

A



**Surname** \_\_\_\_\_

**Forename(s)** \_\_\_\_\_

**Centre Number** \_\_\_\_\_

**Candidate Number** \_\_\_\_\_

**Candidate Signature** \_\_\_\_\_

**I declare this is my own work.**

**GCSE**

**BIOLOGY**

**H**

**Higher Tier Paper 1H**

**8461/1H**

**Tuesday 16 May 2023**

**Morning**

**Time allowed: 1 hour 45 minutes**

**[Turn over]**



J U N 2 3 8 4 6 1 1 H 0 1

## **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 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**



0 1

**A root is a plant organ.**

**Plant roots contain many different types of tissue.**

0 1 . 1

**What is a tissue? [1 mark]**

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**0** **1** . **2**

**Tissue in the tip of a plant root contains stem cells.**

**Stem cells can differentiate into any type of cell.**

**Name the type of tissue in plants that contains stem cells. [1 mark]**

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**[Turn over]**

**In the past many drugs were extracted from plants.**

**0 1 . 3**

**Aspirin is a painkiller.**

**Which plant does aspirin originate from?  
[1 mark]**

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**Scientists have extracted chemical A from the deadly nightshade plant.**

**Chemical A can be used as a painkiller.**

**TABLE 1, on the opposite page, shows information about where chemical A is found.**



**TABLE 1**

<b>Part of deadly nightshade plant</b>	<b>Mass of chemical A in 100 g of plant tissue in grams</b>
<b>Roots</b>	<b>1.3</b>
<b>Leaves</b>	<b>1.2</b>
<b>Berries</b>	<b>0.7</b>

**0 1 . 4**

**The scientists usually extract chemical A from the berries of the deadly nightshade plant.**

**Suggest ONE reason why berries are used instead of leaves or roots. [1 mark]**

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**[Turn over]**

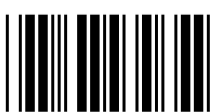


**A deadly nightshade plant has chlorosis (yellow leaves).**

**The mass of chemical A found in the LEAVES of the plant is 60% of the mass shown in TABLE 1.**

### **REPEAT OF TABLE 1**

<b>Part of deadly nightshade plant</b>	<b>Mass of chemical A in 100 g of plant tissue in grams</b>
<b>Roots</b>	<b>1.3</b>
<b>Leaves</b>	<b>1.2</b>
<b>Berries</b>	<b>0.7</b>





01.5

**Calculate the mass of chemical A in 200 g of the LEAVES with chlorosis.**

**Give your answer in mg. [4 marks]**

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**Mass of chemical A = \_\_\_\_\_ mg**

**[Turn over]**



01.6

**Suggest ONE reason why the leaves of the deadly nightshade plant have chlorosis. [1 mark]**

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**Chemical A has NOT been tested in large-scale clinical trials in the UK.**

**0 1 . 7**

**It is important for drugs to be tested in clinical trials before the drugs are approved for use by the public.**

**Give TWO reasons why. [2 marks]**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**[Turn over]**



**There are many online reports making claims about the effects of chemical A.**

**Some of these reports are biased.**

**0 1 . 8**

**Suggest ONE reason why a report making claims about the effects of chemical A may be biased. [1 mark]**

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0	1	.	9
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**How can scientists be sure that claims about new drugs are valid? [1 mark]**

**Tick (✓) ONE box.**

**Advertise the claims on social media.**

**Ask an international company to produce the drug.**

**Have the claims peer reviewed.**

**Publish the claims in a newspaper.**

<b>13</b>

**[Turn over]**

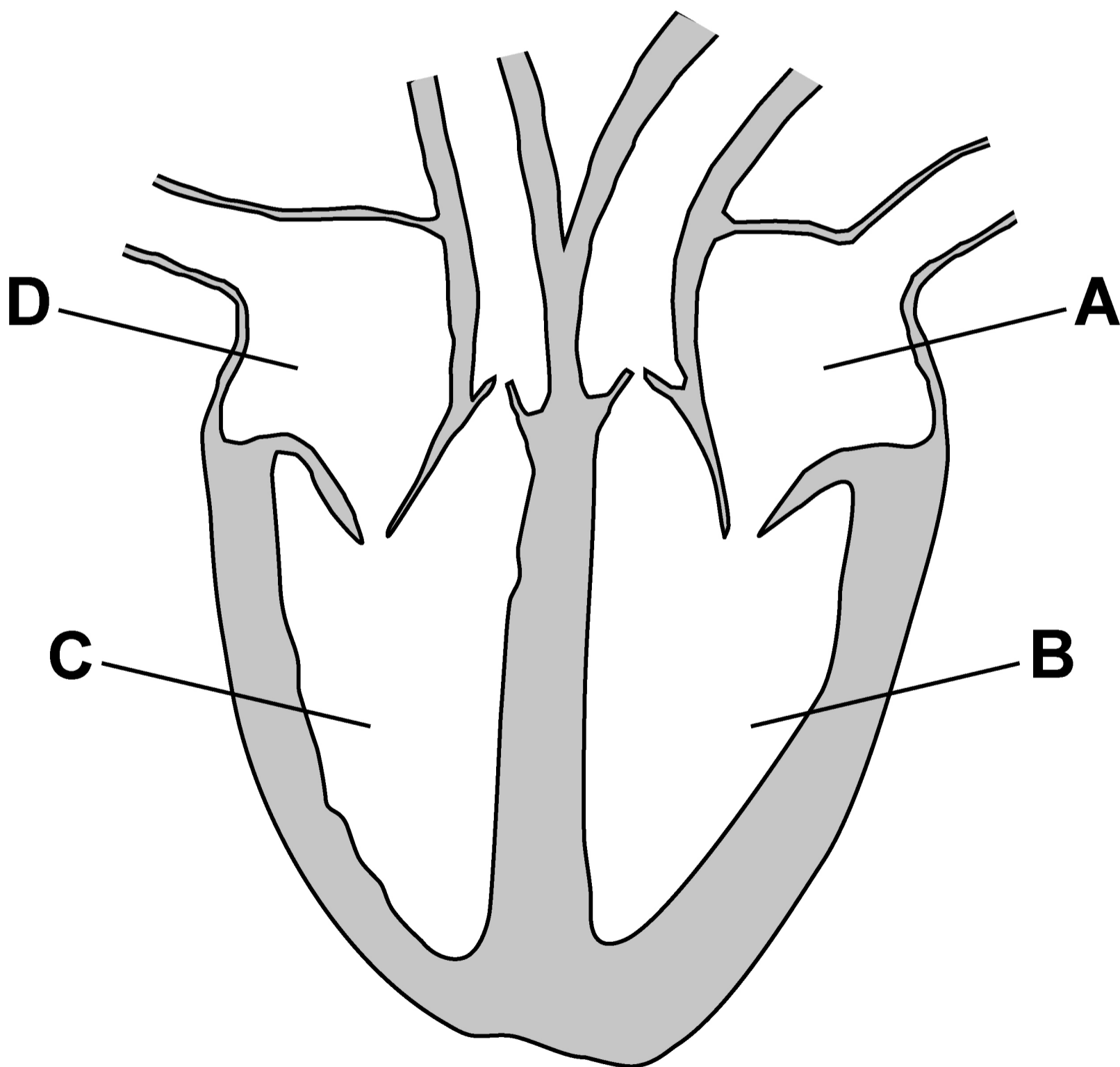


02

This question is about the circulatory system.

FIGURE 1 shows the human heart.

FIGURE 1



0	2	.	1
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**Which part of the heart receives oxygenated blood from the lungs?  
[1 mark]**

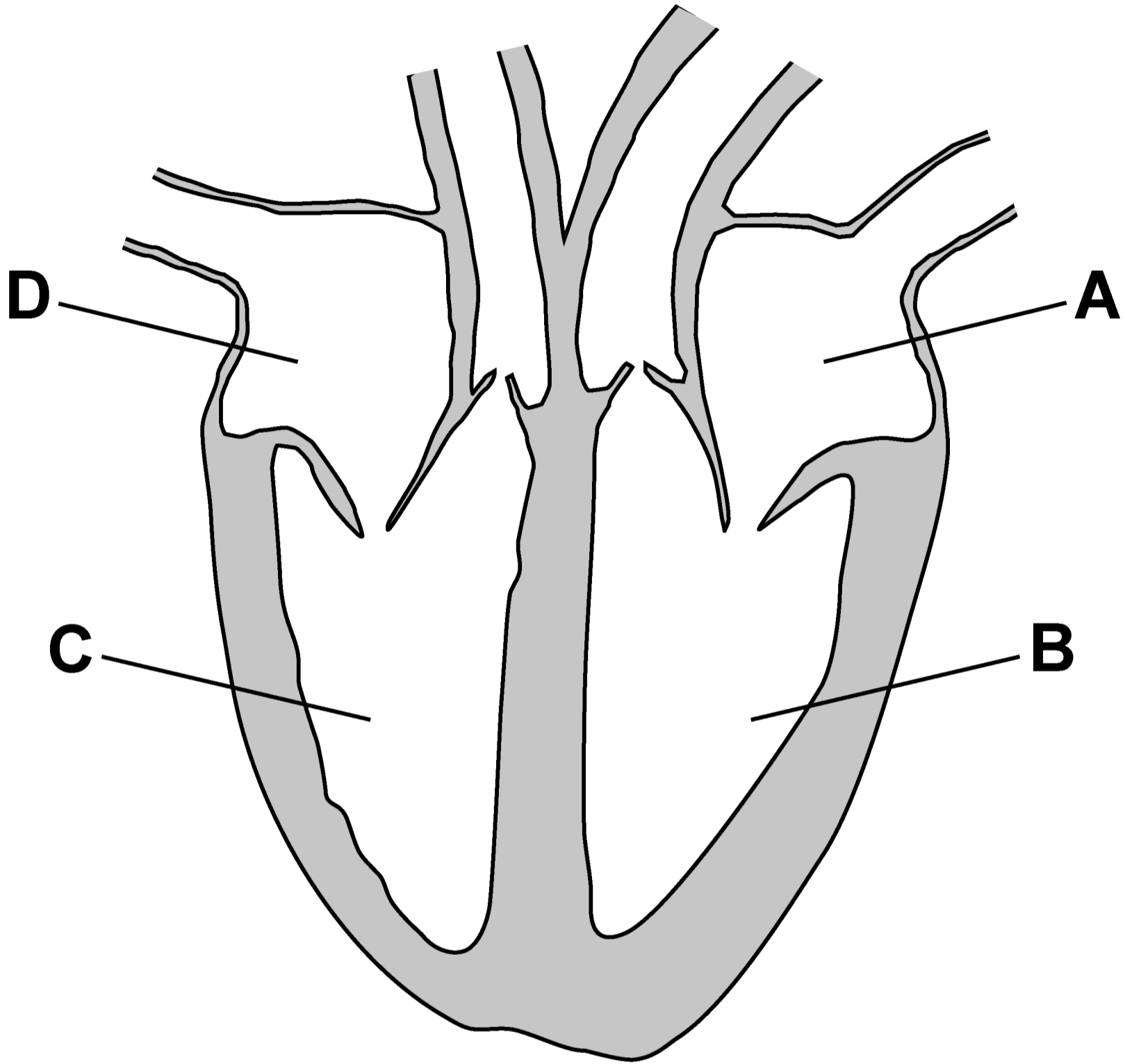
**Tick (✓) ONE box.**

**A****B****C****D**

**[Turn over]**



REPEAT OF FIGURE 1





**0 2 . 2**

**Which part of the heart pumps  
deoxygenated blood to the lungs?  
[1 mark]**

**Tick (✓) ONE box.**

**A****B****C****D**

**[Turn over]**



**0 2 . 3**

**A group of cells called the pacemaker controls the resting heart rate.**

**Where in the heart is the pacemaker found? [1 mark]**

**Tick (✓) ONE box.**

**Left atrium**

**Left ventricle**

**Right atrium**

**Right ventricle**



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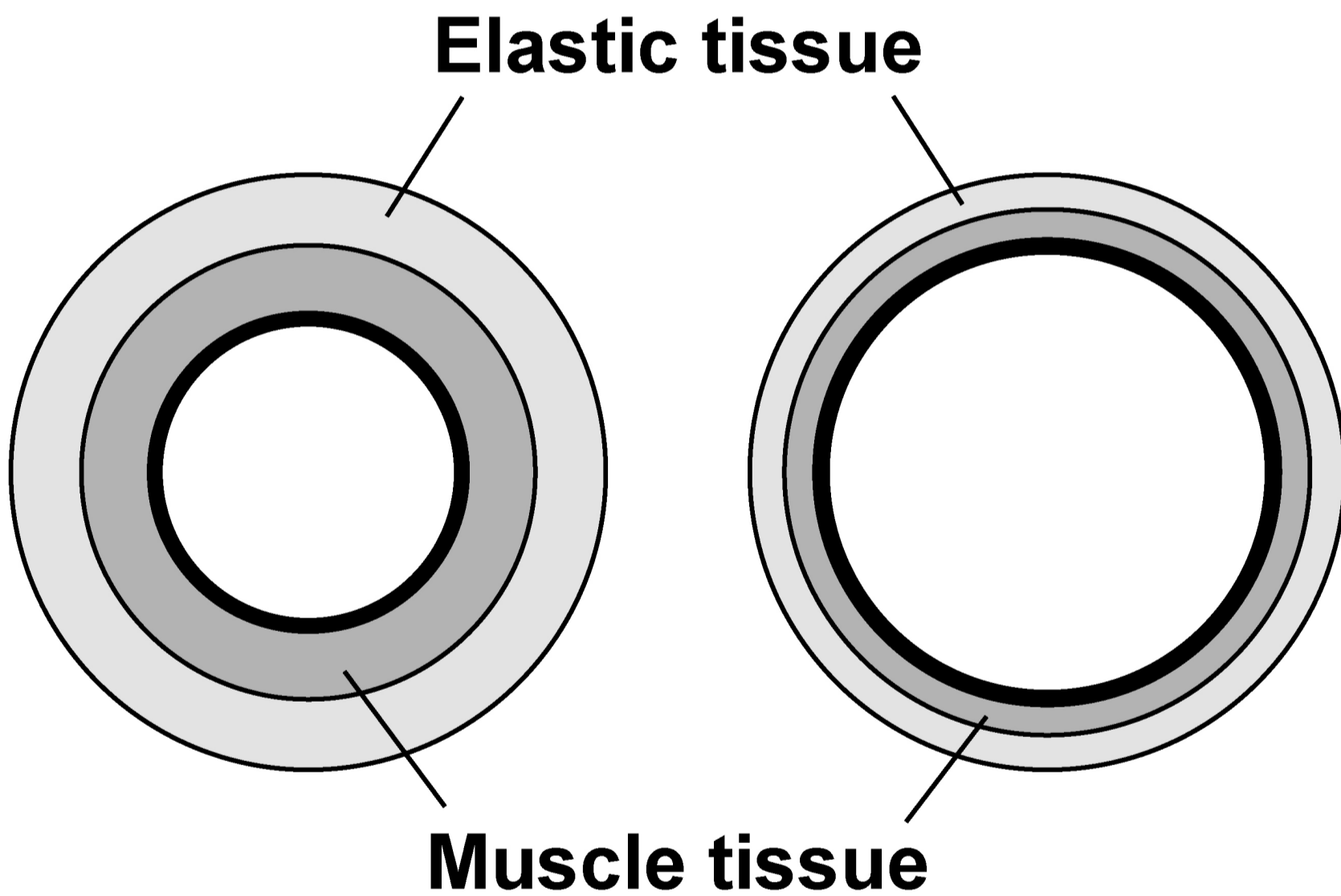
**[Turn over]**



**02.4**

**FIGURE 2** shows a cross section of an artery and of a vein.

**FIGURE 2**



**Describe TWO ways that the structure of an artery is different from the structure of a vein. [2 marks]**

**1** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**2** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**[Turn over]**



02.5

**In coronary heart disease, the coronary arteries become narrower.**

**A build-up of fatty material can cause a blockage in a coronary artery.**

**TABLE 2 shows how a blockage in a coronary artery affects blood flow.**

**TABLE 2**

<b>Percentage (%) of coronary artery that is blocked</b>	<b>Blood flow in <math>\text{cm}^3/\text{minute}</math></b>
<b>0</b>	<b>100</b>
<b>10</b>	<b>64</b>
<b>20</b>	<b>42</b>
<b>50</b>	<b>8</b>
<b>80</b>	<b>2</b>



**Describe the trend shown in TABLE 2.  
[1 mark]**

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**[Turn over]**



**REPEAT OF TABLE 2**

<b>Percentage (%) of coronary artery that is blocked</b>	<b>Blood flow in cm<sup>3</sup>/minute</b>
<b>0</b>	<b>100</b>
<b>10</b>	<b>64</b>
<b>20</b>	<b>42</b>
<b>50</b>	<b>8</b>
<b>80</b>	<b>2</b>

**0 2 . 6**

**Complete FIGURE 3, on the opposite page.**

**You should:**

- use a suitable scale for the y-axis**
- plot the data from TABLE 2**
- draw a line of best fit.**

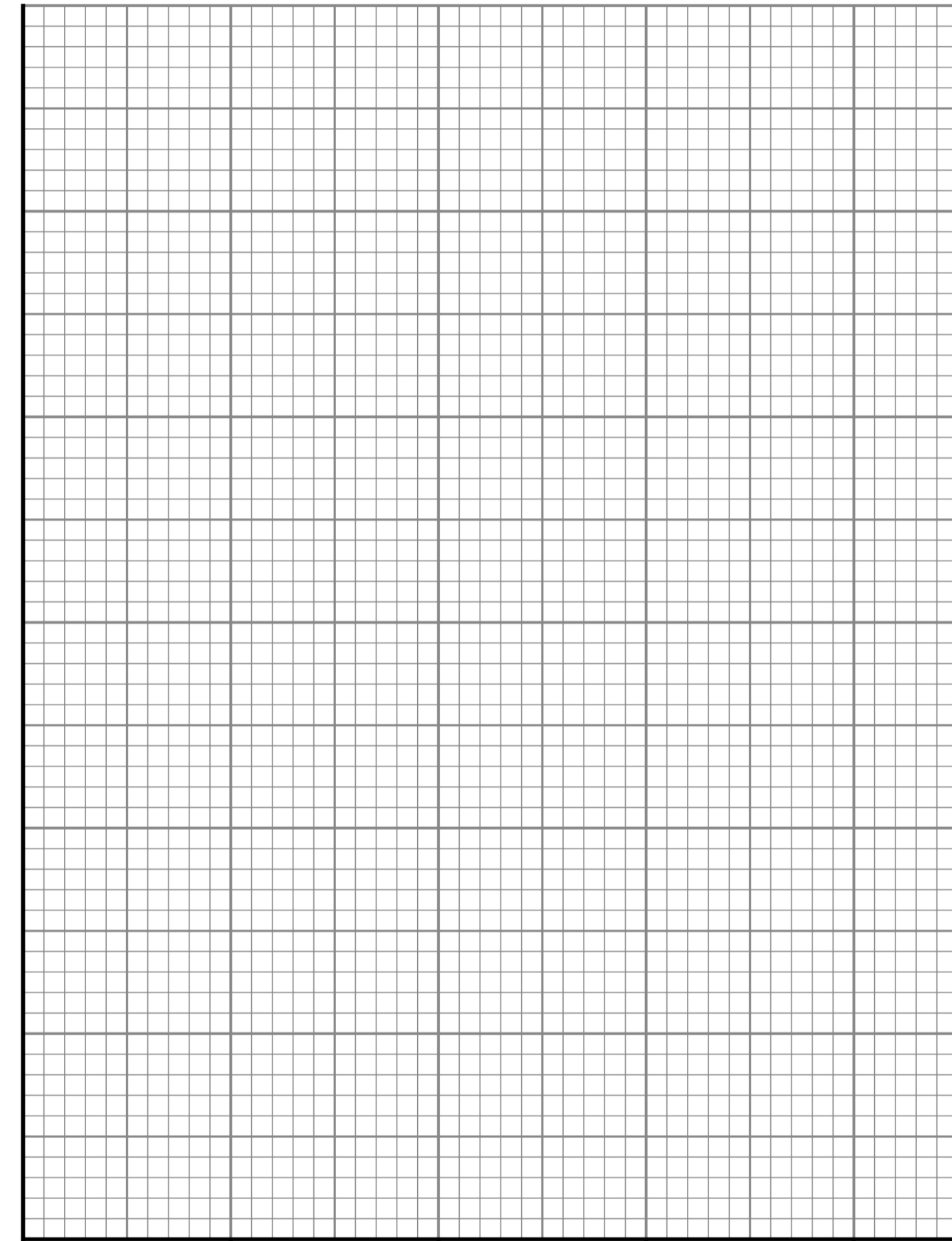
**[4 marks]**





**FIGURE 3**

**Blood flow in  
cm<sup>3</sup>/minute**



**0            20            40            60            80**

**Percentage (%) of coronary  
artery that is blocked**

**[Turn over]**



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0	2	.	7
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**Predict the blood flow in a coronary artery with a 35% blockage.**

**Use FIGURE 3, on page 25. [1 mark]**

**Blood flow = \_\_\_\_\_ cm<sup>3</sup>/minute**

**[Turn over]**



**0 2 . 8**

**Explain the effect of a partly blocked coronary artery on the human body.  
[6 marks]**

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**[Turn over]**



0 2 . 9

**There are different treatments for a blockage in a coronary artery.**

**Explain how ONE treatment for a blockage in a coronary artery works.  
[2 marks]**

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19



03

**‘Salmonella’ bacteria cause outbreaks of food poisoning in humans.**

**To prevent food poisoning in humans, farmers vaccinate their animals against ‘Salmonella’ bacteria.**

03.1

**How do ‘Salmonella’ bacteria in food cause the symptoms of vomiting and diarrhoea? [1 mark]**

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**[Turn over]**



**During a food poisoning outbreak, scientists identified the farm where the food came from.**

**The farmer had NOT vaccinated the farm animals against 'Salmonella' bacteria.**

**0 3 . 2**

**The food poisoning outbreak could have been prevented if the farm animals had been vaccinated.**

**Explain how:**

- the immune systems of animals respond to a vaccination**
- the immune response in farm animals prevents an outbreak of food poisoning in humans.**

**[4 marks]**







**Most cases of food poisoning do NOT need to be treated with antibiotics.**

**However, some patients may need to take antibiotics to recover.**

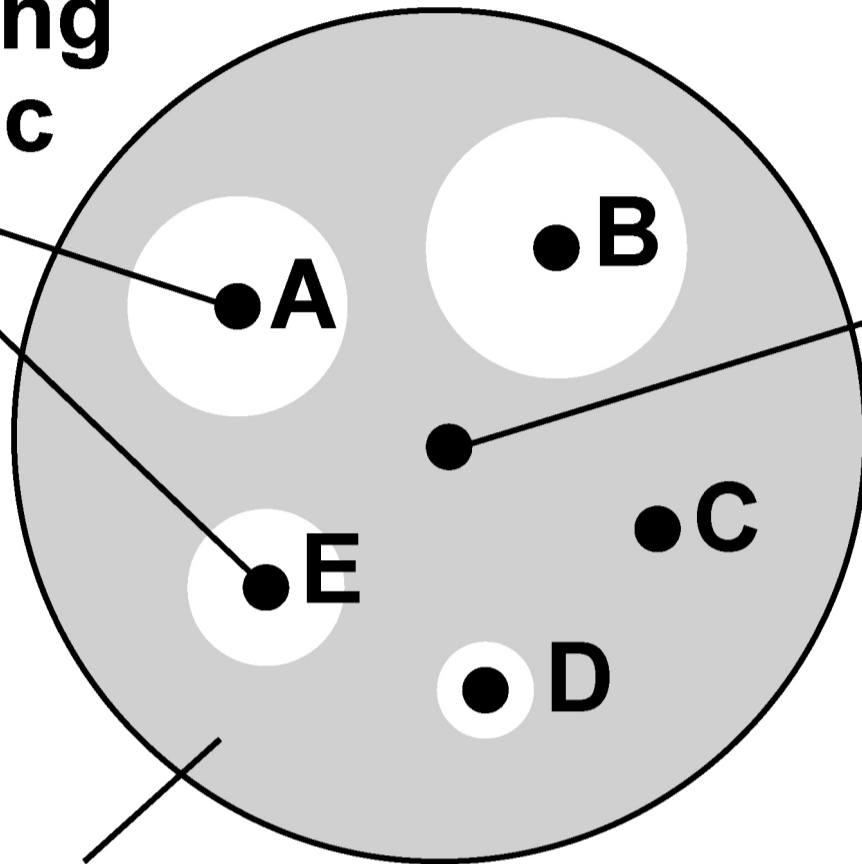
**Scientists investigated the effectiveness of five different antibiotics on the 'Salmonella' bacteria in the outbreak.**

**Antibiotics A, B, C, D and E were used in the investigation.**

**FIGURE 4, on the opposite page, shows the results.**

**FIGURE 4**

**Paper discs  
containing  
antibiotic**



**Paper disc  
with no  
antibiotic**

**'Salmonella'  
bacteria growing**

**[Turn over]**

03.3

**Describe TWO aseptic techniques the scientists should have used in the investigation. [2 marks]**

1 \_\_\_\_\_  
\_\_\_\_\_

2 \_\_\_\_\_  
\_\_\_\_\_

03.4

**The scientists incubated the bacteria at 37 °C.**

**Students in school laboratories incubate bacteria at 25 °C.**

**Explain why scientists use 37 °C but students must use 25 °C to incubate bacteria. [3 marks]**

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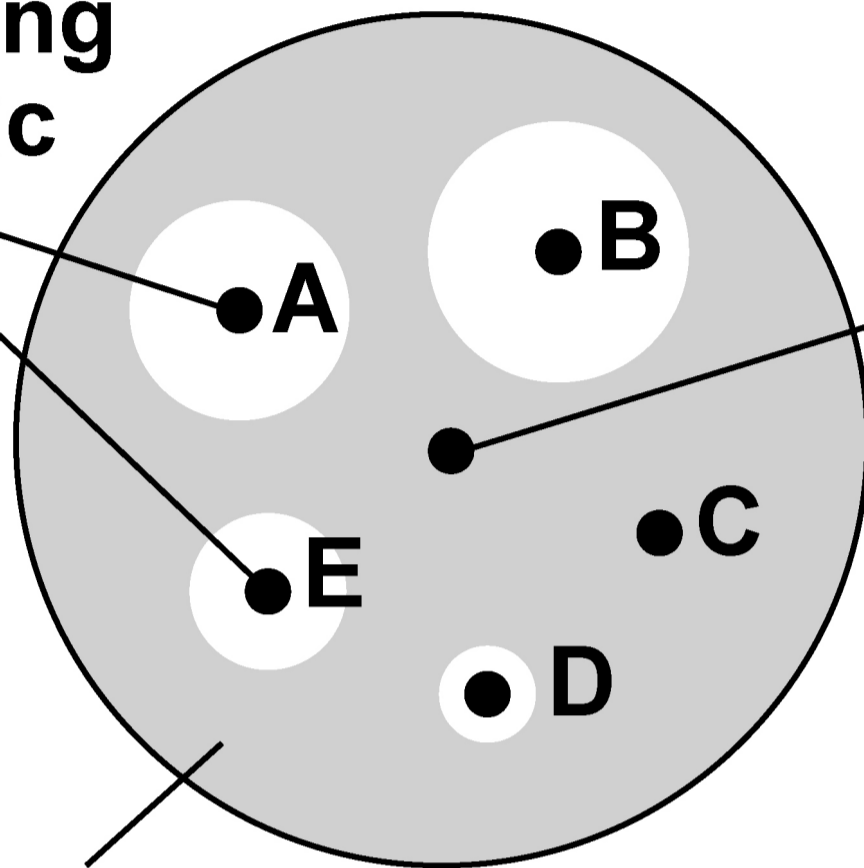
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**[Turn over]**



## REPEAT OF FIGURE 4

Paper discs  
containing  
antibiotic



Paper disc  
with no  
antibiotic

'Salmonella'  
bacteria growing

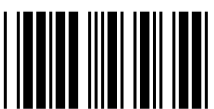
03.5

What is the purpose of the paper disc  
with no antibiotic in FIGURE 4? [1 mark]

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03.6

**The scientists concluded that either antibiotic A or antibiotic B should be prescribed to patients with food poisoning.**

**Why should antibiotic A or antibiotic B be prescribed? [1 mark]**

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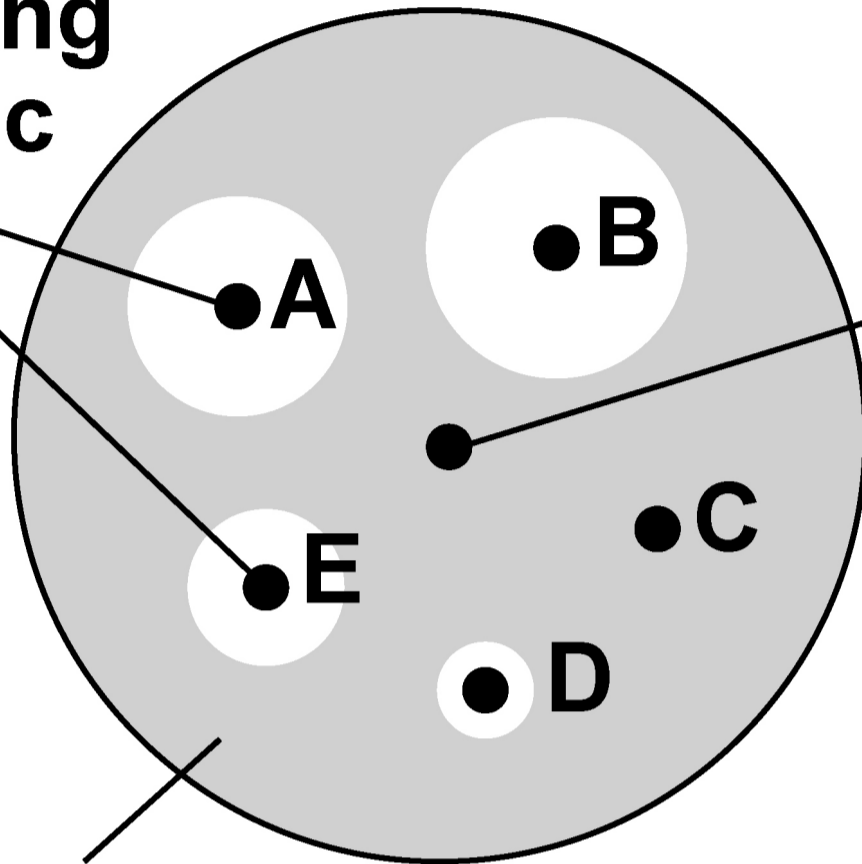
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**[Turn over]**

**REPEAT OF FIGURE 4**

**Paper discs  
containing  
antibiotic**



**Paper disc  
with no  
antibiotic**

**'Salmonella'  
bacteria growing**



0	3	.	7
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**The scientists wanted to be more certain about which antibiotic should be prescribed.**

**Describe how the results in FIGURE 4 could be used to obtain a QUANTITATIVE comparison of antibiotics A and B. [1 mark]**

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**[Turn over]**



0	3	.	8
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**One year later, there was another outbreak at the farm involving 'Salmonella' bacteria.**

**Antibiotic B did NOT have an effect.**

**Suggest why antibiotic B no longer had an effect. [1 mark]**

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0	3	.	9
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**Antibiotics treat food poisoning because they kill 'Salmonella' bacteria inside the human body.**

**Some antibiotics work because they damage the bacterial cell wall.**



**The bacteria die because the cells burst.**

**Explain why the cells burst. [3 marks]**

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**[Turn over]**

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17



04

**This question is about exercise.**

04.1

**During vigorous exercise, anaerobic respiration occurs in a person's body.**

**Explain TWO effects of anaerobic respiration on the person's body.  
[4 marks]**

1 \_\_\_\_\_  
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\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2 \_\_\_\_\_  
\_\_\_\_\_



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**[Turn over]**



04.2

**Design an investigation to show the effect of different types of exercise on the heart rate of athletes. [6 marks]**

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**[Turn over]**



**Anabolic steroids are drugs.**

**Anabolic steroids:**

- **increase muscle mass in humans**
- **are banned in most competitive sports.**

**Some athletes take anabolic steroids to improve their performance in sport.**

**0 4 . 3**

**Explain how taking anabolic steroids could improve an athlete's performance. [2 marks]**

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**[Turn over]**



**Scientists use monoclonal antibodies to test for the presence of anabolic steroids in an athlete's urine.**

**To produce monoclonal antibodies, a mouse lymphocyte is combined with a tumour cell.**

**0 4 . 4**

**What type of cell is created when a mouse lymphocyte and a tumour cell combine? [1 mark]**

**Tick (✓) ONE box.**

**Embryo**

**Hybridoma**

**Phagocyte**

**Stem cell**



04.5

**Describe how scientists make monoclonal antibodies using the cell created when a mouse lymphocyte and a tumour cell combine. [3 marks]**

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**[Turn over]**



**04.6**

**What property makes a monoclonal antibody useful in detecting the presence of an anabolic steroid in urine?  
[1 mark]**

**Tick (✓) ONE box.**

**A monoclonal antibody is quick and easy to produce.**

**A monoclonal antibody is specific to only one person's urine.**

**A monoclonal antibody only binds to the anabolic steroid.**

**A monoclonal antibody can identify many different drugs at the same time.**



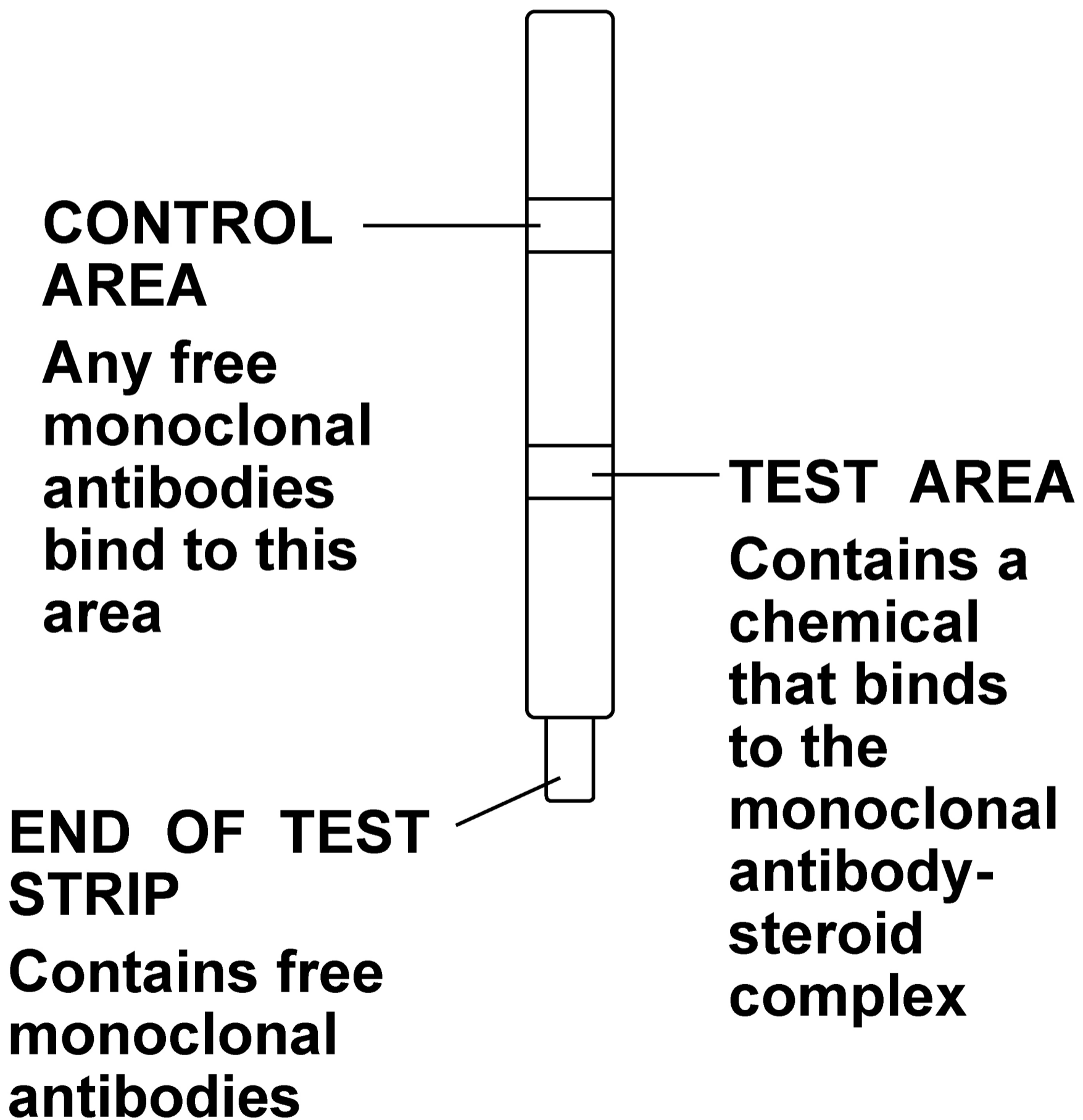
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**[Turn over]**



**FIGURE 5** shows a test strip that can detect the presence of an anabolic steroid in an athlete's urine.

**FIGURE 5**



**The end of the test strip is dipped in urine.**

**The urine moves up through the test strip.**

**The test area and the control area contain a dye. The dye turns blue when monoclonal antibodies bind to it.**

**0 4 . 7**

**Suggest the purpose of the control area in the test strip. [1 mark]**

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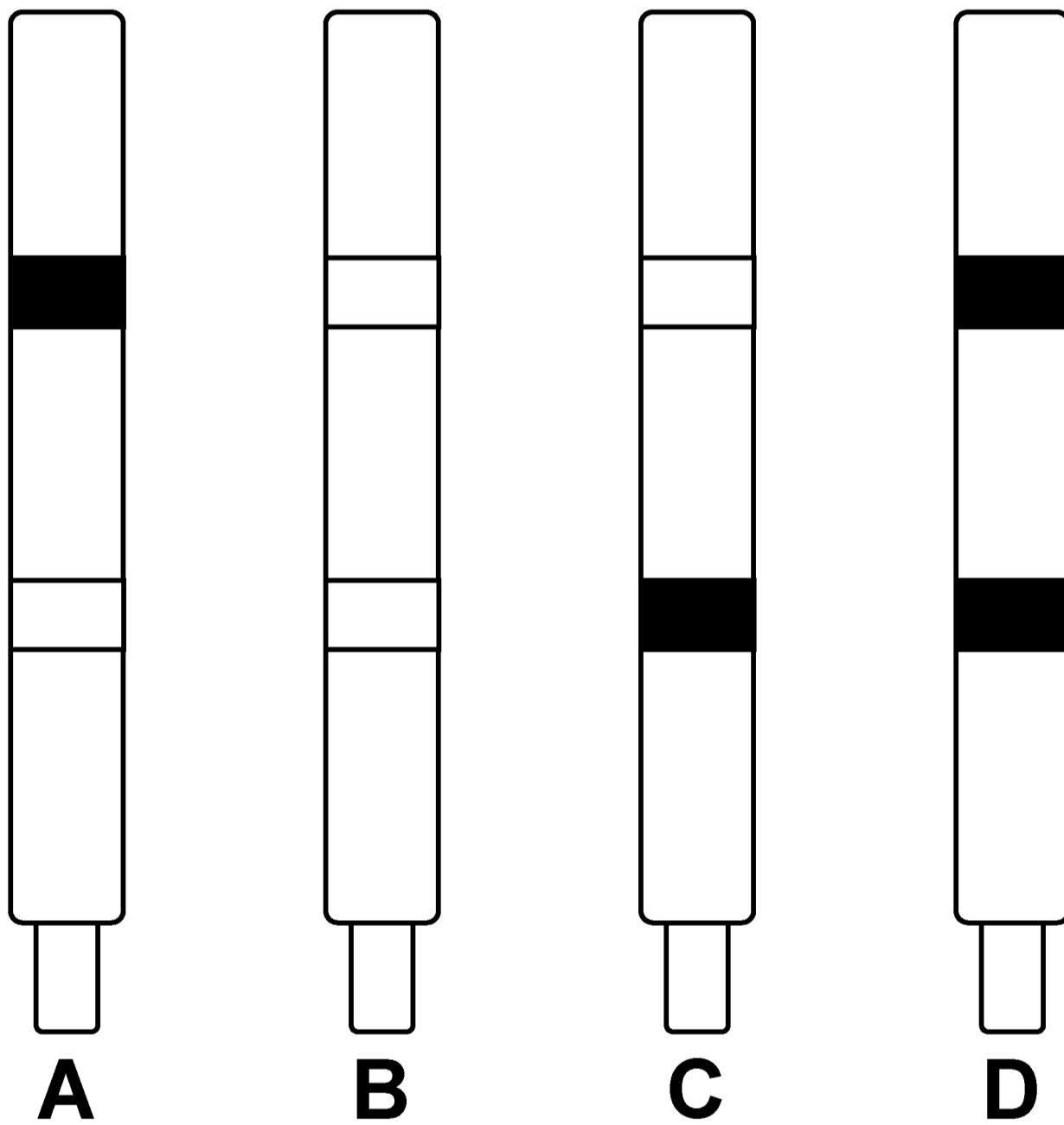
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**[Turn over]**



**FIGURE 6** shows the urine test results of four athletes.

**FIGURE 6**



**KEY**

 **Blue dye**



0 4 . 8

**Describe the evidence in FIGURE 6, on the opposite page, that shows the test for athlete B has NOT worked.**

**Suggest ONE reason why the test did NOT work. [2 marks]**

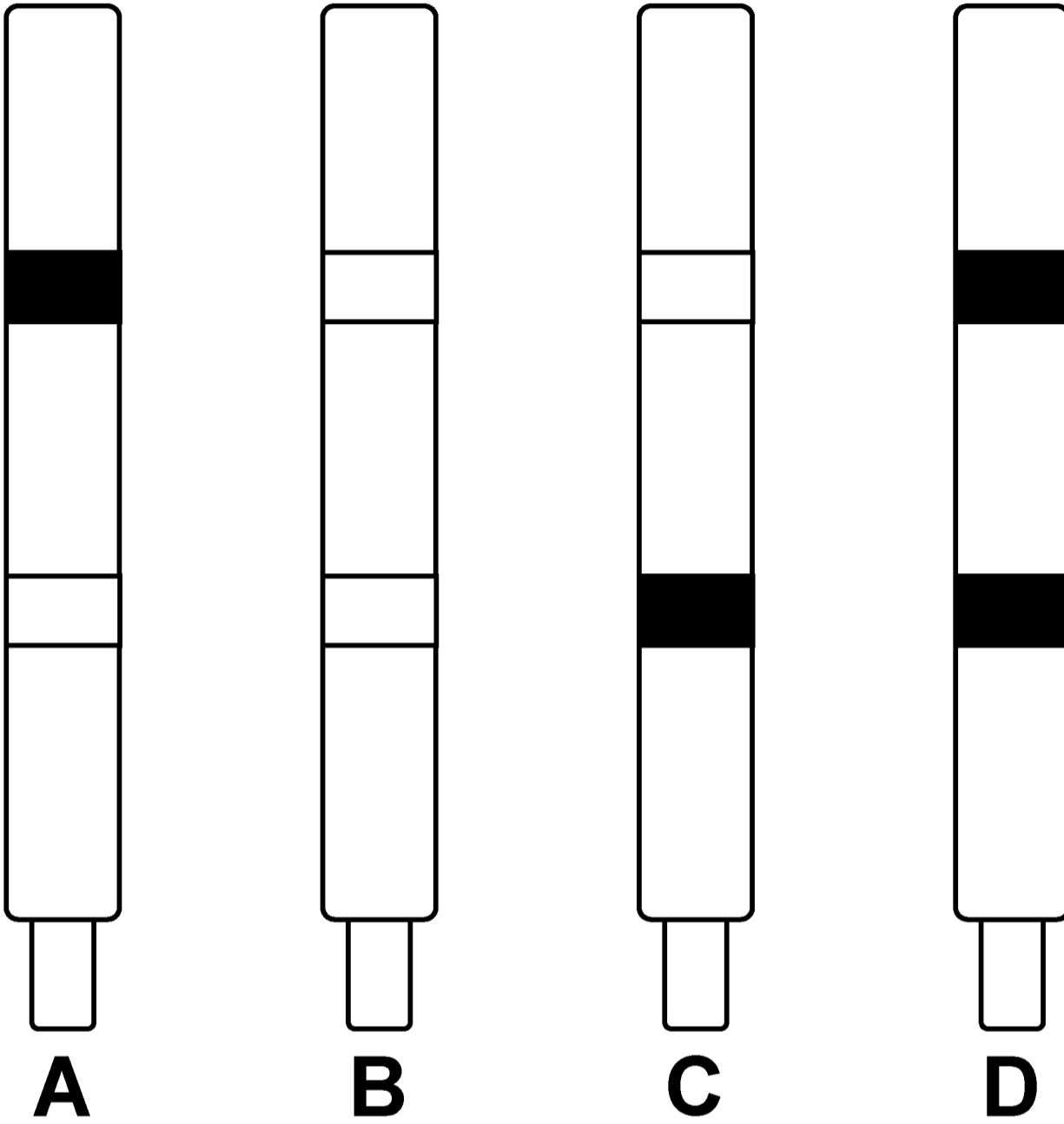
**Evidence** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Reason** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**[Turn over]**



REPEAT OF FIGURE 6



KEY

■ Blue dye

0	4	.	9
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**Which athlete has tested positive for anabolic steroids in their urine? [1 mark]**

**Tick (✓) ONE box.**

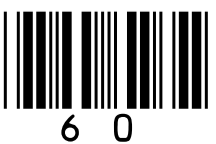
**A****B****C****D**

**[Turn over]**

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<b>21</b>



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0 5

**The protist that causes malaria is passed from one person to another person by mosquitos.**

0 5 . 1

**What term describes an organism that passes a pathogen from one person to another person? [1 mark]**

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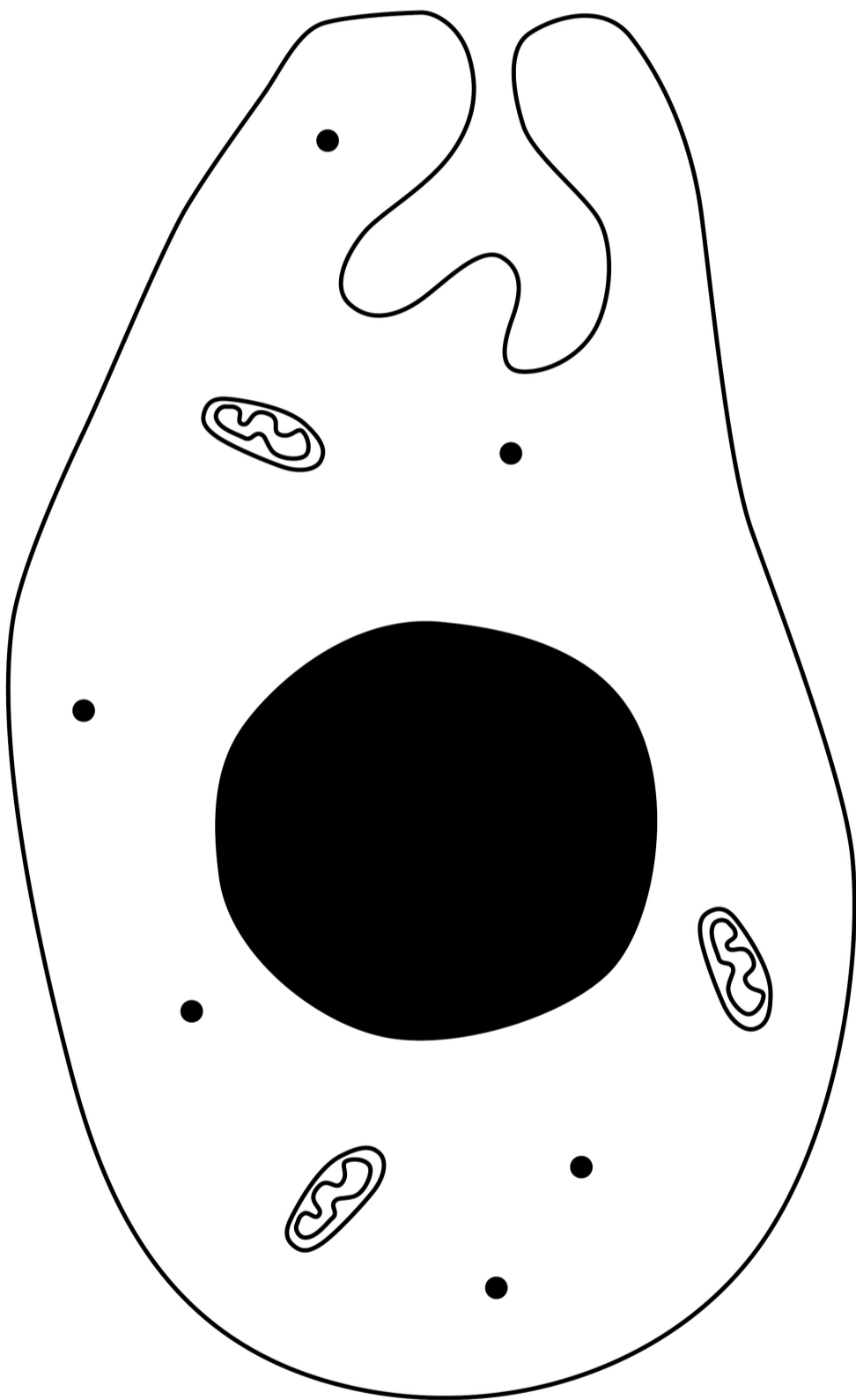
**[Turn over]**



05.2

**FIGURE 7 shows the malarial protist.**

**FIGURE 7**



**The malarial protist is a eukaryotic cell.**

**Describe THREE ways the structure of the malarial protist is different from the structure of a prokaryotic cell.**

**Do NOT refer to size in your answer.**

**[3 marks]**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

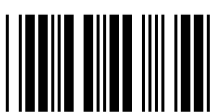
\_\_\_\_\_

**3** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**[Turn over]**



05.3

**During one stage of malaria infection, the malarial protists enter red blood cells and cause them to burst.**

**Explain why the bursting of red blood cells causes tiredness. [2 marks]**

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**[Turn over]**



**05.4**

**The malarial protist reproduces sexually and asexually during a life cycle.**

**Complete TABLE 3, on the opposite page, to give THREE differences between sexual reproduction and asexual reproduction.**

**One difference has been completed for you. [3 marks]**



TABLE 3

	<b>SEXUAL REPRODUCTION</b>	<b>ASEXUAL REPRODUCTION</b>
	<b>Involves two parents</b>	<b>Involves one parent</b>
<b>1</b>		
<b>2</b>		
<b>3</b>		

**[Turn over]**



0	5	.	5
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**One drug for treating malaria prevents mitosis occurring in the malarial protist.**

**The drug stops the synthesis of new DNA bases in the cell.**

**Suggest how the drug prevents mitosis occurring. [1 mark]**

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0 5 . 6

**Describe the process of cell division by mitosis. [3 marks]**

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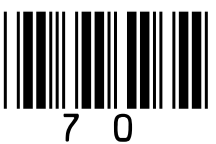
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**[Turn over]**

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**05.7**

**Different types of disease may interact.**

**Scientists studied the incidence of malaria infections in children:**

- **with disorder S**
- **without disorder S.**

**The incidence of malaria in children with disorder S was calculated as a percentage of the incidence in children without disorder S.**

**TABLE 4, on page 72, shows the results.**

**[Turn over]**



**TABLE 4**

<b>Age in years</b>	<b>Calculated percentage (%) incidence of malaria in children with disorder S</b>
<b>2 to &lt; 4</b>	<b>69</b>
<b>4 to &lt; 6</b>	<b>63</b>
<b>6 to &lt; 8</b>	<b>50</b>
<b>8 to 10</b>	<b>45</b>
<b>&gt; 10</b>	<b>73</b>







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**This question is about photosynthesis.**

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**Complete the symbol equation for photosynthesis. [1 mark]**



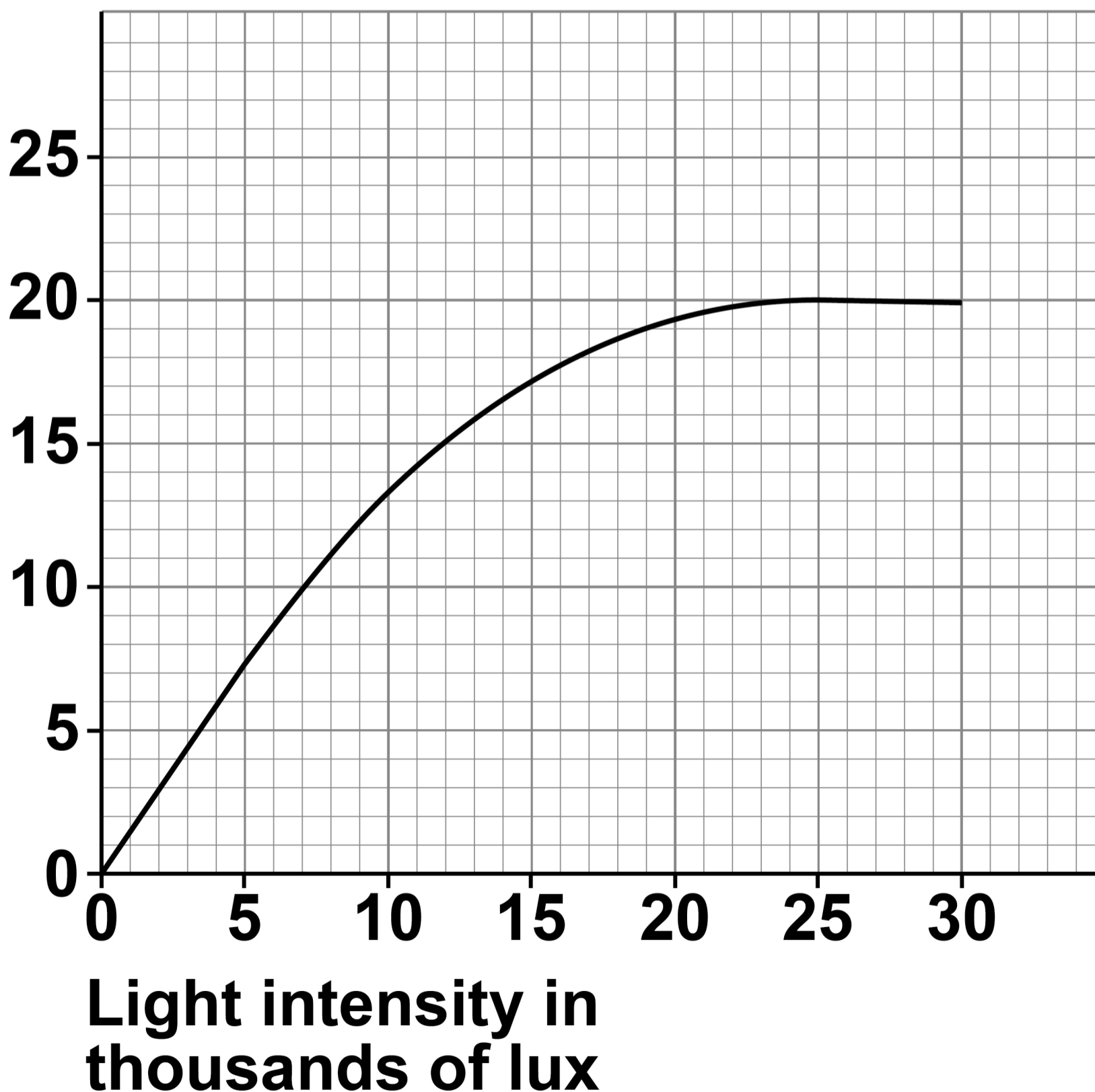
**[Turn over]**



**FIGURE 8** shows how the rate of photosynthesis changes with light intensity.

## **FIGURE 8**

**Rate of photosynthesis in arbitrary units**



**06.2**

**Which part of the graph could be represented by the equation  $y = mx + c$  ?**  
**[1 mark]**

**Tick (✓) ONE box.**

**From 0 to 5 000 lux**

**From 10 000 to 15 000 lux**

**From 15 000 to 20 000 lux**

**From 20 000 to 25 000 lux**

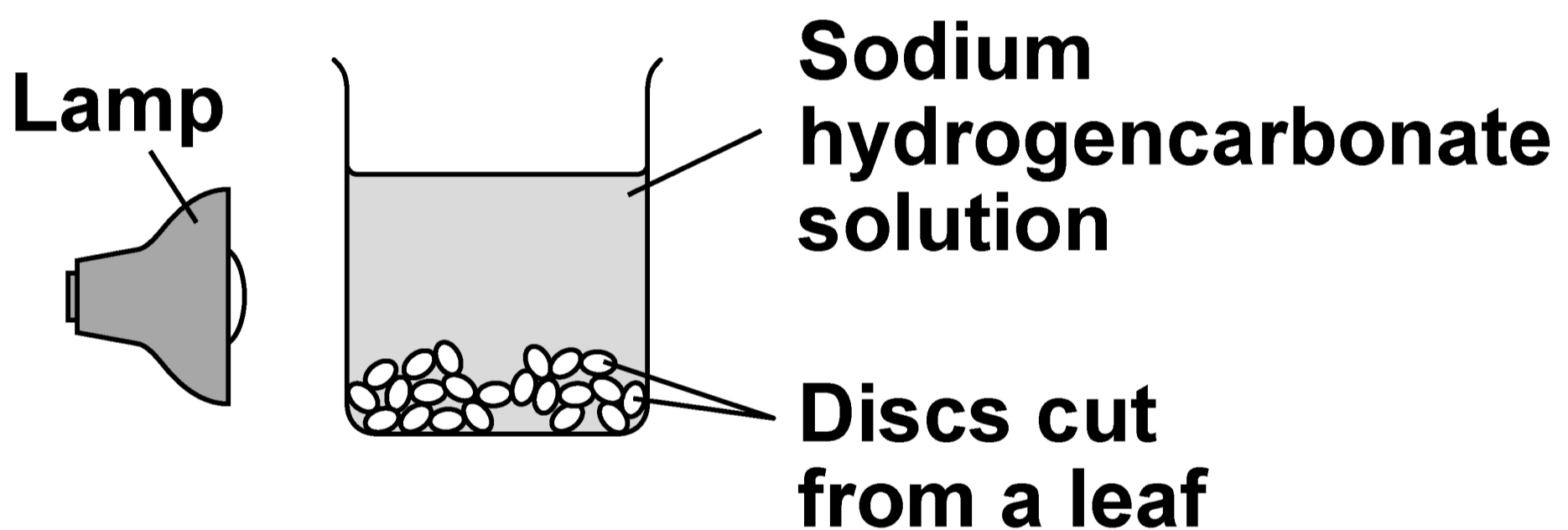
**[Turn over]**



**A student investigated the effect of colour of light on the rate of photosynthesis in leaves.**

**FIGURE 9 shows how the investigation was set up.**

**FIGURE 9**



**TABLE 5 shows the results.**

**TABLE 5**

<b>COLOUR OF LIGHT</b>	<b>Time taken for 10 leaf discs to reach the surface of the solution in seconds</b>
<b>Blue</b>	<b>115</b>
<b>Green</b>	<b>831</b>
<b>Red</b>	<b>397</b>

**0 6 . 3**

**Give ONE way the student could change the colour of the light shining on the leaf discs. [1 mark]**

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**[Turn over]**



0 6 . 4

**Give the independent variable and the dependent variable in this investigation.  
[2 marks]**

**Independent variable** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Dependent variable** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_





06.5

**All of the air had to be removed from the leaf discs before placing them in the beaker.**

**Suggest ONE reason why. [1 mark]**

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**[Turn over]**

**06.6**

**The leaf discs were placed in a beaker of sodium hydrogencarbonate ( $\text{NaHCO}_3$ ) solution.**

**Explain why sodium hydrogencarbonate solution was used instead of water.**

**[2 marks]**

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0	6	.	7
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**Explain why the leaf discs moved to the surface of the solution during the investigation. [2 marks]**

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**[Turn over]**



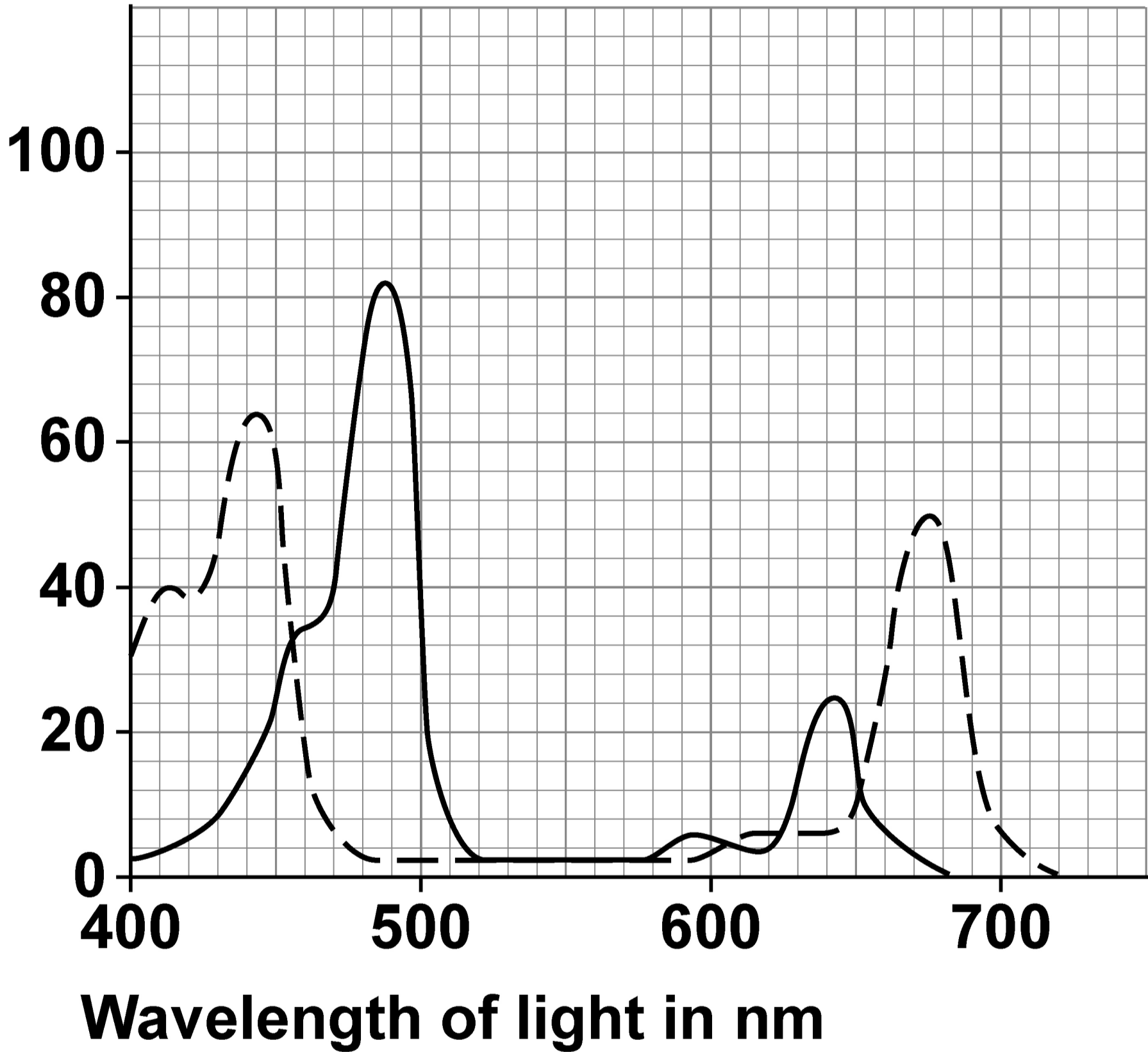
**There are two types of chlorophyll in leaves.**

**FIGURE 10, on the opposite page, shows the percentage of different wavelengths of light that the two types of chlorophyll absorb.**



**FIGURE 10**

**Percentage (%) of  
light absorbed**

**KEY**

- — Chlorophyll a**
- Chlorophyll b**

**[Turn over]**



**TABLE 6 shows the colour of different wavelengths of light.**

**TABLE 6**

<b>Range of wavelength of light in nm</b>	<b>380 - 435</b>	<b>450 - 499</b>	<b>500 - 570</b>	<b>571 - 590</b>	<b>620 - 720</b>
<b>Colour of light</b>	<b>violet</b>	<b>blue</b>	<b>green</b>	<b>yellow</b>	<b>red</b>

06.8

**Suggest the advantage to a plant of having two types of chlorophyll. [1 mark]**

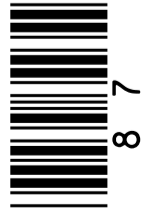
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87

**[Turn over]**



**06.9**

**TABLE 5 is repeated below.**

**TABLE 5**

<b>COLOUR OF LIGHT</b>	<b>Time taken for 10 leaf discs to reach the surface of the solution in seconds</b>
<b>Blue</b>	<b>115</b>
<b>Green</b>	<b>831</b>
<b>Red</b>	<b>397</b>

**The leaf discs in the investigation are green.**

**Explain the results in TABLE 5 for blue light and for green light.**





**Use data from FIGURE 10 and TABLE 6. FIGURE 10 is provided on page 85 and TABLE 6 is provided on page 86. [4 marks]**

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**END OF QUESTIONS**

<b>15</b>



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**Additional page, if required.**

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