 8 . 4

Predict the number of people per 100 000 who died from malaria in 2017 if the trend stayed the same. [1 mark]

Number of people per 100 000 =

0 8 . 5

Use of mosquito nets has helped to reduce the number of deaths from malaria each year.

Suggest ONE other reason for the reduced number of deaths from malaria each year. [1 mark]

_____

_____

_____

0 8 . 6

Describe how the human body:

- **prevents pathogens from entering**
- **defends itself against pathogens inside the body.**

[6 marks]

[Turn over]

0 9

This question is about photosynthesis.

0 9 . 1

Complete the word equation for photosynthesis: [2 marks]

_____ + _____ ⟶

_____ + oxygen

BLANK PAGE

[Turn over]

A student investigated photosynthesis using pondweed.

FIGURE 14, on the opposite page, shows the apparatus the student used.

This is the method used.

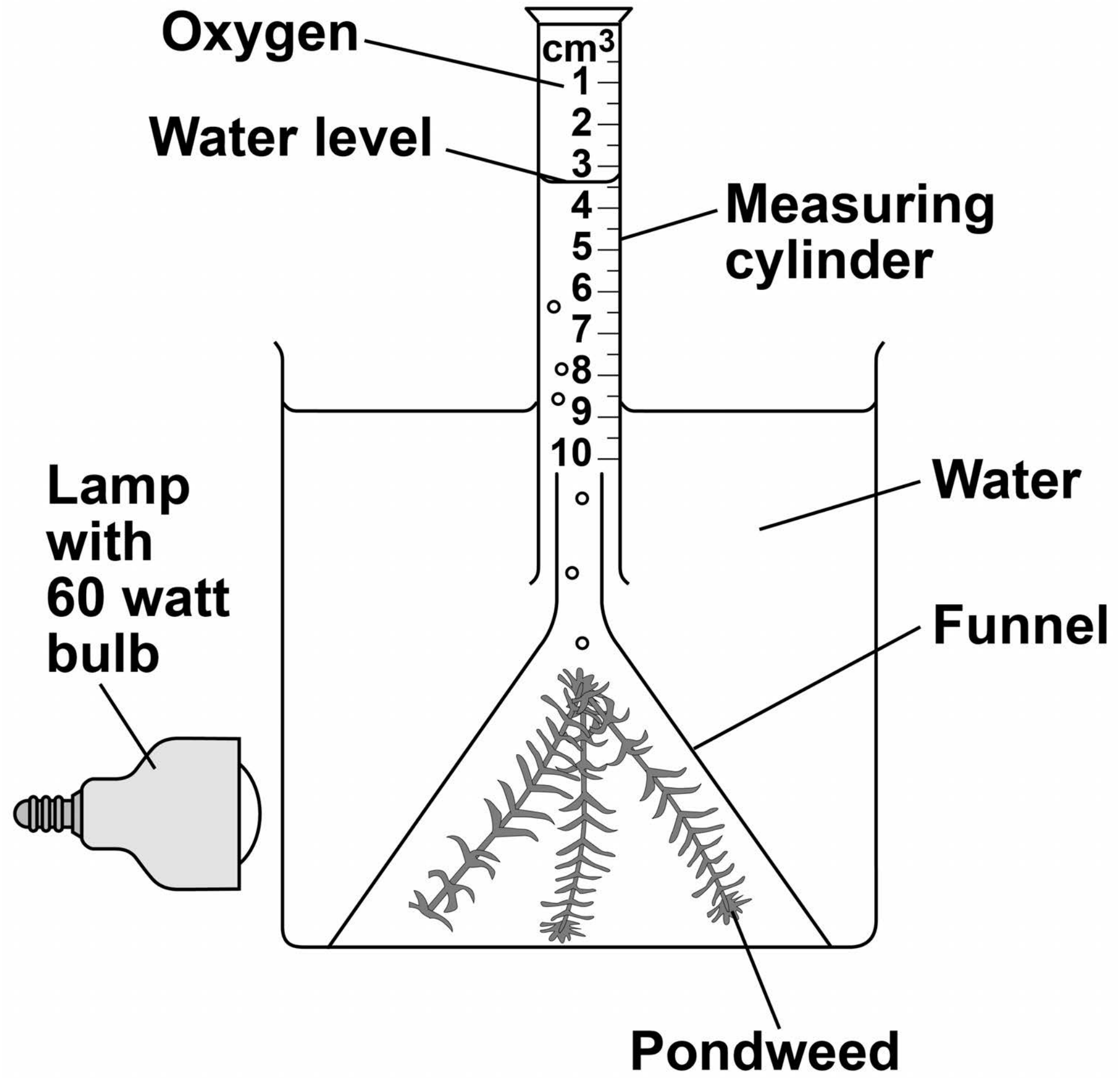
1. **Set up the apparatus as shown in FIGURE 14.**

2. **Switch on the lamp.**

3. **After 20 minutes, record the volume of oxygen collected in the measuring cylinder.**

4. **Repeat steps 1–3 using bulbs of different power output.**

FIGURE 14



[Turn over]

0 9 . 2

What was the independent variable in the investigation? [1 mark]

Tick (✓) ONE box.

- ☐ **Power output of bulb**
- ☐ **Rate of photosynthesis**
- ☐ **Time to collect oxygen**
- ☐ **Volume of oxygen collected**

0 9 . 3

Suggest TWO ways the method could be improved so the results would be more valid. [2 marks]

1 _____

_____

2 _____

_____

_____

[Turn over]

TABLE 9 shows the student's results.

TABLE 9

Power output of bulb in watts	Volume of oxygen collected in 20 minutes in cm^3	Rate of photosynthesis in cm^3/hour
60	0.5	1.5
100	0.8	2.4
150	1.1	X
200	1.2	3.6
250	1.2	3.6

0 9 . 4

Calculate value X in TABLE 9. [1 mark]

_____

_____

_____

X = _____ cm^3/hour

10

3

[Turn over]

0 9 . 5

Complete FIGURE 15, on the opposite page. [4 marks]

You should:

- **label the x-axis**
- **use a suitable scale**
- **plot the data from TABLE 9, on page 102, and your answer to Question 09.4, on page 103.**
- **draw a line of best fit.**

0 9 . 6

Determine the expected rate of photosynthesis with a bulb of power output 75 watts.

Use FIGURE 15. [1 mark]

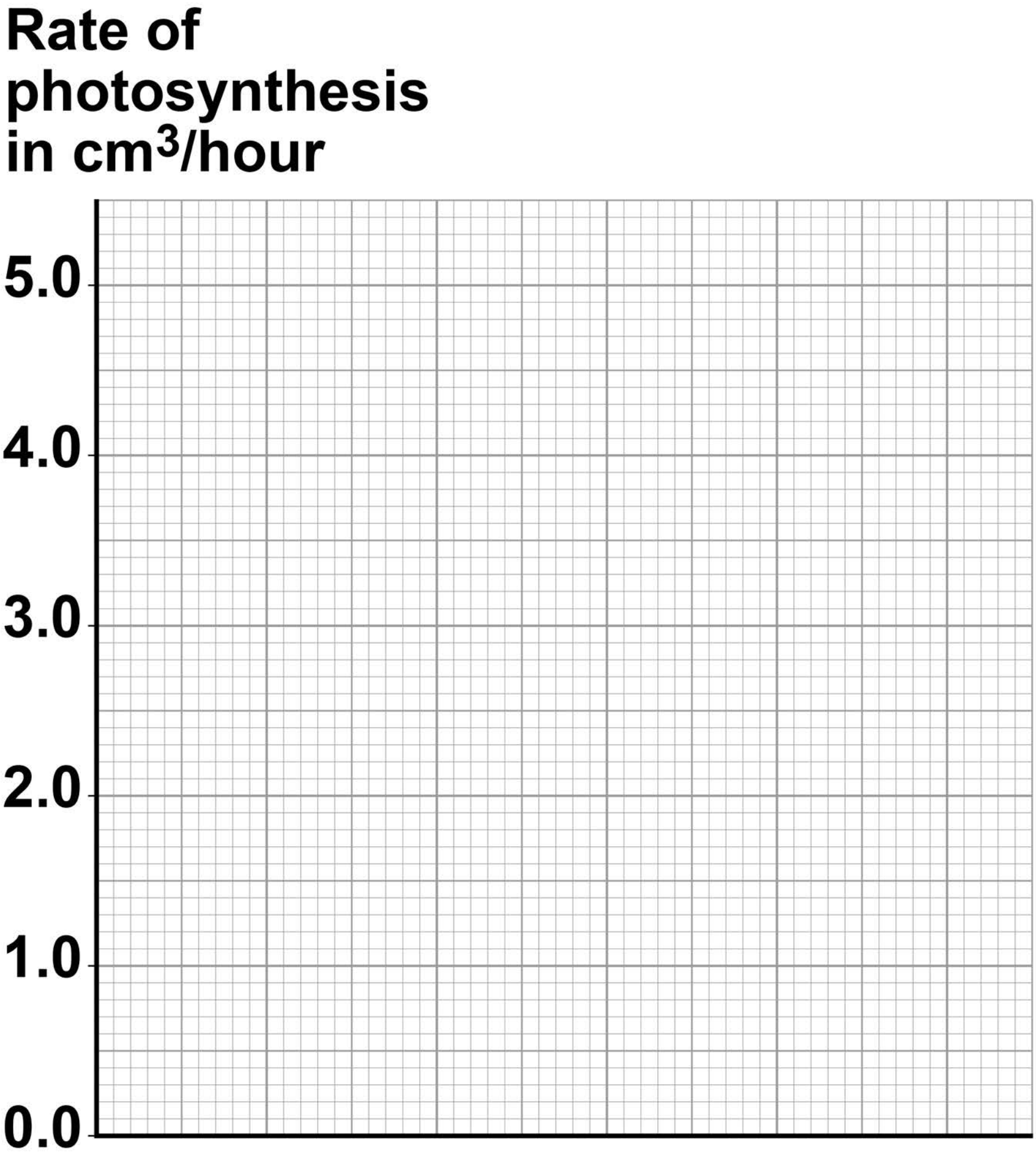
_____

_____

Rate of photosynthesis at 75 watts =

_____ **cm^3/hour**

FIGURE 15



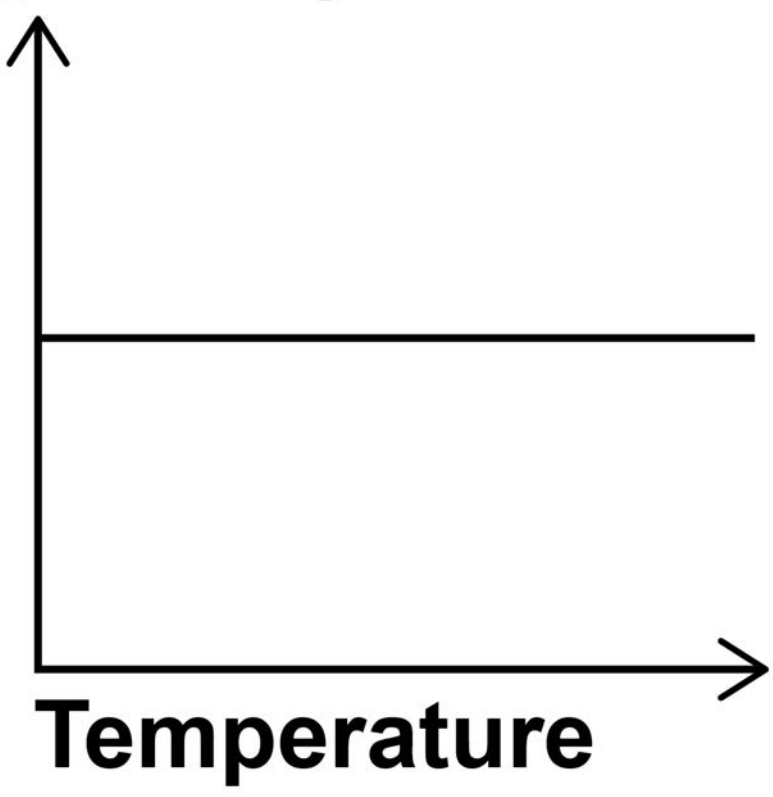
[Turn over]

0 9 . 7

Which graph shows the effect of temperature on the rate of photosynthesis? [1 mark]

Tick (✓) ONE box.

☐



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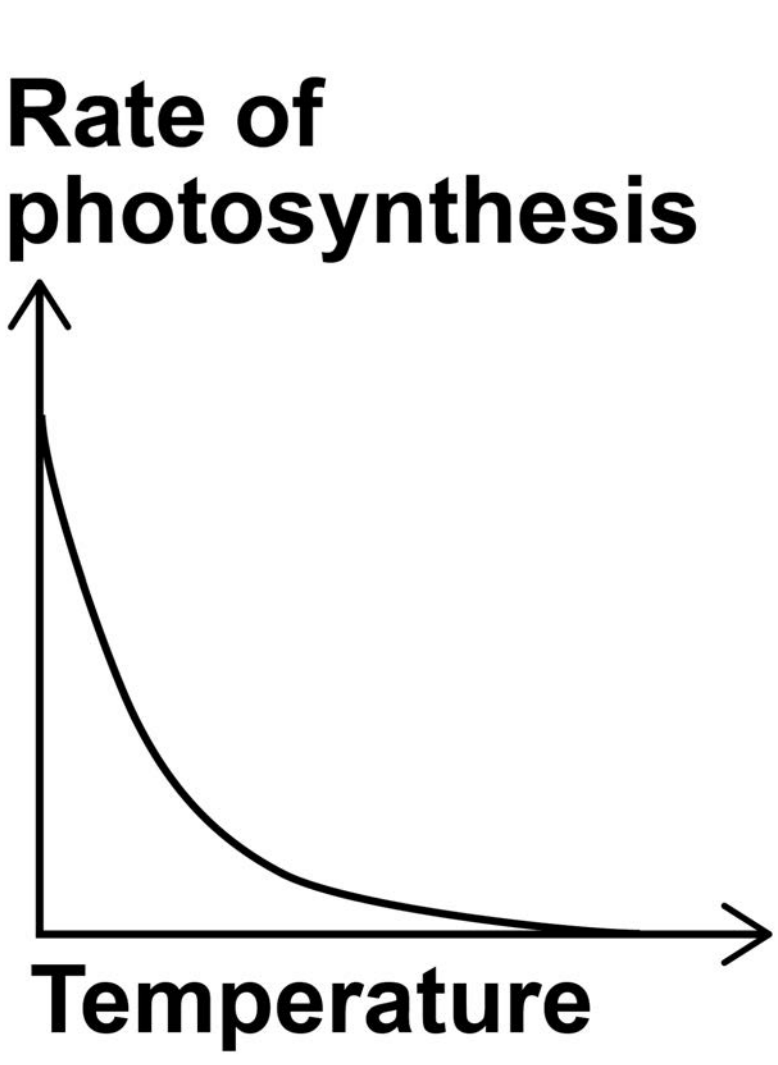

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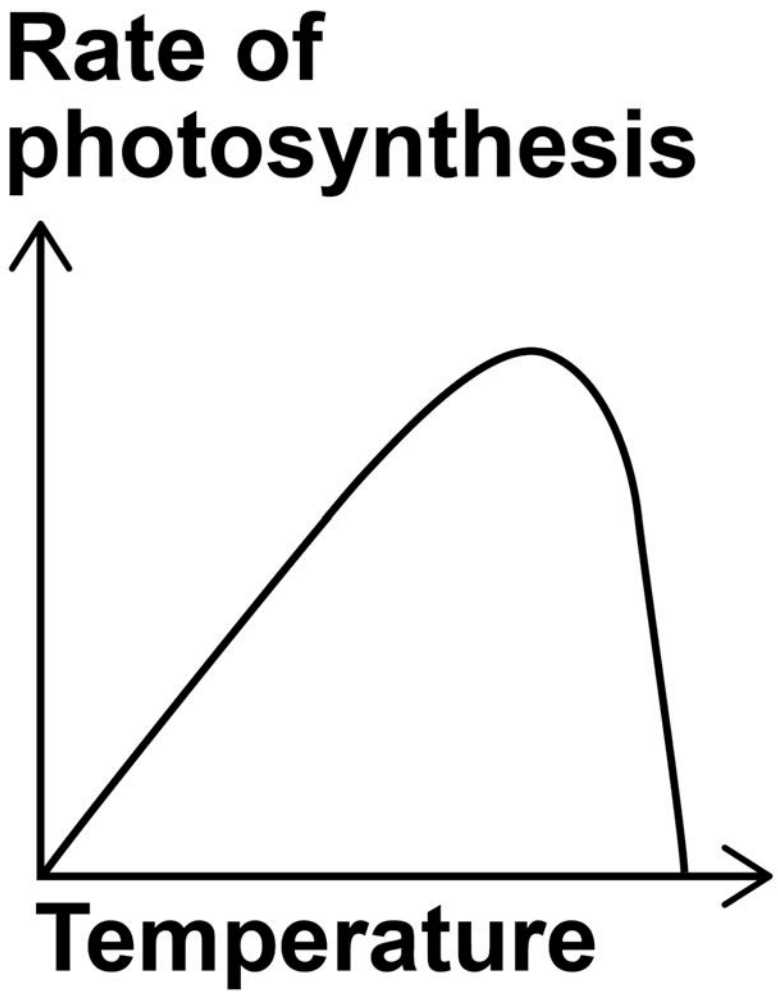

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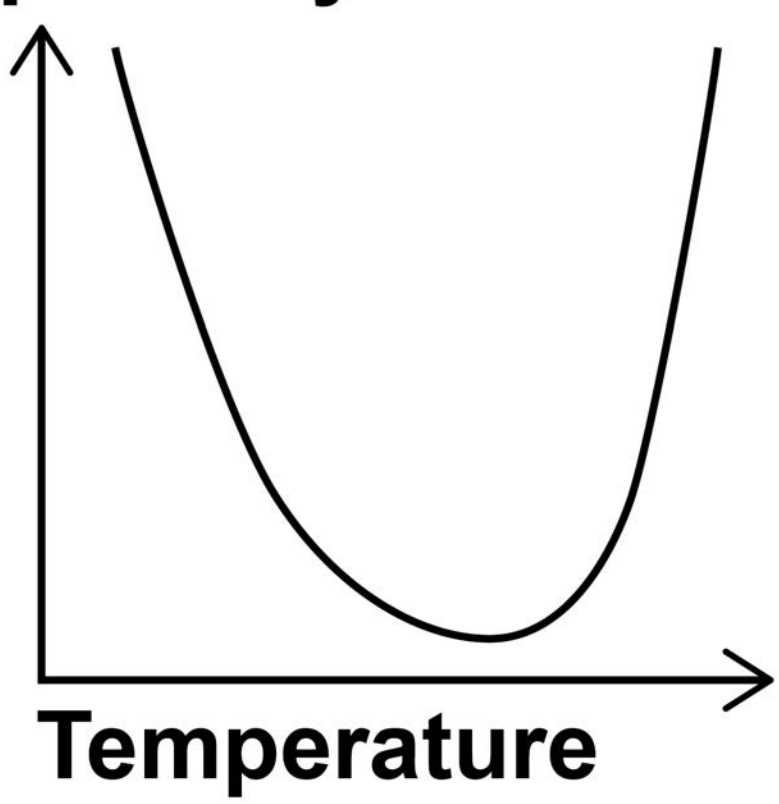

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END OF QUESTIONS

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For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	