A

AQA

Surname

Other Names

Centre Number

Candidate Number

Candidate Signature

I declare this is my own work.

GCSE
BIOLOGY

F

Foundation Tier   Paper 1F

8461/1F

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.**

- **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 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

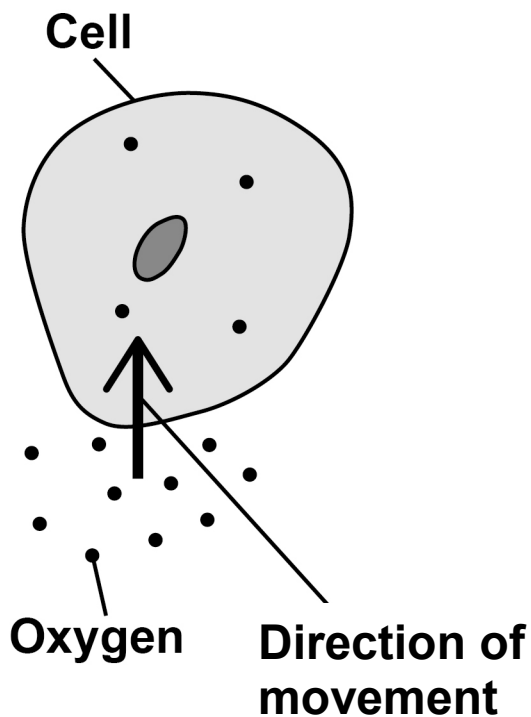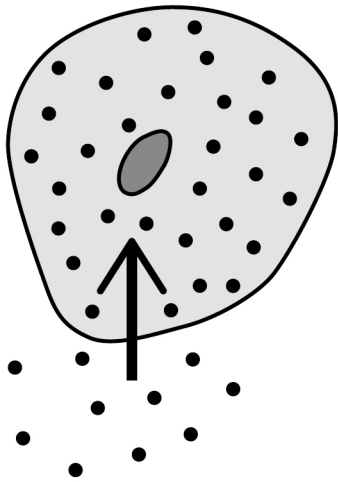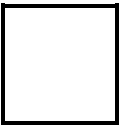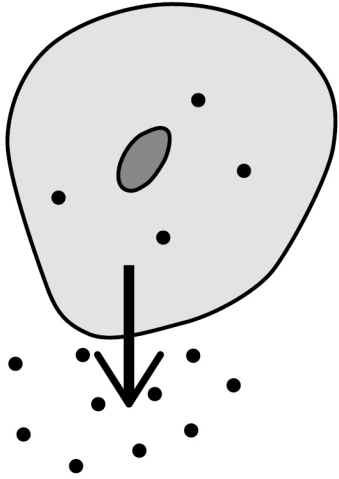**Answer ALL questions in the spaces provided.**

| 0 | 1 |

This question is about cells.

| 0 | 1 |.| 1 |

Which diagram shows oxygen moving by diffusion?
[1 mark]

Tick (✓) ONE box.

Cell

Oxygen   Direction of movement
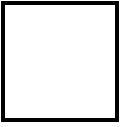
[Turn over]

0 1 . 2

Complete the sentences. [3 marks]

Choose answers from the list.

- **carbon dioxide**
- **chlorophyll**
- **energy**
- **light**
- **mineral ions**
- **water**

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb

_____.

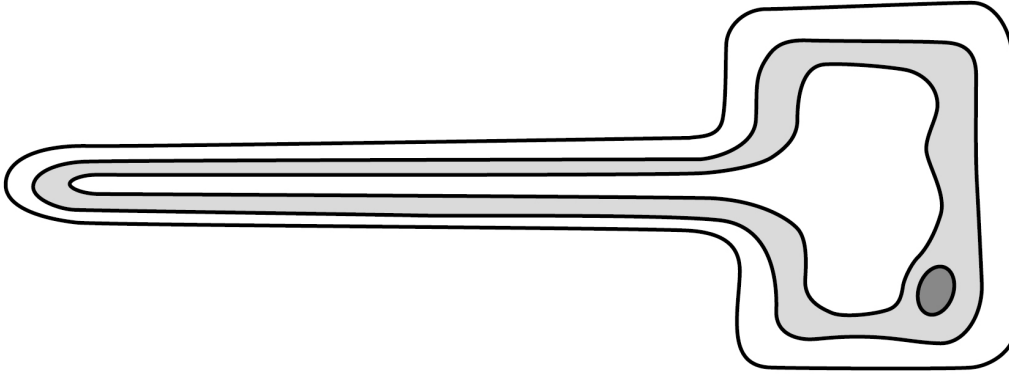**Plant cells use active transport to absorb**

_____.

Active transport moves substances against the

concentration gradient and needs _____.

FIGURE 1 shows a specialised cell that absorbs substances from the soil.

FIGURE 1

| 0 | 1 | . | 3 |

Name the type of specialised cell in FIGURE 1. [1 mark]

_____

| 0 | 1 | . | 4 |

Describe how the cell in FIGURE 1 is adapted to increase the absorption of substances from the soil. [1 mark]
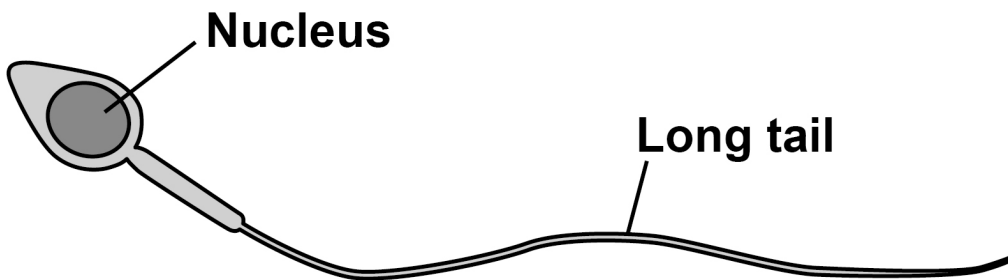
_____

_____

_____

[Turn over]

A sperm cell is another specialised cell.

FIGURE 2 shows a sperm cell.

FIGURE 2

| 0 | 1 |. | 5 |

Draw ONE line from each feature to how the feature helps the sperm cell carry out its function. [2 marks]

Feature of sperm cell

Contains a nucleus

Has a long tail

How the feature helps

To break the outer layer of the egg

To help the cell to swim to the egg
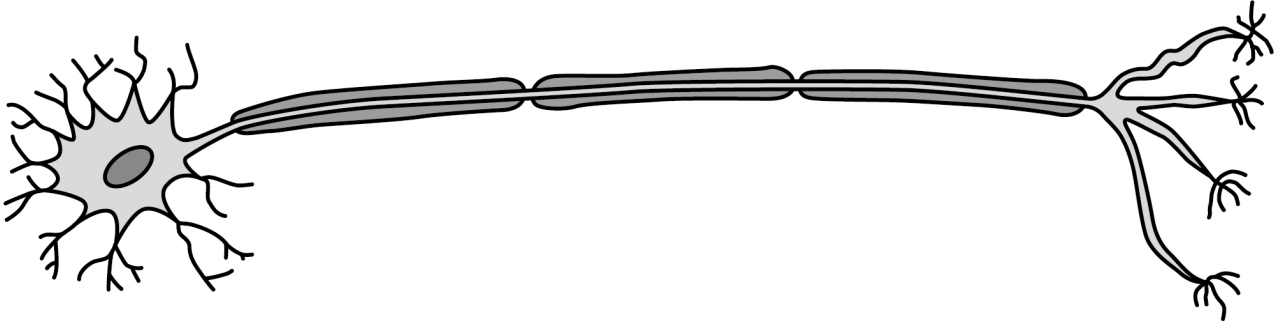
To provide the chromosomes for fertilisation

To release energy

FIGURE 3 shows another specialised cell.

FIGURE 3

| 0 | 1 |.| 6 |

Name the type of cell in FIGURE 3.

Describe ONE feature of the cell that helps it to carry out its function. [2 marks]

Name of the cell _____

Feature of the cell _____

_____

_____

[Turn over]

10

0 2

Viruses cause disease.

0 2 . 1

What name is given to microorganisms that cause disease? [1 mark]

Tick (✓) ONE box.

☐ **Pathogens**

☐ **Predators**

☐ **Prokaryotes**

0 2 . 2

How do viruses cause the symptoms of disease?
[1 mark]

Tick (✓) ONE box.

☐ **Viruses engulf white blood cells, destroying them.**

☐ **Viruses produce antibodies that damage tissues.**

☐ **Viruses reproduce inside cells, damaging them.**

[Turn over]

FIGURE 4 shows a virus and an animal cell.

FIGURE 4

The diagram is not drawn to scale.

VIRUS   ANIMAL CELL

0 2 . 3

Suggest ONE reason why viruses are NOT classed as cells. [1 mark]

_____

_____

_____

A vaccine can protect humans from a viral disease.

| 0 | 2 | . | 4 |

What does the vaccine contain? [1 mark]

Tick (✓) ONE box.

☐ A toxic form of a virus

☐ A weakened form of a virus

☐ An active form of a virus

[Turn over]

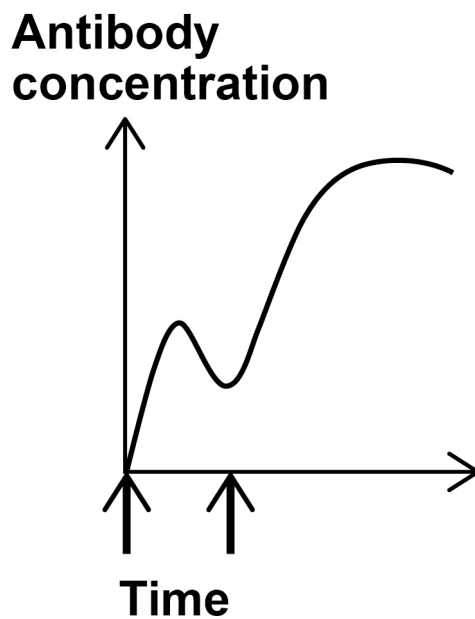**In some cases, a first vaccination needs to be followed by a second vaccination some time later.**

| 0 | 2 |.| 5 |

Which graph shows how the concentration of antibodies in a person's blood changes after the first and second vaccinations? [1 mark]

Tick (✓) ONE box.

Antibody
concentration

Time

Antibody
concentration

Time
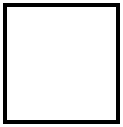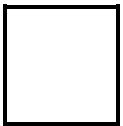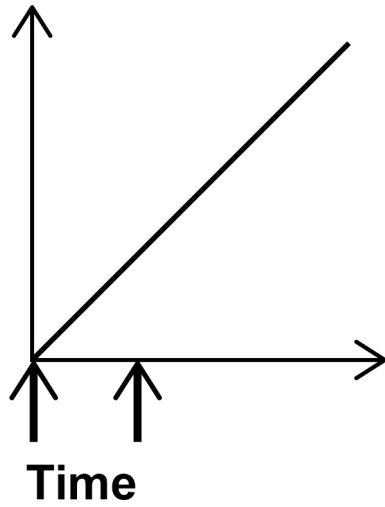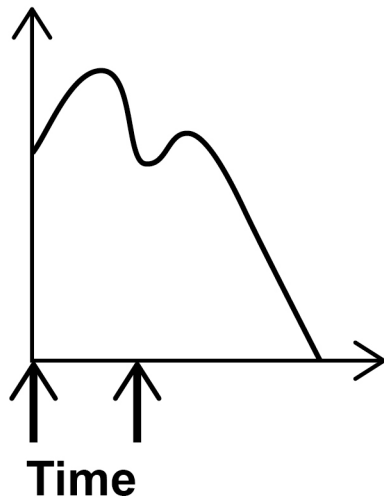
KEY

↑ Vaccination
given

[Turn over]

Tobacco mosaic virus (TMV) causes disease in plants.

TMV affects the rate of photosynthesis in plants.

| 0 | 2 | . | 6 |

Which part of a plant shows discolouration caused by TMV? [1 mark]

Tick (✓) ONE box.

☐ Flower

☐ Leaf

☐ Root

BLANK PAGE

[Turn over]

TABLE 1 shows the rate of photosynthesis in four different tobacco plants.

TABLE 1

Tobacco plant	Level of TMV infection in plant	Rate of photosynthesis in arbitrary units
A	None	15
B	Mild	13
C	Medium	7
D	High	3

0 2 . 7

Complete FIGURE 5, on the opposite page.

You should:

- label the y-axis

- add the correct scale to the y-axis

- plot the data from TABLE 1

- label each bar.

[5 marks]

FIGURE 5

None
(A)
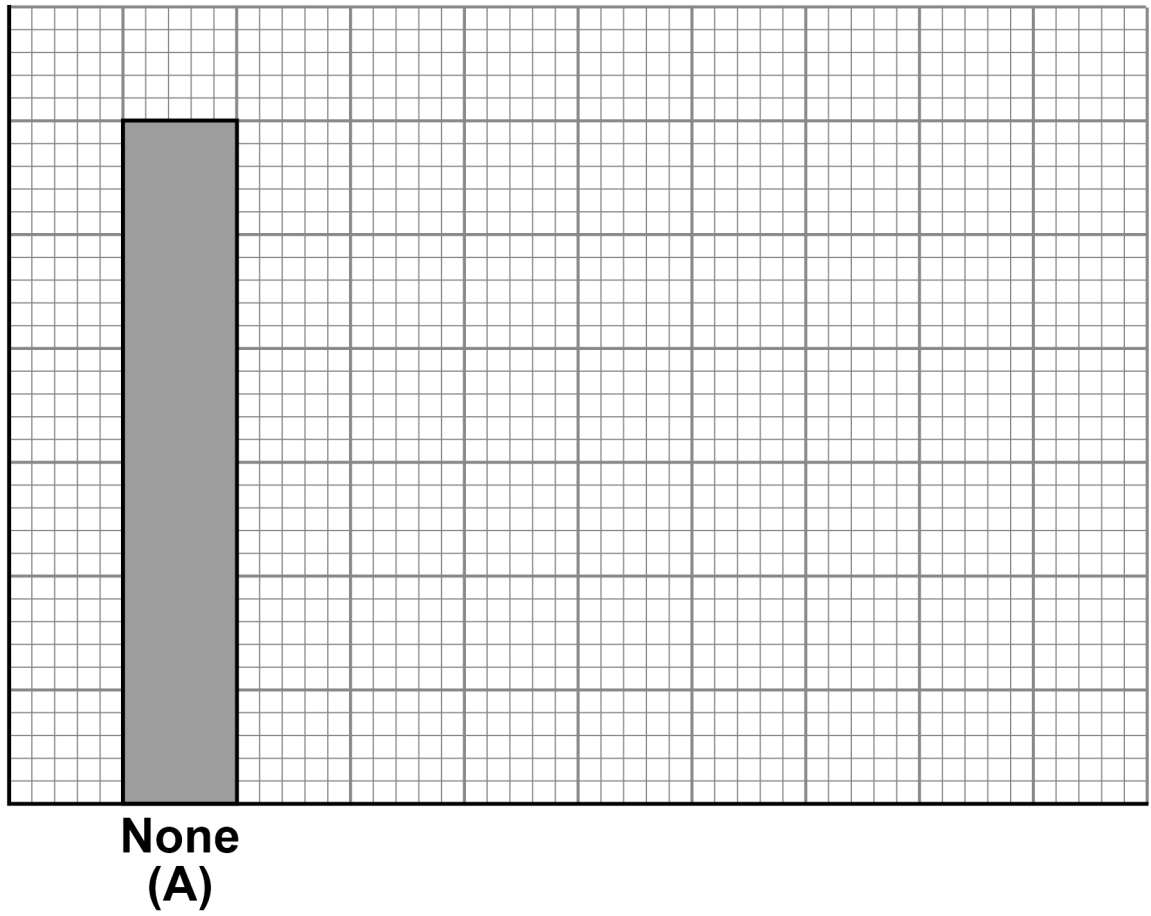
Level of TMV infection

[Turn over]

0 2 . 8

What conclusion can be made from the data in TABLE 1? [1 mark]

_____

_____

_____

0 2 . 9

Explain why a high level of TMV infection reduces growth in a plant. [2 marks]

_____

_____

_____

_____

_____

14

0 3

A cactus is a plant that lives in a dry environment.

FIGURE 6 shows part of a cactus plant.

FIGURE 6
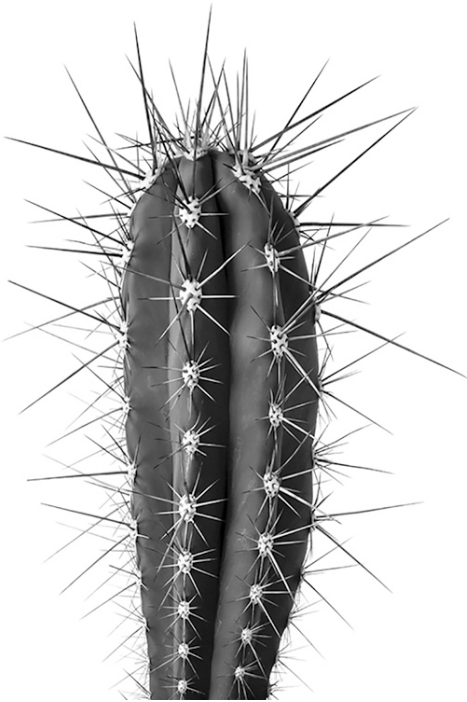
0 3 . 1

Give ONE adaptation shown in FIGURE 6 that helps to prevent the cactus from being eaten by animals.
[1 mark]

_____

_____

[Turn over]

0 3 . 2

A plant may produce poisons that make animals unwell.

What is this type of defence mechanism? [1 mark]

Tick (✓) ONE box.

☐ **Chemical**

☐ **Mechanical**

☐ **Physical**

0 3 . 3

Some desert plants only grow leaves after it has rained.

As soon as the soil dries out, the leaves fall off.

How could the leaves falling off the plant be an advantage to a plant that lives in a dry environment?
[1 mark]

Tick (✓) ONE box.

☐ **The plant is less likely to reproduce.**

☐ **The plant will not lose as much water.**

☐ **The plant will photosynthesise faster.**

[Turn over]

2 3

The stem of a cactus is green.

0 3 . **4**

What causes the green colour in the stem? [1 mark]

_____

_____

0 3 . **5**

What is the advantage to the cactus of having a green stem? [1 mark]

_____

_____

The stem of a cactus contains many different tissues.

0 3 . 6

What name is given to a group of tissues working together? [1 mark]

Tick (✓) ONE box.

☐ **Organ**

☐ **Organism**

☐ **Organ system**

0 3 . 7

Name ONE substance transported through the xylem in the stem of the cactus. [1 mark]

0 3 . 8

Name the tissue that transports dissolved sugars through the stem of the cactus. [1 mark]

8

0 4

Carbohydrates are needed as part of a balanced diet.

0 4 . 1

Which formula shows glucose? [1 mark]

Tick (✓) ONE box.

☐ $C_6H_{12}O_6$

☐ CO_2

☐ H_2O

☐ O_2
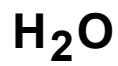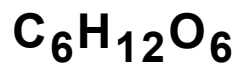
| 0 | 4 | . | 2 |

Which type of enzyme breaks down starch?   [1 mark]

Tick (✓) ONE box.

☐ **Carbohydrase**

☐ **Lipase**

☐ **Protease**

[Turn over]

A student investigated the effect of temperature on the activity of the enzyme amylase.

FIGURE 7 shows the apparatus used.

FIGURE 7

Test tube

Q

Water at 10 °C

5 cm^3 of starch solution

1 cm^3 of amylase solution
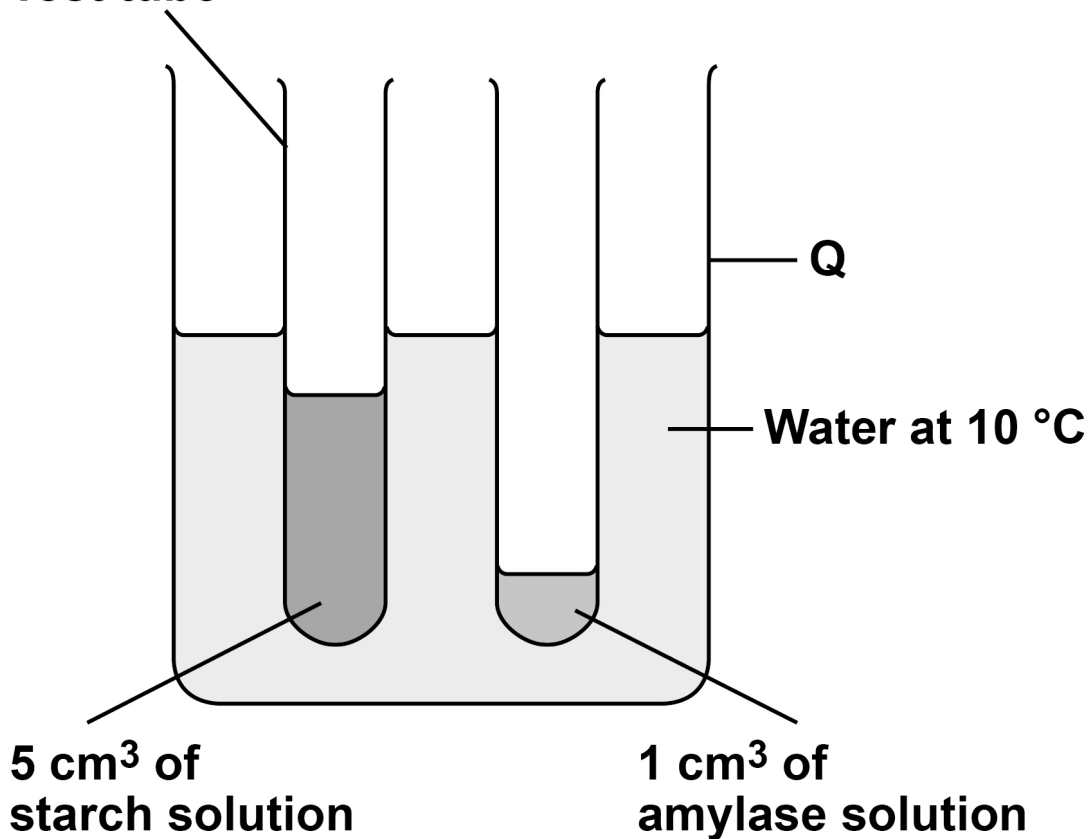
This is the method used.

1. **Set up the apparatus as shown in FIGURE 7.**

2. **After 5 minutes, pour the starch solution into the amylase solution and mix.**

3. **Remove one drop of the amylase-starch solution mixture and place onto a spotting tile.**

4. **Immediately add two drops of iodine solution to the amylase-starch solution mixture on the spotting tile.**

5. **Record the colour of the iodine solution added to the amylase-starch solution mixture.**

6. **Repeat steps 3 to 5 every minute until the iodine solution is yellow-brown.**

| 0 | 4 | . | 3 |

Name apparatus Q in FIGURE 7. [1 mark]

_____

[Turn over]

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0 4 . 4

Why were the starch solution and the amylase solution left for five minutes before mixing them together?
[1 mark]

Tick (✓) ONE box.

☐   **So that both solutions could reach 10 °C**

☐   **So that the student could calculate a mean**

☐   **So that the student could repeat the investigation**

☐   **So that the student had time to draw a table of results**

[Turn over]
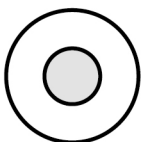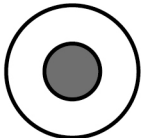
FIGURE 8 shows the results.

FIGURE 8

0 minutes 1 minute

Iodine solution
and amylase-starch
solution mixture

Spotting tile
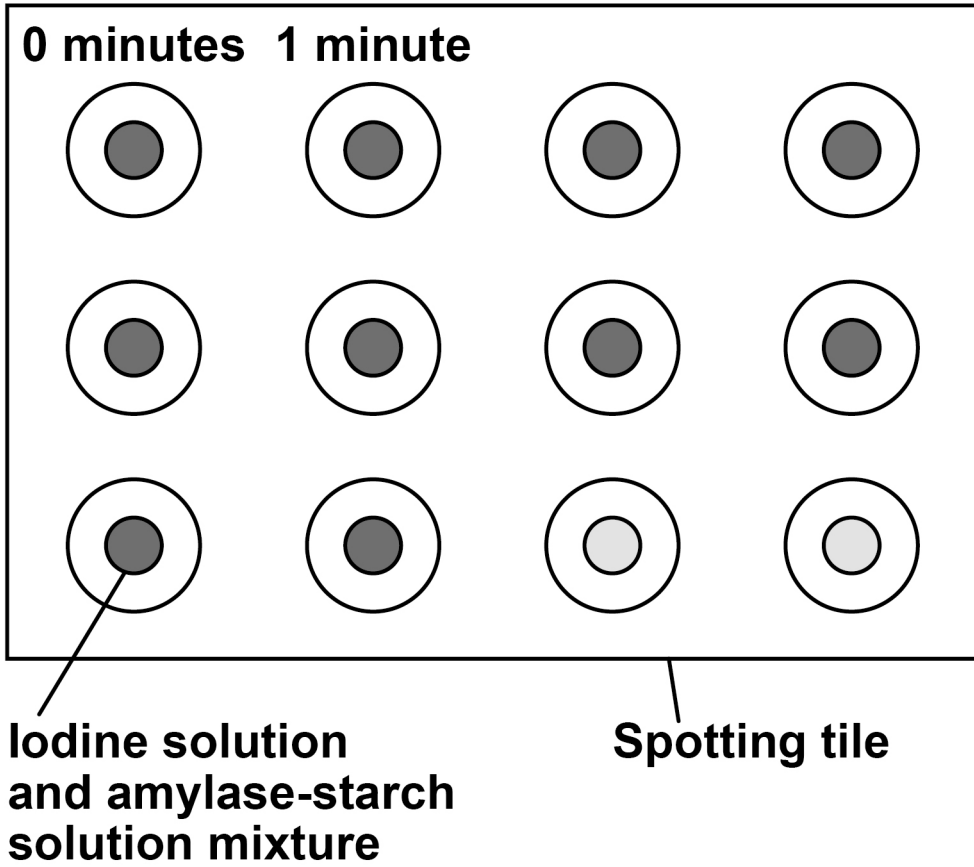
KEY

Yellow-brown

Blue-black

| 0 | 4 | . | 5 |

How many minutes did it take until the iodine solution and amylase-starch solution mixture was yellow-brown?

Use FIGURE 8. [1 mark]

_____ **minutes**

| 0 | 4 | . | 6 |

How could a more accurate time be obtained? [1 mark]

Tick (✓) ONE box.

☐   **Add more iodine solution to the spotting tile.**

☐   **Test the mixture with iodine solution every 30 seconds.**

☐   **Test the mixture with iodine solution for more time.**

☐   **Use two drops of amylase-starch solution mixture in each test.**

[Turn over]

The student repeated the investigation at five different temperatures.

TABLE 2 shows the results.

TABLE 2

Temperature in °C	Time taken until iodine solution and mixture was yellow-brown in minutes
20	5
35	2
50	7
65	12
80	Remained blue-black

0 4 . 7

Which temperature did the enzyme work quickest at?
[1 mark]

Tick (✓) ONE box.

☐ **20 °C**

☐ **35 °C**

☐ **50 °C**

☐ **65 °C**

[Turn over]

| 0 | 4 | . | 8 |

Explain why the iodine solution remained blue-black in the investigation at 80 °C. [2 marks]

_____

_____

_____

_____

_____

9

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[Turn over]

0 5

A high cholesterol concentration in the blood can lead to blockages inside arteries.

The coronary arteries supply blood to the heart muscle.

FIGURE 9 shows a coronary artery with a blockage.

FIGURE 9

Coronary artery

Direction of blood flow
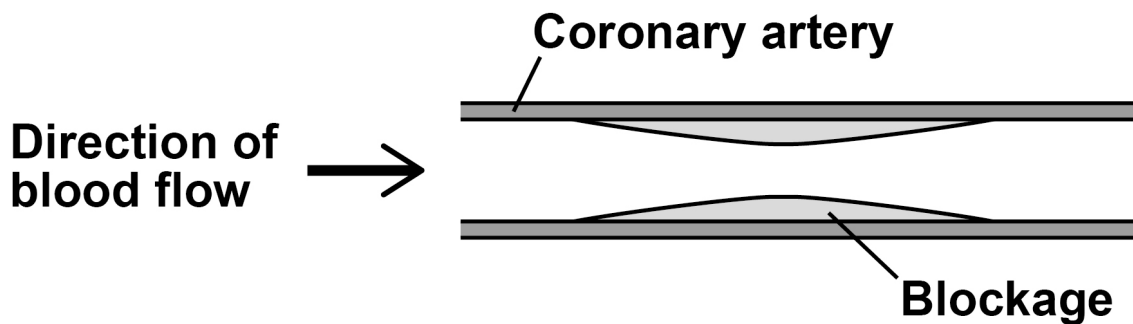
Blockage

0 5 . 1

Why could the blockage in FIGURE 9 cause cells in the heart to die? [2 marks]

[Turn over]

Doctors can measure the concentration of cholesterol in the blood.

TABLE 3 shows four different blood cholesterol categories.

TABLE 3

Blood cholesterol concentration in mmol per dm^3	Cholesterol category
<4.6	Low
4.6–5.0	Normal
5.1–6.1	Medium
6.2 and above	High

FIGURE 10, on the opposite page, shows the blood cholesterol concentration of four people.

FIGURE 10

Blood
cholesterol
concentration
in mmol
per dm^3
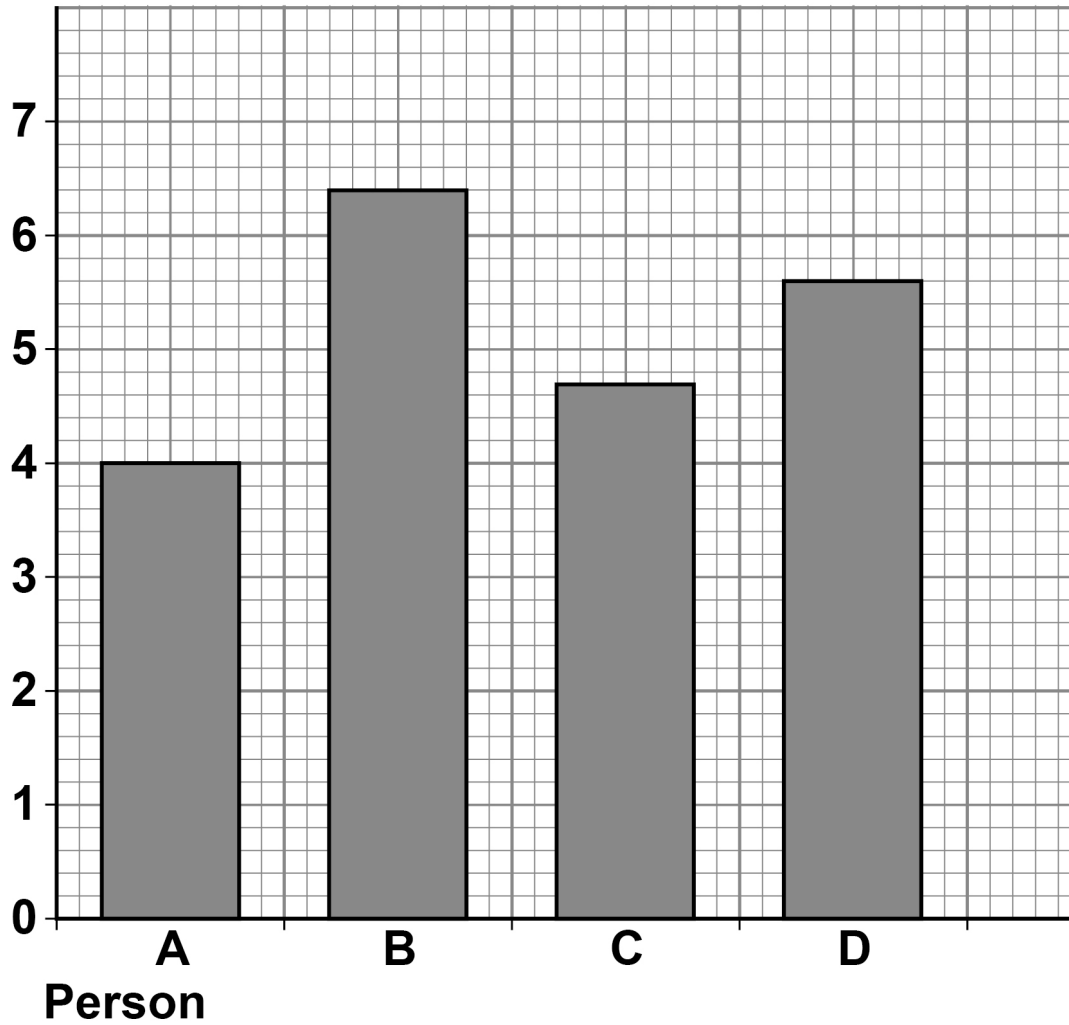
[Turn over]

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0 5 . 2

Which person is in the medium cholesterol category?
[1 mark]

Tick (✓) ONE box.

☐　**A**

☐　**B**

☐　**C**

☐　**D**

[Turn over]

BLANK PAGE

BLANK PAGE

0 5 . 3

Which person is most at risk of having a heart attack?
[1 mark]

Tick (✓) ONE box.

☐   **A**

☐   **B**

☐   **C**

☐   **D**

0 5 . 4

Give a reason for your answer to Question 05.3.
[1 mark]

_____

_____

_____

[Turn over]

REPEAT OF FIGURE 10

Blood
cholesterol
concentration
in mmol
per dm^3
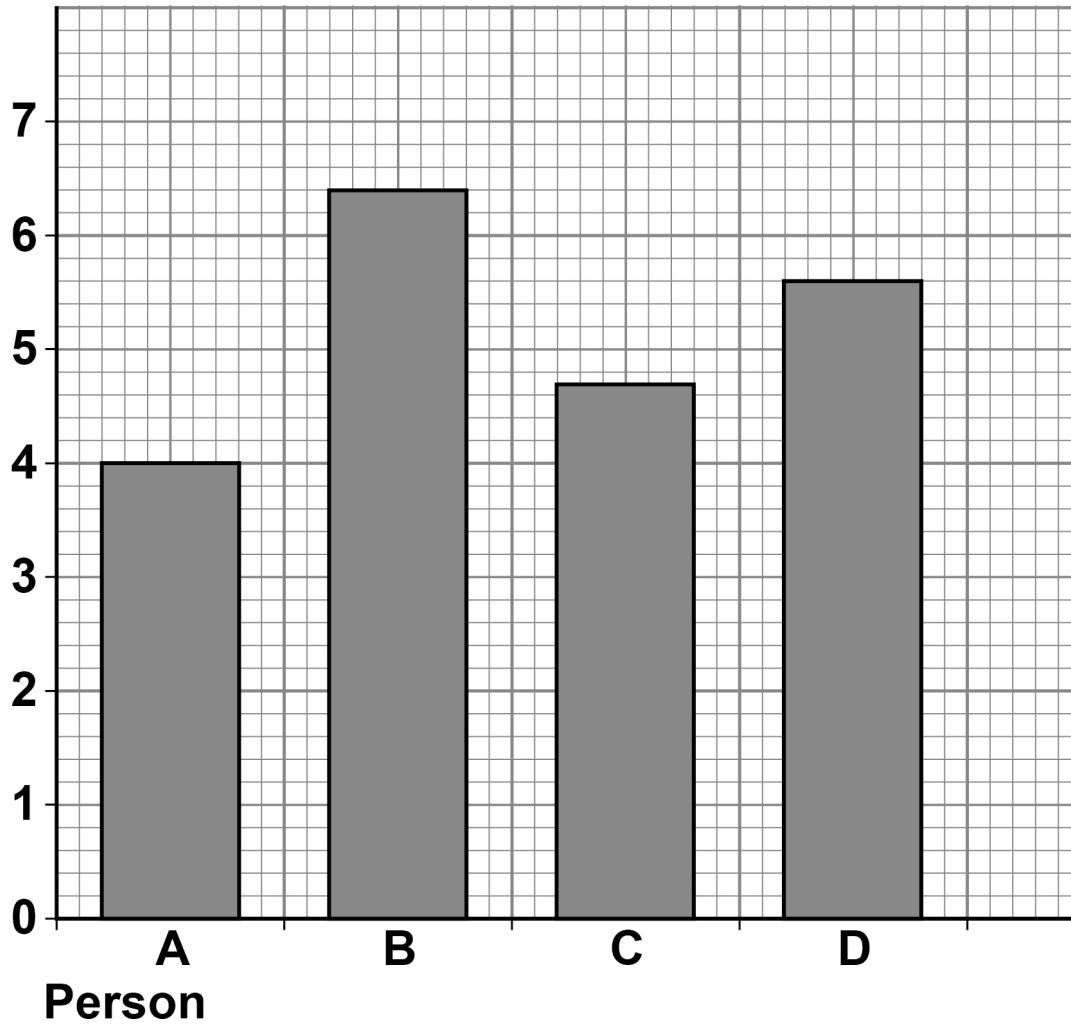
0 5 . 5

The blood cholesterol concentration of person D is greater than the blood cholesterol concentration of person A.

Calculate how many times greater.

Use FIGURE 10, on page 46. [2 marks]

_____

_____

_____

_____

Number of times greater = _____

[Turn over]

FIGURE 11 shows how a stent can be used to treat a person with a blockage in a coronary artery.

FIGURE 11
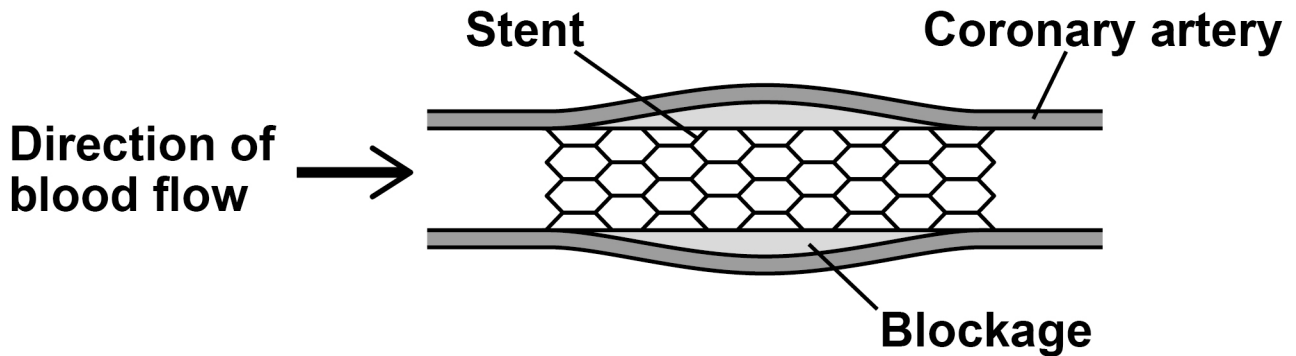
0 5 . 6

Explain how a stent works as a treatment for a person with a blockage in a coronary artery. [2 marks]

_____

_____

_____

_____

_____

_____

Patients are given anti-clotting drugs after they have a stent fitted.

The drugs help to prevent clots forming in the blood.

| 0 | 5 | . | 7 |

Which part of the blood starts the blood clotting process? [1 mark]

Tick (✓) ONE box.

☐   **Antibodies**

☐   **Plasma**

☐   **Platelets**

☐   **Red blood cells**

[Turn over]

0 5 . 8

When a stent is fitted the doctor gives the patient an injection of anti-clotting drugs.

The patient then takes one anti-clotting tablet every day.

Anti-clotting drugs:

- are very effective

- can take a week to begin working fully

- have been used for over 60 years

- cost very little to make

- do NOT work effectively if the patient eats certain types of food.

The patient must have their blood tested every few weeks to check that the anti-clotting drugs are working.

Evaluate the use of anti-clotting drugs in patients who have had a stent fitted. [4 marks]

_____

_____

_____

_____

14

0 6

FIGURE 12 shows a model used to demonstrate human breathing.

FIGURE 12
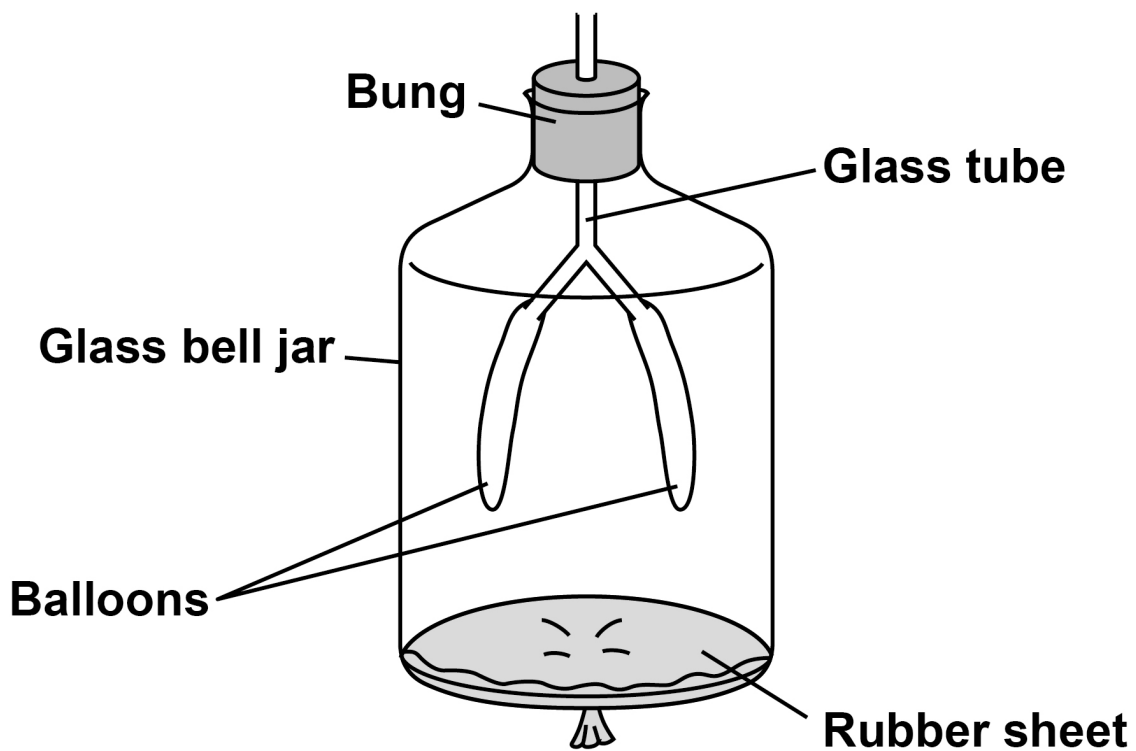
0 6 . 1

Which part of the breathing system is represented by the glass tube? [1 mark]

Tick (✓) ONE box.

☐   **Alveoli**

☐   **Capillaries**

☐   **Lung**

☐   **Trachea**

[Turn over]

The model in FIGURE 12 represents the human breathing system.

A teacher said:

"The model does NOT represent the human breathing system very well."

| 0 | 6 | . | 2 |

Give TWO reasons why the teacher is correct.
[2 marks]

1 _____

_____

_____

2 _____

_____

_____

A scientist investigated the effect of exercise on breathing rate.

This is the method used.

1. Record the breathing rates of 10 male non-smokers at rest.

2. Tell each man to run on a treadmill at the same speed for 8 minutes.

3. Record the breathing rate of each man every 2 minutes.

4. Continue to record the breathing rate of each man for 4 minutes after he stops running.

| 0 | 6 | . | 3 |

Give TWO variables the scientist controlled in the investigation. [2 marks]

1 _____

2 _____

[Turn over]

FIGURE 13, on the opposite page, shows the data collected from ONE of the men.

0 6 . **4**

Calculate the percentage increase in the man's breathing rate between 0 minutes and 8 minutes. [3 marks]

Use the equation:

percentage increase =

$$\frac{(\text{breathing rate at 8 minutes} - \text{breathing rate at 0 minutes})}{\text{breathing rate at 0 minutes}} \times 100$$

_____

_____

_____

Percentage increase = _____ %

FIGURE 13

Breathing rate in breaths per minute

Time in minutes
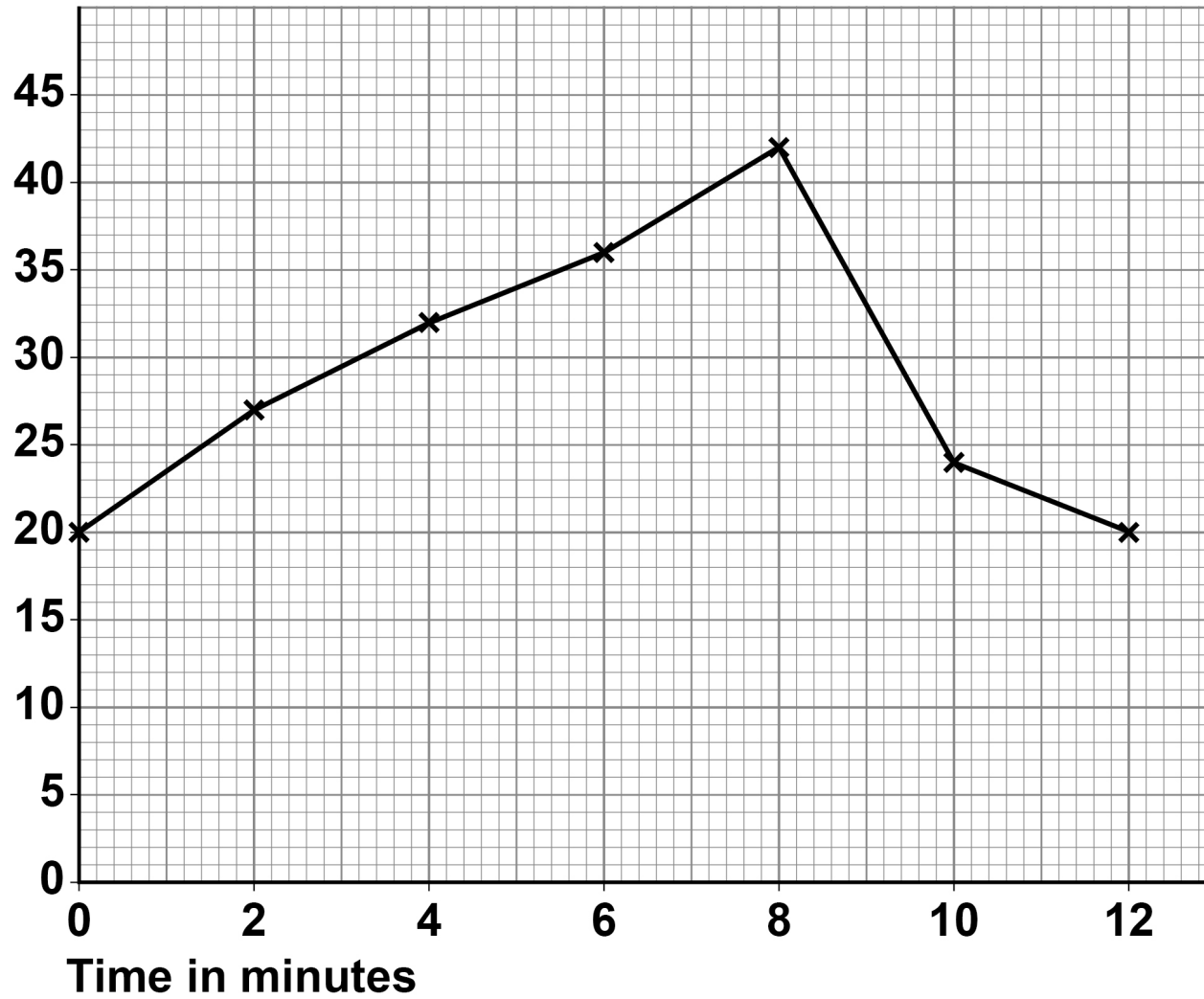
0 6 . **5**

Explain why the man's breathing rate increased when he was running. [2 marks]

_____

_____

_____

_____

_____

0 6 . **6**

Give ONE measurement that could be taken to show a different effect of exercise on the body.

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

_____

0 6 . 7

The men in the investigation were all non-smokers.

Give ONE effect that smoking can have on the body.
[1 mark]

_____

_____

_____

[Turn over]

12

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0	7

A student prepared some animal cells to view using a microscope.

FIGURE 14 shows the student preparing the cells.

FIGURE 14
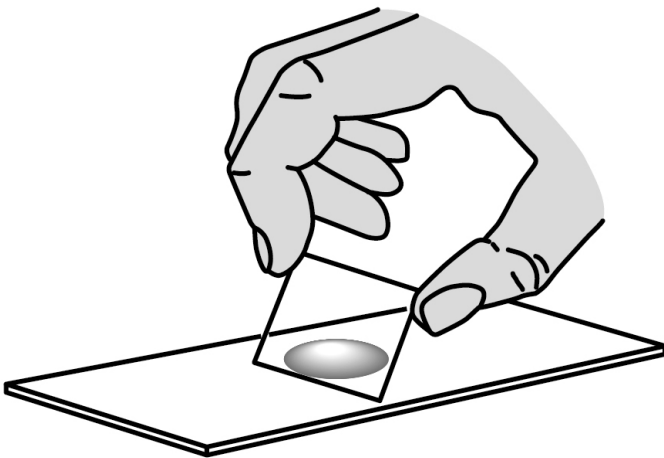
0	7	.	1

Name TWO pieces of laboratory equipment the student could have used to PREPARE cells to view using a microscope. [2 marks]

1 _____

_____

2 _____

_____

[Turn over]

FIGURE 15 shows the student's light microscope.

FIGURE 15
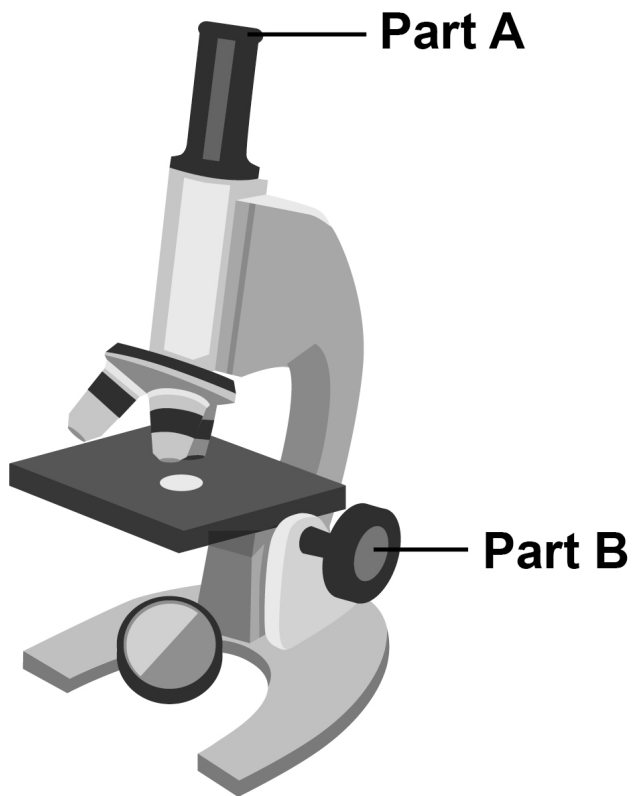
| 0 | 7 |.| 2 |

Name part A. [1 mark]

0 7 . 3

What is the function of part B? [1 mark]

_____

_____

_____

0 7 . 4

The student tried to look at the cells using the microscope.

Suggest ONE reason why the student could NOT see any cells when looking through part A. [1 mark]

_____

_____

_____

[Turn over]

0 7 . 5

Red blood cells are specialised animal cells.

Compare the structure of a red blood cell with the structure of a plant cell. [6 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

0 7 . 6

When placed into a beaker of water:

- **a red blood cell bursts**

- **a plant cell does NOT burst.**

Explain why the red blood cell bursts but the plant cell does NOT burst. [2 marks]

13

BLANK PAGE

[Turn over]

0 8

A student investigated the effectiveness of three different antibiotics.

FIGURE 16, on the opposite page, shows how the student set up an agar plate.

The student used aseptic techniques to make sure that only one type of bacterium was growing on the agar.

0 8 . 1

Describe TWO aseptic techniques the student should have used. [2 marks]

1 _____

_____

_____

_____

2 _____

_____

_____

_____

FIGURE 16

Bacteria growing on agar

Filter paper disc containing antibiotic A

Filter paper disc containing antibiotic B

A

B

C

Filter paper disc containing antibiotic C

Petri dish
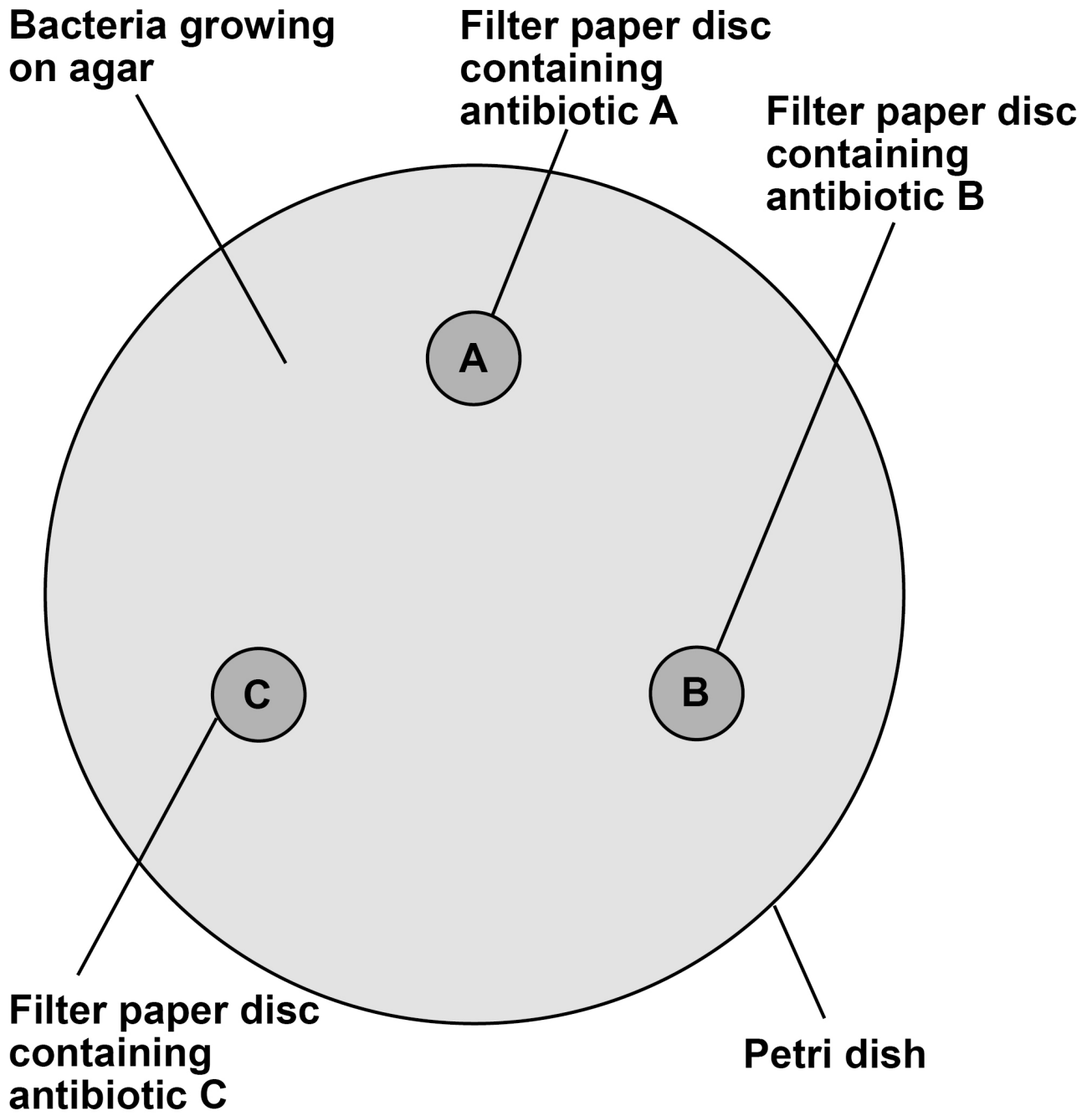
[Turn over]

The student placed the agar plate in an incubator at 25 °C for 48 hours.

FIGURE 17 shows the agar plate after 48 hours.

FIGURE 17

Bacteria growing on agar

Area where no bacteria were growing

A

C

B

Petri dish

0 8 . 2

Which antibiotic is the LEAST effective?

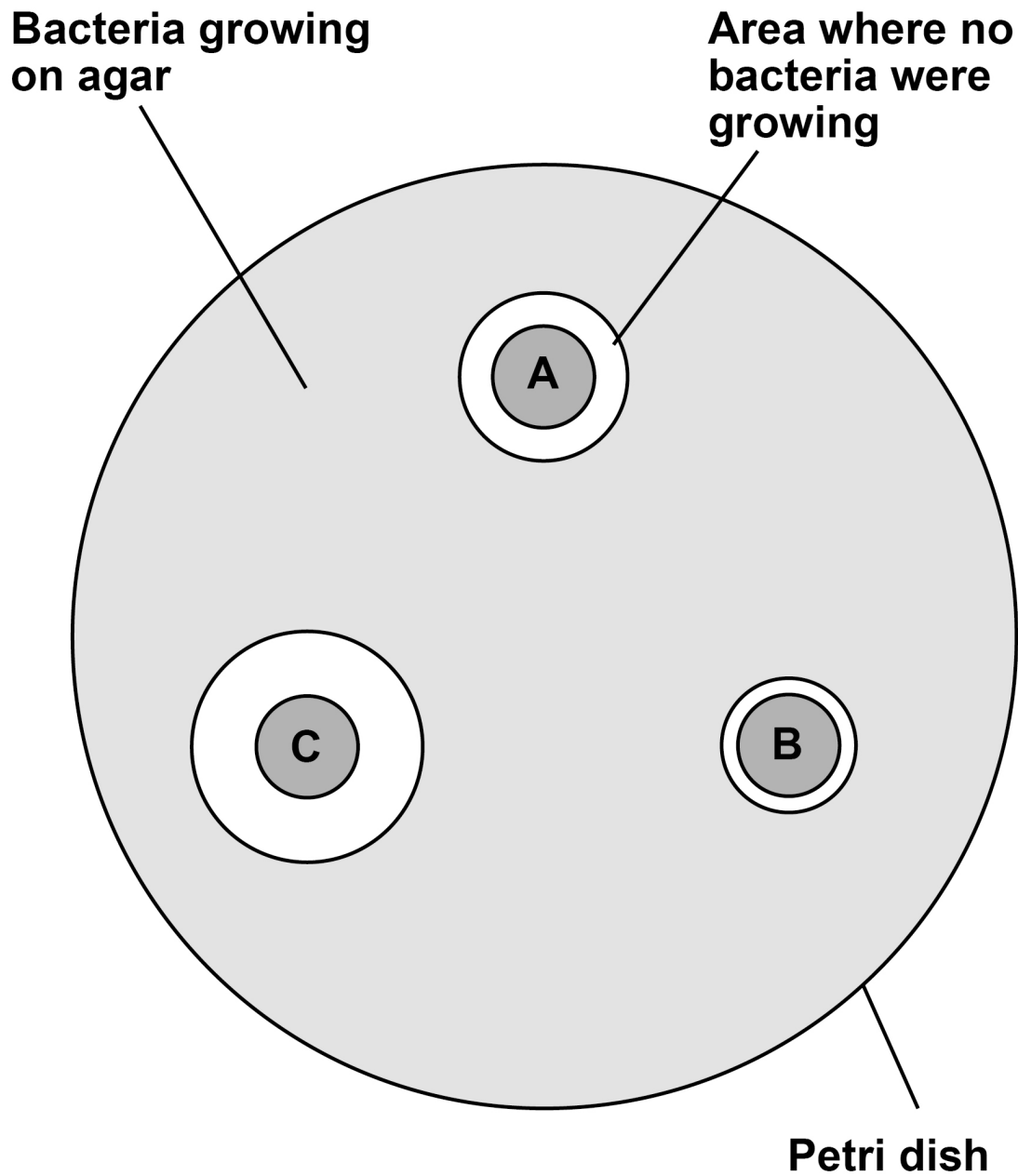**Give a reason for your answer. [1 mark]**

Least effective antibiotic _____

Reason _____

_____

_____

_____

[Turn over]

0 8 . 3

Calculate the area where no bacteria were growing for antibiotic C.

Use π = 3.14

Give the unit. [5 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Area = _____

Unit _____

| 0 | 8 |.| 4 |

Suggest ONE way the student could improve the investigation. [1 mark]

_____

_____

_____

[Turn over]

9

0 9

Body Mass Index (BMI) is a way of finding out if a person's body mass falls within a healthy range for their height.

TABLE 4 shows information about two people.

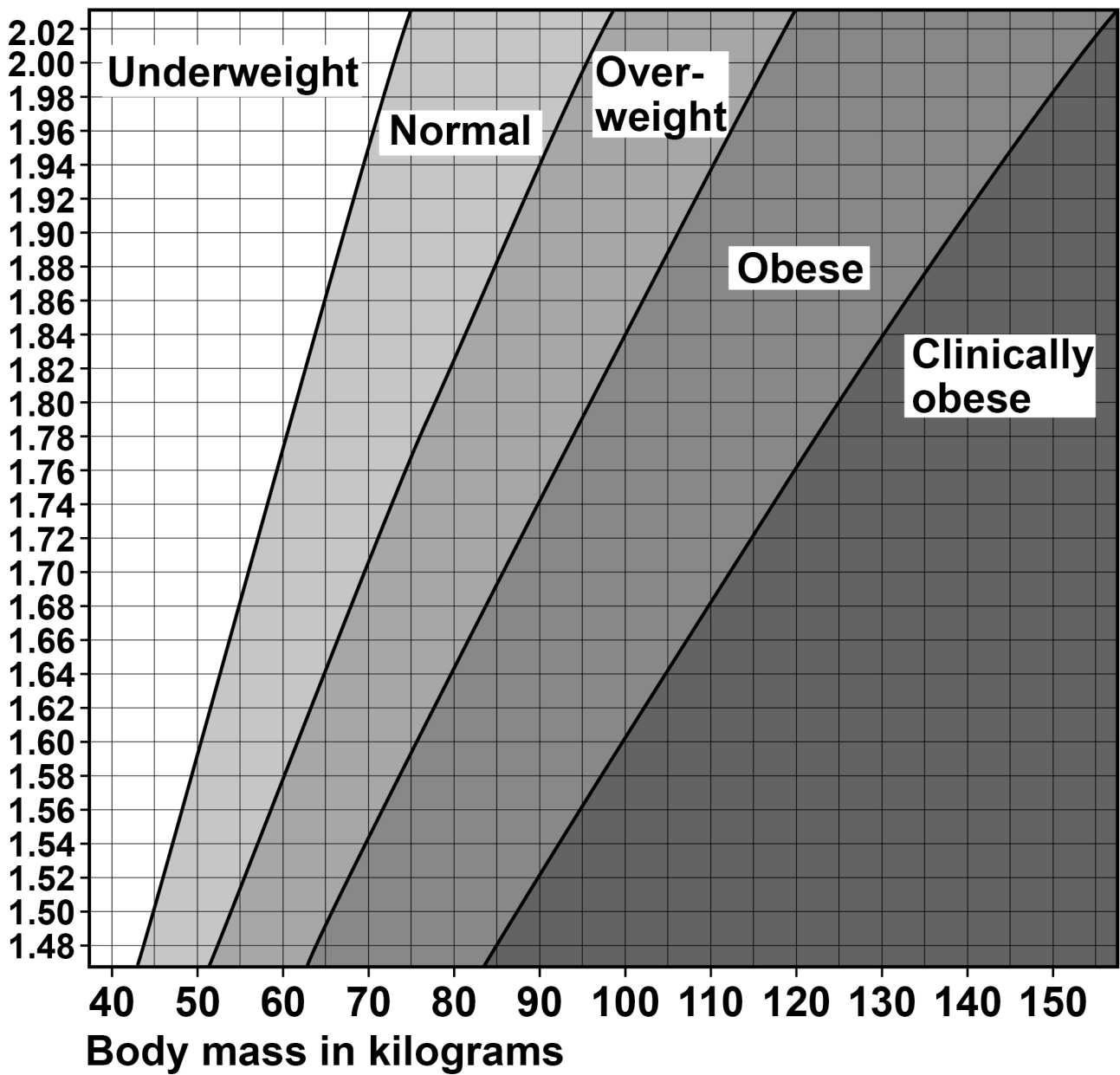TABLE 4

Person	Body mass in kg	Height in m	BMI in kg/m^2
A	63	1.65	23.1
B	92	1.71	X

FIGURE 18, on the opposite page, shows five BMI categories for adults.

FIGURE 18

[Turn over]

0 9 . 1

Which is the BMI category of person A in TABLE 4?
[1 mark]

Tick (✓) ONE box.

☐ **Clinically obese**

☐ **Normal**

☐ **Obese**

☐ **Overweight**

☐ **Underweight**

REPEAT OF TABLE 4

Person	Body mass in kg	Height in m	BMI in kg/m²
A	63	1.65	23.1
B	92	1.71	X

09.2

Calculate value X in TABLE 4.

Use the equation:

$$BMI = \frac{body\ mass}{height^2}$$

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

_____

_____

_____

_____

_____

_____

_____

X = _____ **kg/m^2**

[Turn over]

Scientists think there is a link between BMI and life expectancy.

TABLE 5 shows information about predicted life expectancy of men after the age of 50.

TABLE 5

BMI Category	Predicted number of years living in good health after the age of 50	Predicted number of years living in bad health after the age of 50
Normal	19.06	4.98
Overweight	18.68	5.32
Obese	16.37	7.08
Clinically obese	13.07	10.10

0 9 . 3

Describe TWO patterns shown in TABLE 5 about the effects of BMI category. [2 marks]

1 _____

_____

_____

_____

2 _____

_____

_____

_____

[Turn over]

The number of people who are obese in the UK is increasing.

| 0 | 9 |.| 4 |

Explain the financial impact on the UK economy of an increasing number of people who are obese. **[2 marks]**

_____

_____

_____

_____

_____

0 9 . 5

A person who is obese is more at risk of arthritis.

Arthritis is a condition that damages joints.

Suggest how arthritis could affect a person's lifestyle.
[1 mark]

_____

_____

0 9 . 6

A person who eats a diet high in saturated fat might become obese.

Name TWO health conditions that might develop if a person eats a diet high in saturated fat.

Do NOT refer to arthritis in your answer. [2 marks]

1 _____

_____

2 _____

_____

END OF QUESTIONS

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Additional page, if required.
Write the question numbers in the left-hand margin.

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