

A



**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]**



J U N 2 2 8 4 6 1 1 F 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 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**



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

**0 1**

**HIV (Human Immunodeficiency Virus) is a pathogen.**

**0 1 . 1**

**How is HIV spread from one person to another person? [1 mark]**

**Tick (✓) ONE box.**

**Coughing**

**Sexual intercourse**

**Touching door handles**

**[Turn over]**



**TABLE 1 shows information about new cases of HIV diagnosed in the UK.**

**TABLE 1**

<b>YEAR</b>	<b>Number of new HIV cases</b>
<b>2010</b>	<b>2642</b>
<b>2014</b>	<b>2767</b>
<b>2018</b>	<b>1530</b>



0 1 . 2

**Describe what happened to the number of new cases of HIV from 2010 to 2018.  
[2 marks]**

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**[Turn over]**

0	1	.	3
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**What could cause a DECREASE in the number of new HIV cases in the future?  
[1 mark]**

**Tick (✓) ONE box.**

**A higher population of people in the UK**

**A lower number of trained HIV nurses**

**Better education on how to prevent the spread of HIV**





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**[Turn over]**



**01.4**

**Scientists have been working to produce a vaccine for HIV for many years.**

**How could a vaccine work to prevent a person being infected with HIV?**

**Write the stages A, B, C, D and E in the correct order. [3 marks]**

**The first stage has been completed for you.**

- A Antibodies attach to the inactive virus.**
- B Antibodies destroy the inactive virus.**
- C An inactive form of the virus is injected into the body.**



**D** If the active virus enters the body, antibodies are produced quickly.

**E** White blood cells produce antibodies to the inactive virus.

**C** → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_

**[Turn over]**



**0 1 . 5**

**When scientists produce a vaccine for a disease the vaccine is tested on live animals.**

**What is the next stage in testing the vaccine? [1 mark]**

**Tick (✓) ONE box.**

**Testing on cells in a laboratory**

**Testing on healthy volunteers**

**Testing on the whole human population**



**0 1 . 6**

**A vaccine for HIV is important because it is difficult to develop safe drugs to destroy viruses.**

**Why is it difficult to develop safe drugs to destroy viruses? [1 mark]**

**Tick (✓) ONE box.**

**Drugs that destroy viruses also damage body tissues.**

**There are too many viruses for the drugs to destroy.**

**Viruses are too big for the drugs to destroy.**

**[Turn over]**



01.7

Some drugs originated from plants.

Draw ONE line from each drug to the plant the drug originated from. [2 marks]

**DRUG**

Aspirin

Digitalis

**Plant the drug  
originated from**

Foxglove

Rose

Tobacco

Willow



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**[Turn over]**

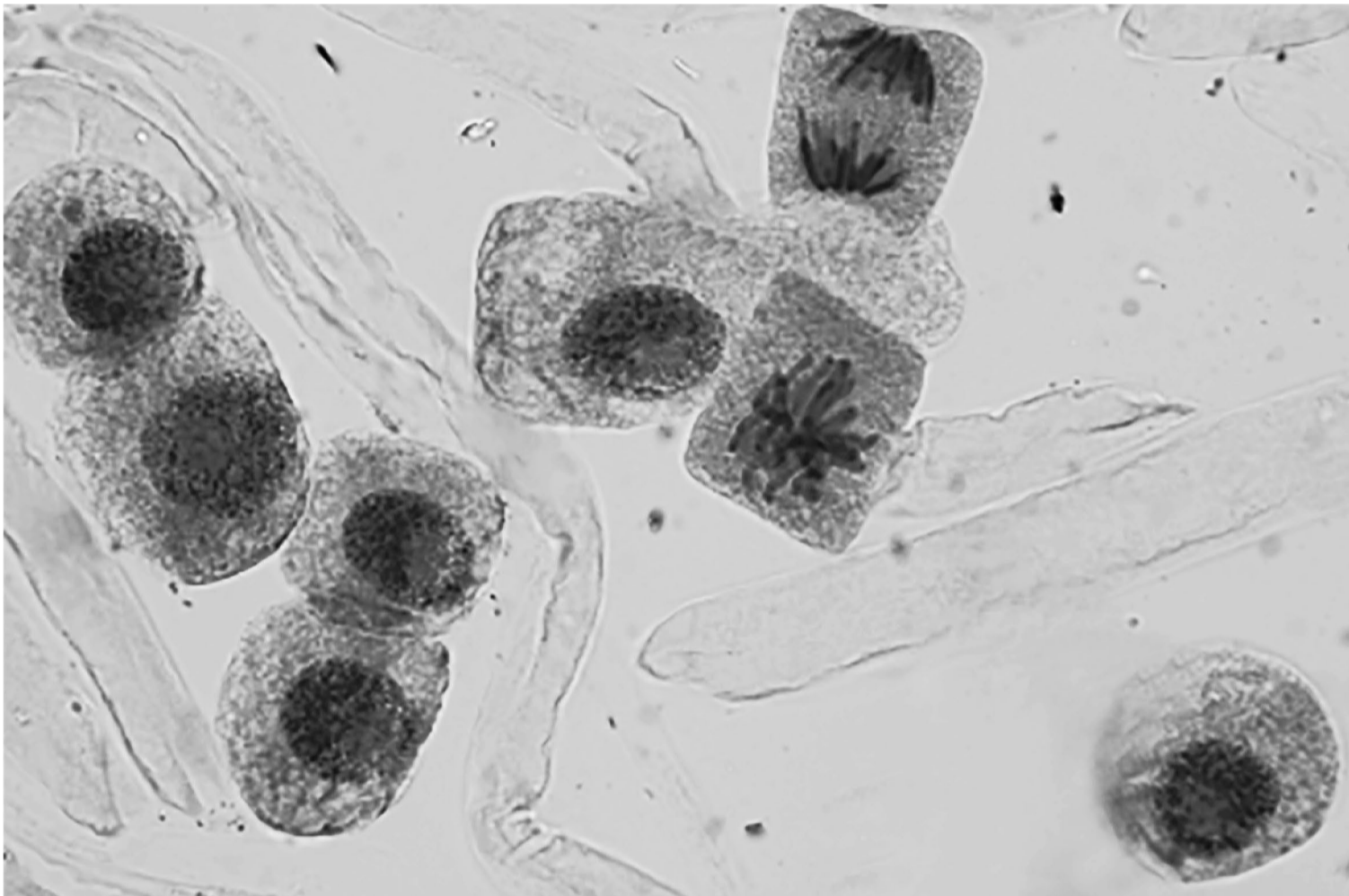


0	2
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**FIGURE 1 shows animal cells.**

**Some of the cells are dividing by mitosis for growth and repair.**

**FIGURE 1**





0	2	.	1
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**What fraction of the cells in FIGURE 1 is dividing by mitosis? [1 mark]**

**Tick (✓) ONE box.**

<input type="checkbox"/>	$\frac{1}{8}$
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<input type="checkbox"/>	$\frac{1}{4}$
--------------------------	---------------

<input type="checkbox"/>	$\frac{1}{2}$
--------------------------	---------------

<input type="checkbox"/>	$\frac{3}{4}$
--------------------------	---------------

**[Turn over]**



**0 2 . 2**

**The cells which are NOT dividing in FIGURE 1, on page 16, each contain 10 chromosomes.**

**One of these cells divides by mitosis to produce two new cells.**

**How many chromosomes will each new cell contain after mitosis? [1 mark]**

**Tick (✓) ONE box.**

**5****10****15****20**

**BLANK PAGE**

**[Turn over]**



0	2	.	3
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**Cells divide in a series of stages called the cell cycle.**

**Complete the sentences.**

**Choose answers from the list. [3 marks]**

- **contracts**
- **divides**
- **grows**
- **reacts**
- **relaxes**
- **replicates**

**Before mitosis occurs, the cell**

\_\_\_\_\_ .



**The genetic material in the cell doubles  
when the DNA \_\_\_\_\_ .**

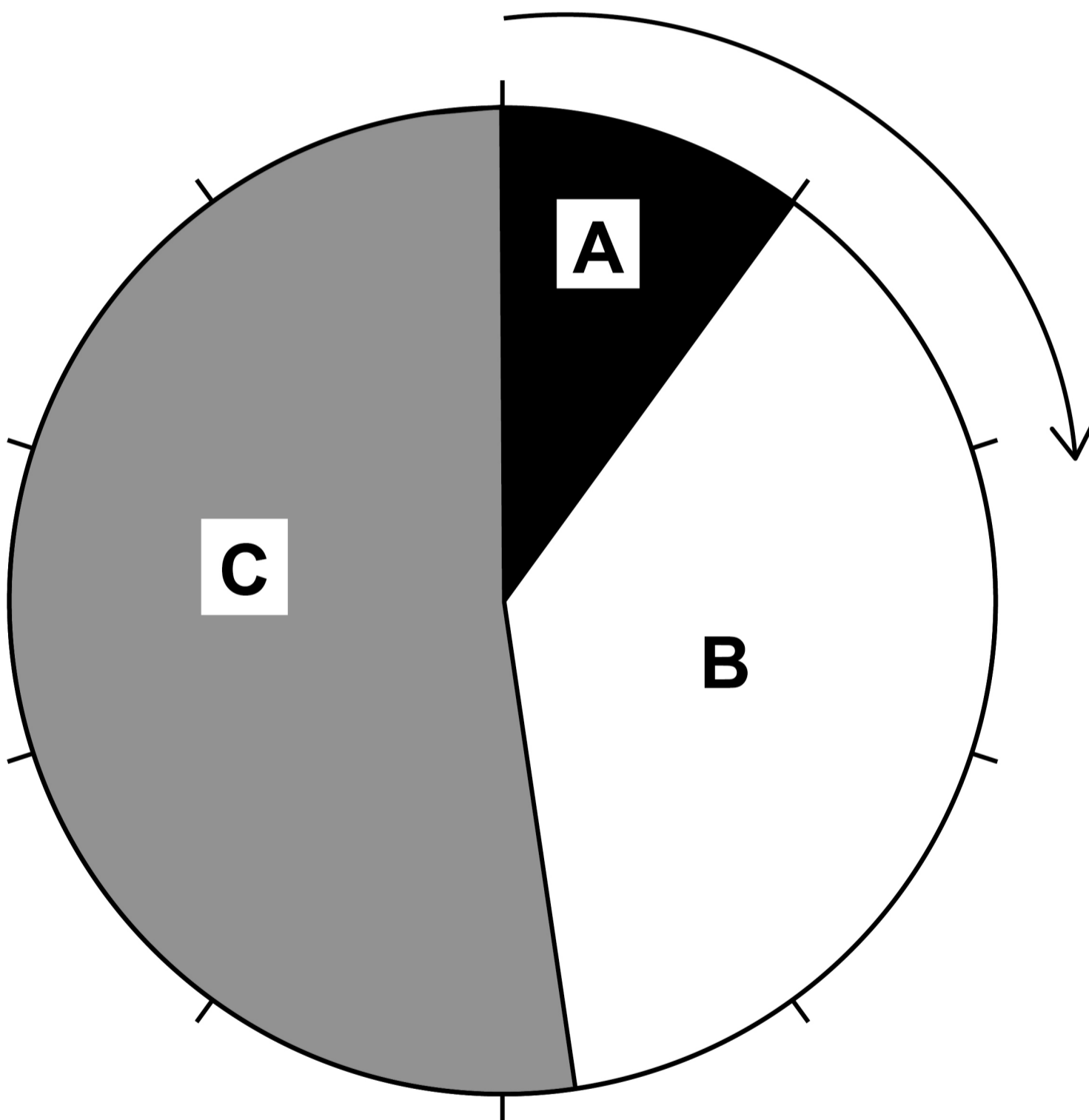
**After the chromosomes have been pulled  
to each end of the cell, the cytoplasm  
\_\_\_\_\_ .**

**[Turn over]**



**FIGURE 2** shows the time taken to complete different stages of the cell cycle.

**FIGURE 2**



0	2	.	4
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**Which stage of the cell cycle takes the most time? [1 mark]**

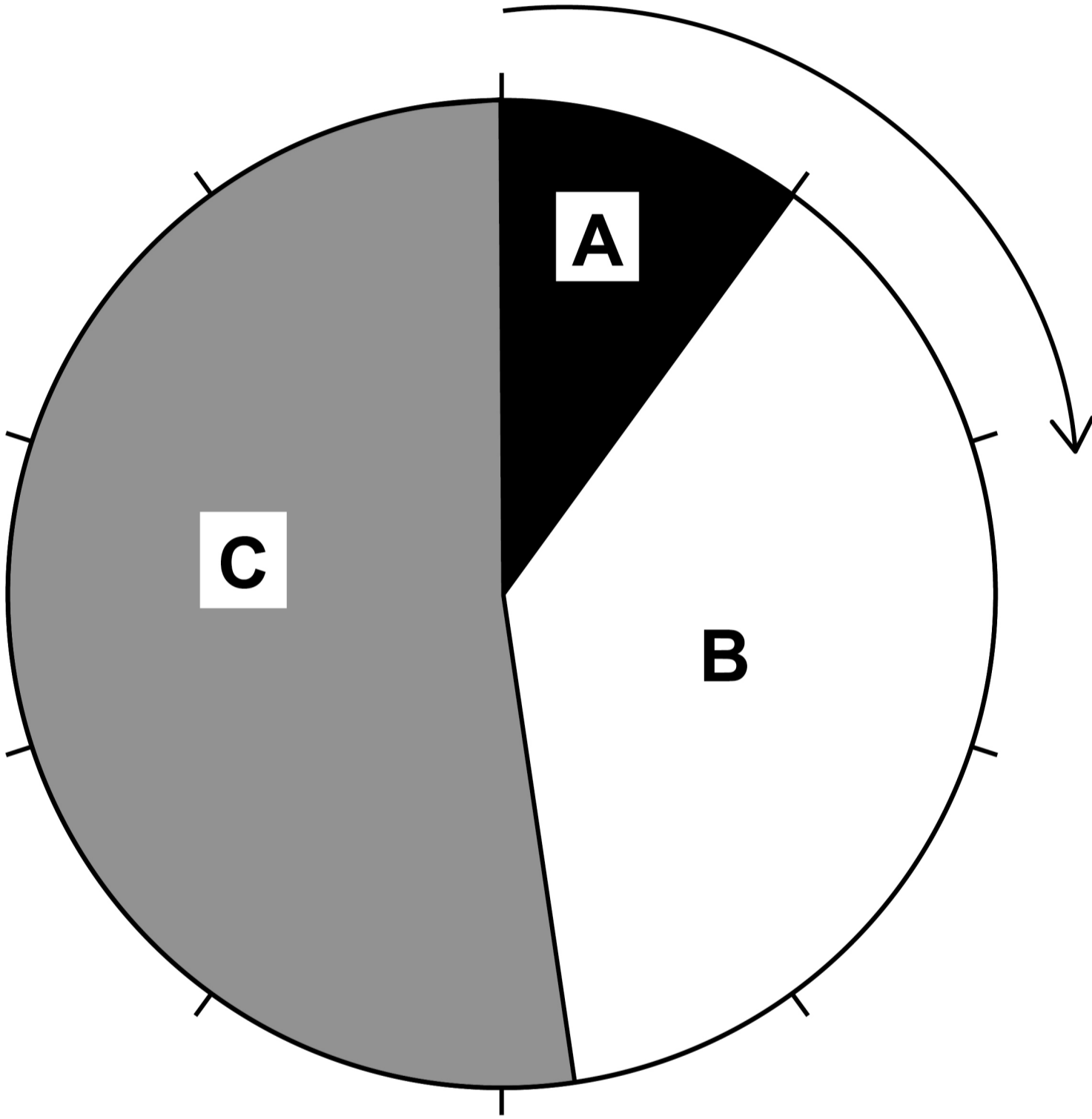
**Tick (✓) ONE box.**

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

**[Turn over]**



REPEAT OF FIGURE 2





**0 2 . 5**

**What percentage of time in the cell cycle is stage A? [1 mark]**

**Tick (✓) ONE box.**

**5%****10%****15%****25%**

**[Turn over]**



**Stem cells divide by mitosis.**

**Scientists can use stem cells from an embryo to create heart cells in a laboratory.**

**0 2 . 6**

**Which organ system contains heart cells? [1 mark]**

**Tick (✓) ONE box.**

**Circulatory system**

**Digestive system**

**Nervous system**

**Respiratory system**



**0 2 . 7**

**Name ONE medical condition that could be treated using heart cells created from an embryo. [1 mark]**

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**0 2 . 8**

**Give ONE reason why a patient may NOT want to be treated with heart cells created from an embryo. [1 mark]**

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**[Turn over]**

10



0	3
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**A scientist investigated the rate of photosynthesis of one type of tomato plant.**

**The tomato plants were grown in a greenhouse.**

**TABLE 2, on the opposite page, shows the results.**



TABLE 2

<b>Percentage (%) concentration of carbon dioxide in the air</b>	<b>Rate of photosynthesis in arbitrary units</b>
<b>0.00</b>	<b>0</b>
<b>0.02</b>	<b>5</b>
<b>0.04</b>	<b>16</b>
<b>0.06</b>	<b>19</b>
<b>0.08</b>	<b>20</b>
<b>0.10</b>	<b>20</b>
<b>0.12</b>	<b>20</b>

**[Turn over]**



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03.1

**Give TWO control variables the scientist should have used in the investigation.  
[2 marks]**

1 \_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

**[Turn over]**



**03.2**

**Which range of carbon dioxide concentrations caused the rate of photosynthesis to change the most?  
[1 mark]**

**Tick (✓) ONE box.**

**From 0.00% to 0.02%**

**From 0.02% to 0.04%**

**From 0.04% to 0.06%**

**From 0.06% to 0.08%**





0	3	.	3
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**How could the scientist have improved the validity of the results? [1 mark]**

**Tick (✓) ONE box.**

**Repeat each reading three times and calculate a mean.**

**Use concentrations of carbon dioxide above 0.12%.**

**Use different tomato plants for each concentration.**

**[Turn over]**



0	3	.	4
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**Explain the change in the rate of photosynthesis when the concentration of carbon dioxide increased between 0.00% to 0.08%. [2 marks]**

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**[Turn over]**



## REPEAT OF TABLE 2

<b>Percentage (%) concentration of carbon dioxide in the air</b>	<b>Rate of photosynthesis in arbitrary units</b>
<b>0.00</b>	<b>0</b>
<b>0.02</b>	<b>5</b>
<b>0.04</b>	<b>16</b>
<b>0.06</b>	<b>19</b>
<b>0.08</b>	<b>20</b>
<b>0.10</b>	<b>20</b>
<b>0.12</b>	<b>20</b>



0	3	.	5
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**A farmer decided NOT to use a concentration of carbon dioxide higher than 0.08% to grow tomato plants.**

**Suggest TWO reasons for the farmer's decision.**

**Use information from TABLE 2 and your own knowledge. [2 marks]**

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

**[Turn over]**

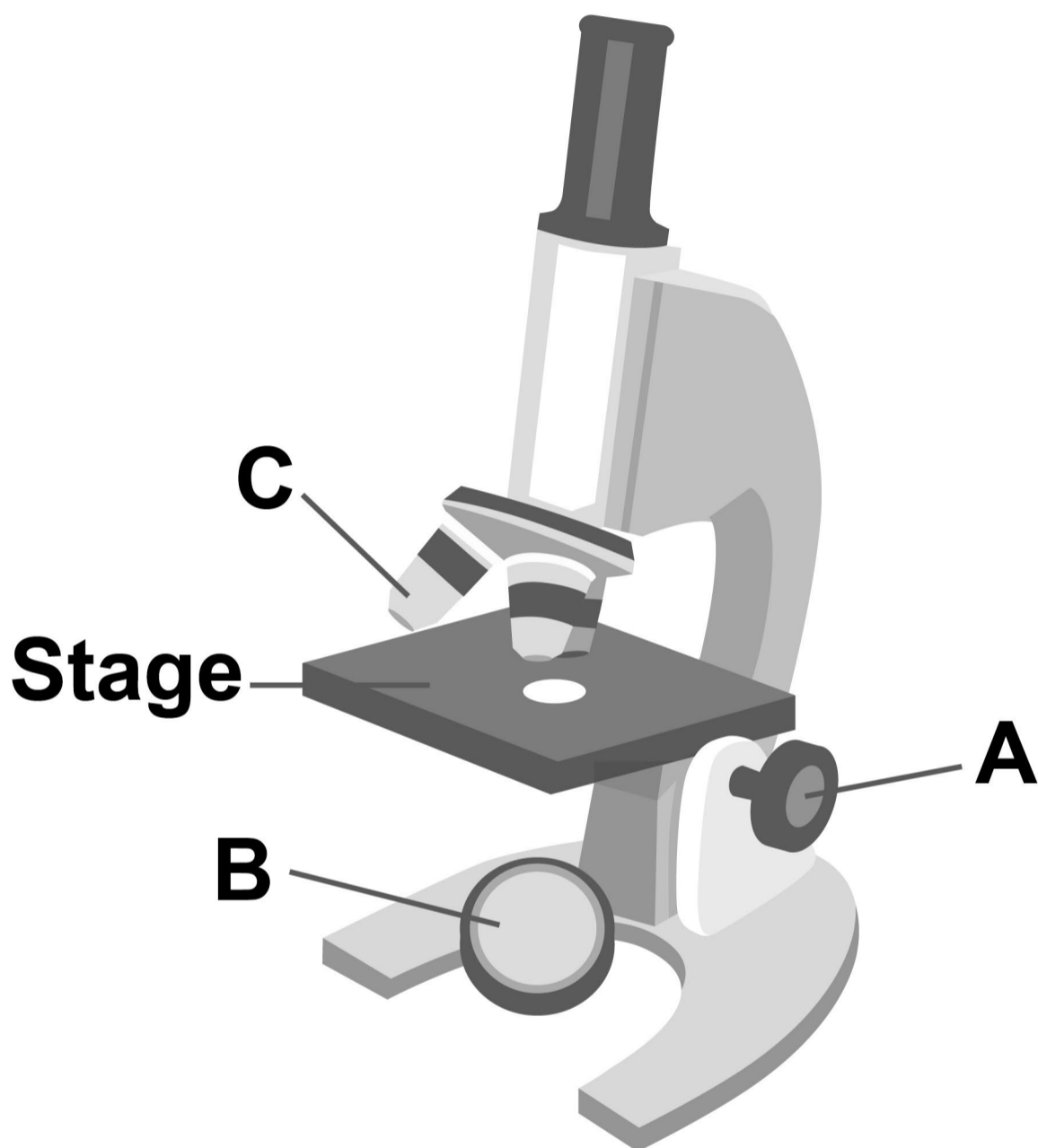
8



0	4
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**FIGURE 3** shows a microscope.

**FIGURE 3**



0	4	.	1
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**On the opposite page, draw ONE line from each part of the microscope to the function of the part. [3 marks]**



**Part of the  
microscope**

**FUNCTION**

**A**

**To adjust the focus  
of the microscope**

**B**

**To direct light into  
the viewer's eye**

**C**

**To hold a slide in  
place**

**To magnify the  
image of a  
specimen**

**To support the  
microscope**

**[Turn over]**



**A student prepared some onion cells.**

**The student viewed the onion cells using a microscope.**

**This is the method used.**

- 1. Cut an onion into pieces using a sharp knife.**
- 2. Peel off a thin layer of cells from one piece.**
- 3. Place the layer of cells onto a microscope slide.**
- 4. Add three drops of iodine solution to the layer of cells.**
- 5. Cover with a cover slip.**
- 6. Place the slide on the stage of the microscope.**





**04.2**

**Why was iodine solution added to the layer of onion cells? [1 mark]**

**Tick (✓) ONE box.**

**To dry the cells**

**To separate the cells**

**To stain the cells**

**[Turn over]**



**0 4 . 3**

**Why was a THIN layer of onion cells used? [1 mark]**

**Tick (✓) ONE box.**

**To allow light to pass through the cells**

**To allow oxygen to pass through the cells**

**To allow water to pass through the cells**

**0 4 . 4**

**The student was worried about using a sharp knife to cut the onion.**

**The student wrote a risk assessment for using a knife.**



**Draw ONE line from each part of the risk assessment to the description of the part. [2 marks]**

**Part of risk assessment**

**DESCRIPTION**

**Hazard**

**Call a first aider**

**Cut the onion on a chopping board**

**Plan to minimise risk**

**The onion is cut into pieces**

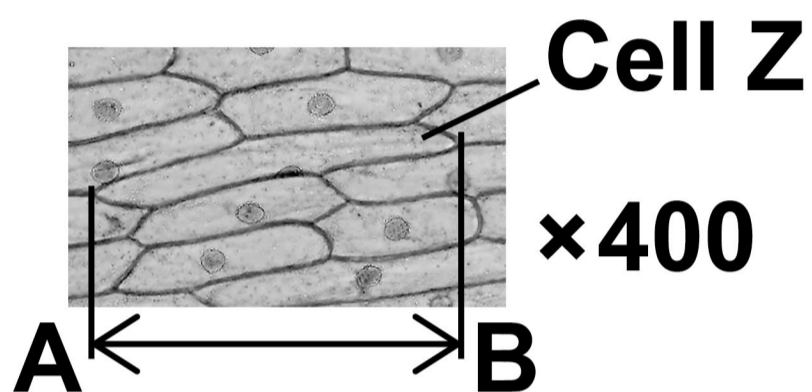
**The knife is sharp**

**[Turn over]**



**FIGURE 4** shows what the student saw using the microscope at a magnification of  $\times 400$ .

**FIGURE 4**



**0 4 . 5**

**Line A–B in FIGURE 4 shows the length of cell Z.**

**Calculate the real length of cell Z.**

**Complete the following steps on pages 45 and 46. [4 marks]**



**Measure the length of line A–B in millimetres (mm).**

**Length of line A–B = \_\_\_\_\_ mm**

**Give your measurement of the length of line A–B in micrometres ( $\mu\text{m}$ ).**

**1 mm = 1 000  $\mu\text{m}$**

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**Length of line A–B = \_\_\_\_\_  $\mu\text{m}$**

**[Turn over]**



**Calculate the real length of cell Z.**

**Use the equation:**

**real length of cell Z (in  $\mu\text{m}$ ) =**

**length of line A–B (in  $\mu\text{m}$ )**

**magnification**

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**Real length of cell Z = \_\_\_\_\_  $\mu\text{m}$**



0	4	.	6
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**How would onion cells look different if they were seen using an electron microscope? [2 marks]**

**Tick (✓) TWO boxes.**

**The cells would be coloured.**

**The cells would have no nuclei.**

**The cells would look larger.**

**The cells would look more blurred.**

**The cells would show more internal structures.**

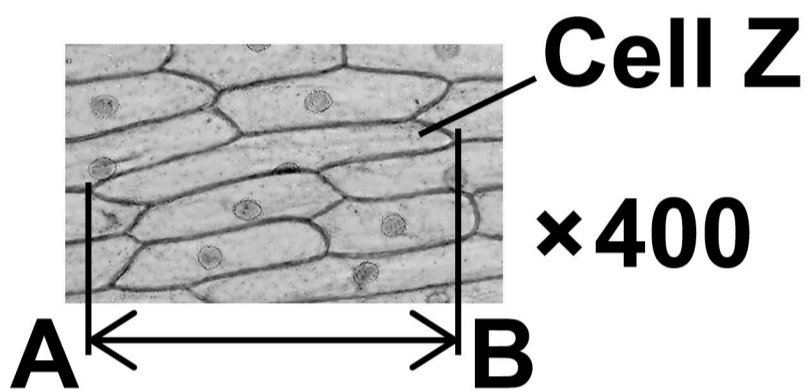
**[Turn over]**



04.7

**FIGURE 4 is repeated below.**

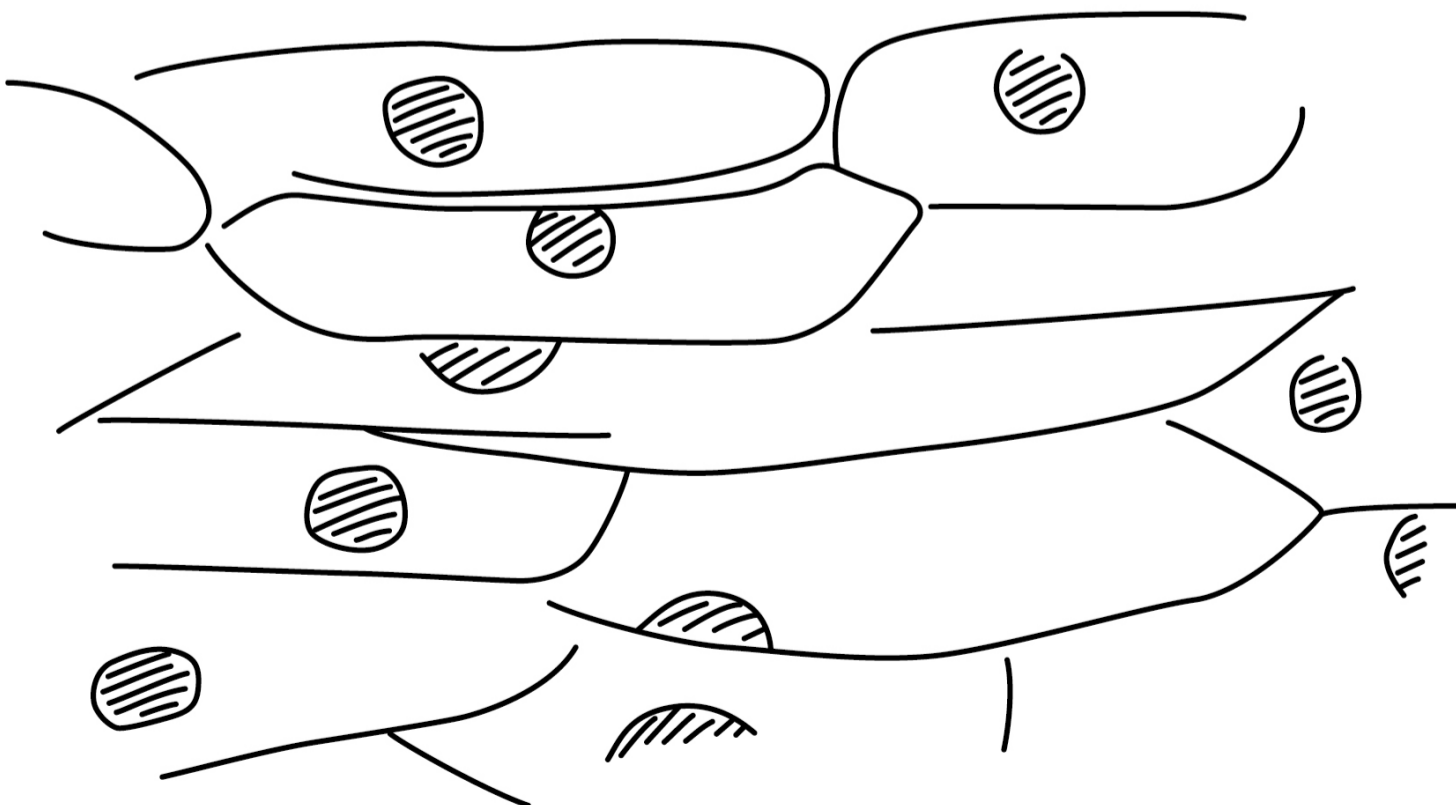
**FIGURE 4**



**FIGURE 5 shows the student's drawing of FIGURE 4.**

**FIGURE 5**

**ONION CELLS**





**What TWO improvements could the student make to the drawing in FIGURE 5? [2 marks]**

**Tick (✓) TWO boxes.**

**Add colour to the cells.**

**Complete the cell walls.**

**Draw each cell on a separate piece of paper.**

**Include the magnification.**

**Use a ruler to draw the cells.**

<b>15</b>

**[Turn over]**



0	5	.	1
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**Plants take up water from the soil through their roots.**

**Some of the water is used for photosynthesis.**

**Complete the word equation for photosynthesis, on the opposite page.**

**Choose answers from the list. [2 marks]**

- fat
- glucose
- nitrogen
- oxygen
- protein

**carbon dioxide + water  $\longrightarrow$**

**+**

\_\_\_\_\_ + \_\_\_\_\_



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**[Turn over]**



0	5	.	2
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**Water and dissolved substances are transported through a plant.**

**Complete the sentences.**

**Choose answers from the list. [3 marks]**

- **epidermis**
- **guard cells**
- **palisade cells**
- **phloem**
- **stomata**
- **xylem**

**Water moves from the roots to the leaves in the \_\_\_\_\_.**



**Water is lost from leaves through pores called \_\_\_\_\_ .**

**Dissolved sugars are transported in the \_\_\_\_\_ .**

**[Turn over]**



**TABLE 3 shows the rate of transpiration in four different plant species.**

**TABLE 3**

<b>PLANT SPECIES</b>	<b>Rate of transpiration in arbitrary units</b>
<b>A</b>	<b>310</b>
<b>B</b>	<b>254</b>
<b>C</b>	<b>87</b>
<b>D</b>	<b>192</b>



0	5	.	3
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**Calculate how many times greater the rate of transpiration of species A is than the rate of transpiration of species B.**

**Give your answer to 2 significant figures.  
[3 marks]**

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**Number of times greater (2 significant figures) = \_\_\_\_\_**

**[Turn over]**



0	5	.	4
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**Which factor could cause species A to have a higher rate of transpiration than species B? [1 mark]**

**Tick (✓) ONE box.**

**Each flower of species A has more petals.**

**Each leaf of species A has more stomata.**

**Each plant of species A has shorter roots.**





0	5	.	5
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**Which environmental change would cause an increase in the rate of transpiration? [1 mark]**

**Tick (✓) ONE box.**

**Decreased light intensity**

**Decreased wind speed**

**Increased humidity**

**Increased temperature**

**[Turn over]**



**REPEAT OF TABLE 3**

<b>PLANT SPECIES</b>	<b>Rate of transpiration in arbitrary units</b>
<b>A</b>	<b>310</b>
<b>B</b>	<b>254</b>
<b>C</b>	<b>87</b>
<b>D</b>	<b>192</b>



**05.6**

**Which plant species in TABLE 3 is most likely to live in a dry desert? [1 mark]**

**Tick (✓) ONE box.**

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

**[Turn over]**

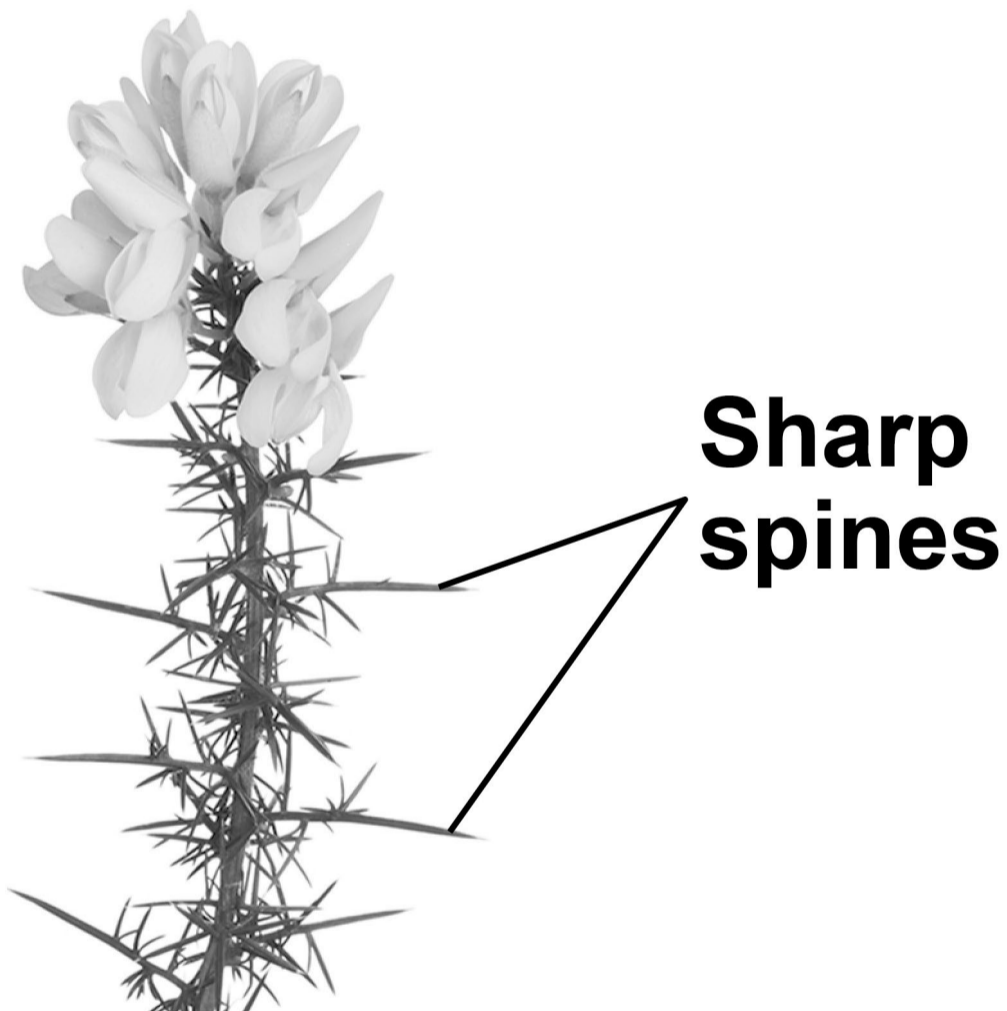


05.7

**Some plants have adaptations that help them survive.**

**FIGURE 6 shows part of a gorse plant.**

**FIGURE 6**



**How will the sharp spines help the gorse plant survive? [1 mark]**

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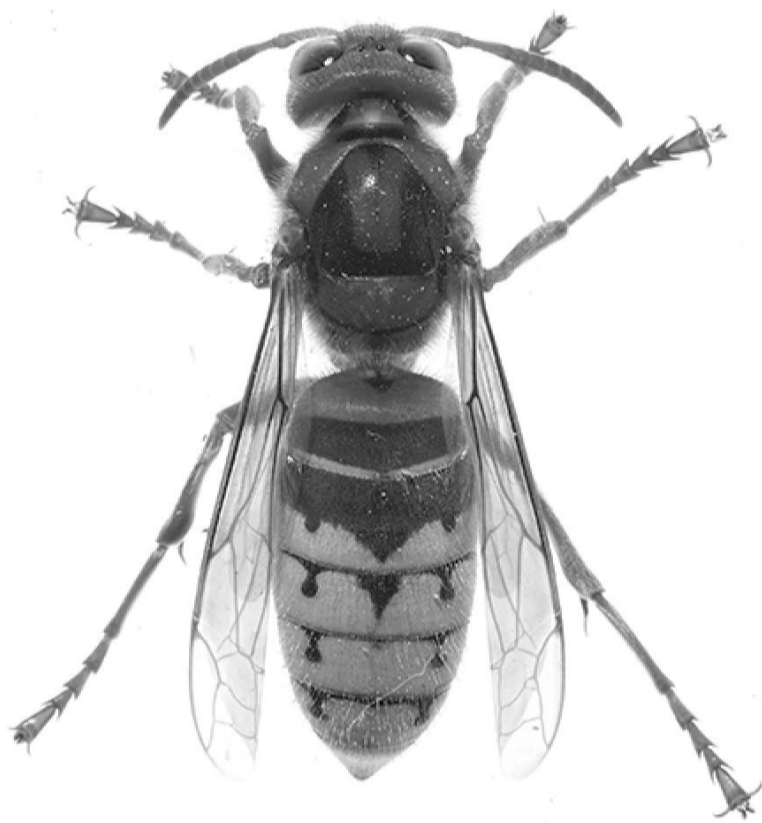
**[Turn over]**

**05.8**

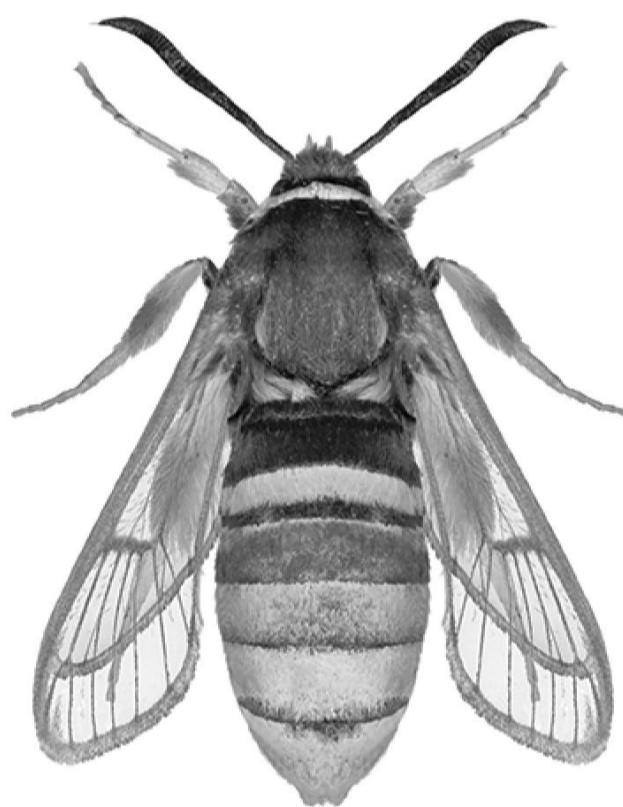
**Animals also have adaptations to help them survive.**

**FIGURE 7 shows two insects.**

**FIGURE 7**



**HORNET**



**HORNET MOTH**

**Hornets are insects that sting other animals and cause pain.**

**Hornet moths do NOT sting other animals.**



**Explain why animals avoid eating the HORNET MOTH. [2 marks]**

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**[Turn over]**

<b>14</b>





0 6

**TABLE 4 shows information about four jellyfish.**

**The jellyfish are listed in order of increasing size.**

**TABLE 4**

<b>Jellyfish</b>	<b>Size of jellyfish</b>	<b>Surface area in mm<sup>2</sup></b>	<b>Volume in mm<sup>3</sup></b>	<b>Surface area to volume ratio</b>
<b>A</b>	<b>Smallest</b> ↓ <b>Largest</b>	<b>3 600</b>	<b>1 200</b>	<b>X:1</b>
<b>B</b>		<b>50 000</b>	<b>25 000</b>	<b>2:1</b>
<b>C</b>		<b>1 800 000</b>	<b>6 000 000</b>	<b>0.3:1</b>
<b>D</b>		<b>7 500 000</b>	<b>125 000 000</b>	<b>0.06:1</b>





0 6 . 1

**Calculate value X in TABLE 4. [2 marks]**

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**X =** \_\_\_\_\_

**65**

**[Turn over]**



# REPEAT OF TABLE 4

Jellyfish	Size of jellyfish	Surface area in mm <sup>2</sup>	Volume in mm <sup>3</sup>	Surface area to volume ratio
A	Smallest ↓ Largest	3 600	1 200	X:1
B		50 000	25 000	2:1
C		1 800 000	6 000 000	0.3:1
D		7 500 000	125 000 000	0.06:1

0 6 . 2

Describe the relationship between the size of a jellyfish and its surface area to volume ratio.

Use TABLE 4. [1 mark]



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**The jellyfish in TABLE 4 take oxygen into their cells by diffusion.**

**0 6 . 3**

**67**

**Name ONE other substance that enters cells by diffusion.**

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

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**[Turn over]**

06.4

**Suggest TWO factors that affect the rate of diffusion of oxygen into a jellyfish.  
[2 marks]**

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

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

**06.5**

**Some organisms take in oxygen using a respiratory system.**

**In humans, gas exchange takes place in the lungs.**

**Name the organs where gas exchange takes place in FISH. [1 mark]**

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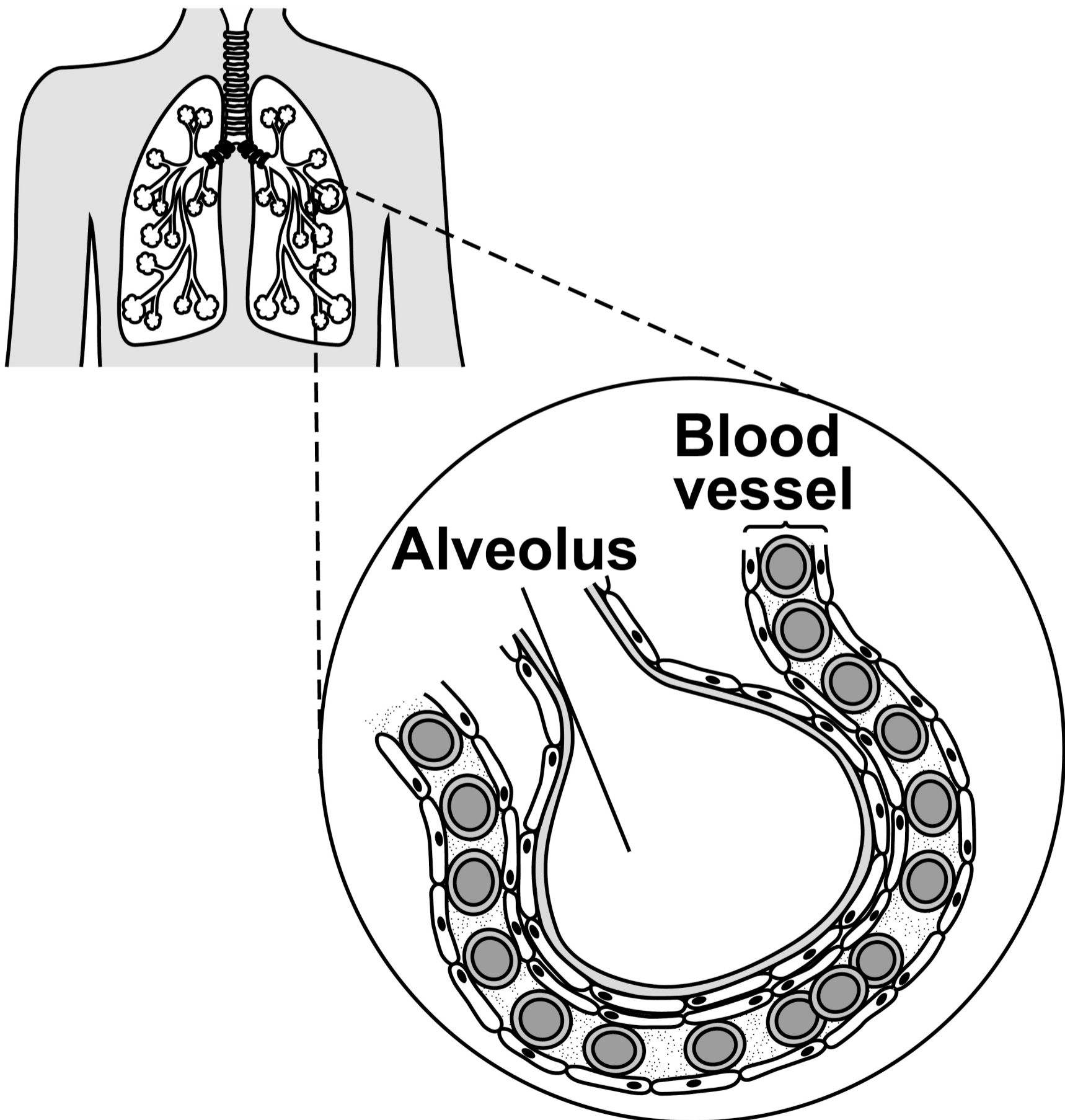
**[Turn over]**



06.6

**FIGURE 8** shows parts of the human breathing system.

**FIGURE 8**





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<b>13</b>





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**[Turn over]**



0	7
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**This question is about cells and transport.**

0	7	.	1
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**Complete TABLE 5. [3 marks]**

**TABLE 5**

<b>NAME OF CELL PART</b>	<b>FUNCTION OF CELL PART</b>
	<b>Contains genetic information</b>
<b>Mitochondria</b>	
	<b>Controls the movement of substances into and out of the cell</b>



**Cells in potatoes are plant cells.**

**Cells in potatoes do NOT contain chloroplasts.**

**0 7 . 2**

**What is the function of chloroplasts?  
[1 mark]**

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**0 7 . 3**

**Name ONE type of cell in a potato plant that does NOT contain chloroplasts.  
[1 mark]**

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**[Turn over]**



**A student investigated the effect of salt concentration on pieces of potato.**

**This is the method used.**

- 1. Cut three pieces of potato of the same size.**
- 2. Record the mass of each potato piece.**
- 3. Add  $150 \text{ cm}^3$  of  $0.4 \text{ mol/dm}^3$  salt solution to a beaker.**
- 4. Place each potato piece into the beaker.**
- 5. After 30 minutes, remove each potato piece and dry the surface with a paper towel.**
- 6. Record the mass of each potato piece.**
- 7. Repeat steps 1 to 6 using different concentrations of salt solution.**



**07.4**

**What is the independent variable in the investigation? [1 mark]**

**Tick (✓) ONE box.**

**Concentration of salt solution**

**Mass of potato piece**

**Time potato is left in salt solution**

**Volume of salt solution**

**[Turn over]**



**07.5**

**Why did the student dry the surface of each potato piece with a paper towel in step 5? [1 mark]**

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**The student calculated the percentage change in mass of each potato piece.**

**07.6**

**For one potato piece:**

- the starting mass was 2.5 g**
- the end mass was 2.7 g.**



**Calculate the percentage increase in mass of the potato piece. [2 marks]**

**Use the equation:**

**percentage increase in mass =**

$$\frac{\text{increase in mass}}{\text{starting mass}} \times 100$$

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**Percentage increase in mass =**

**\_\_\_\_\_ %**

**[Turn over]**



The student used the results from each potato piece to calculate the mean percentage change in mass at each concentration.

TABLE 6 shows the results.

TABLE 6

<b>Concentration of salt solution in mol/dm<sup>3</sup></b>	<b>Mean percentage (%) change in mass</b>
<b>0.0</b>	<b>9.8</b>
<b>0.1</b>	<b>9.5</b>
<b>0.2</b>	<b>7.0</b>
<b>0.3</b>	<b>0.4</b>
<b>0.4</b>	<b>-1.4</b>



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**[Turn over]**



0	7	.	7
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**Complete FIGURE 9, on the opposite page.**

**You should:**

- **label the x-axis**
- **use a suitable scale for the x-axis**
- **plot the data from TABLE 6, on page 80**
- **draw a line of best fit.**

**[4 marks]**

0	7	.	8
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**What concentration of salt solution was equal to the concentration of the solution inside the potato pieces?**

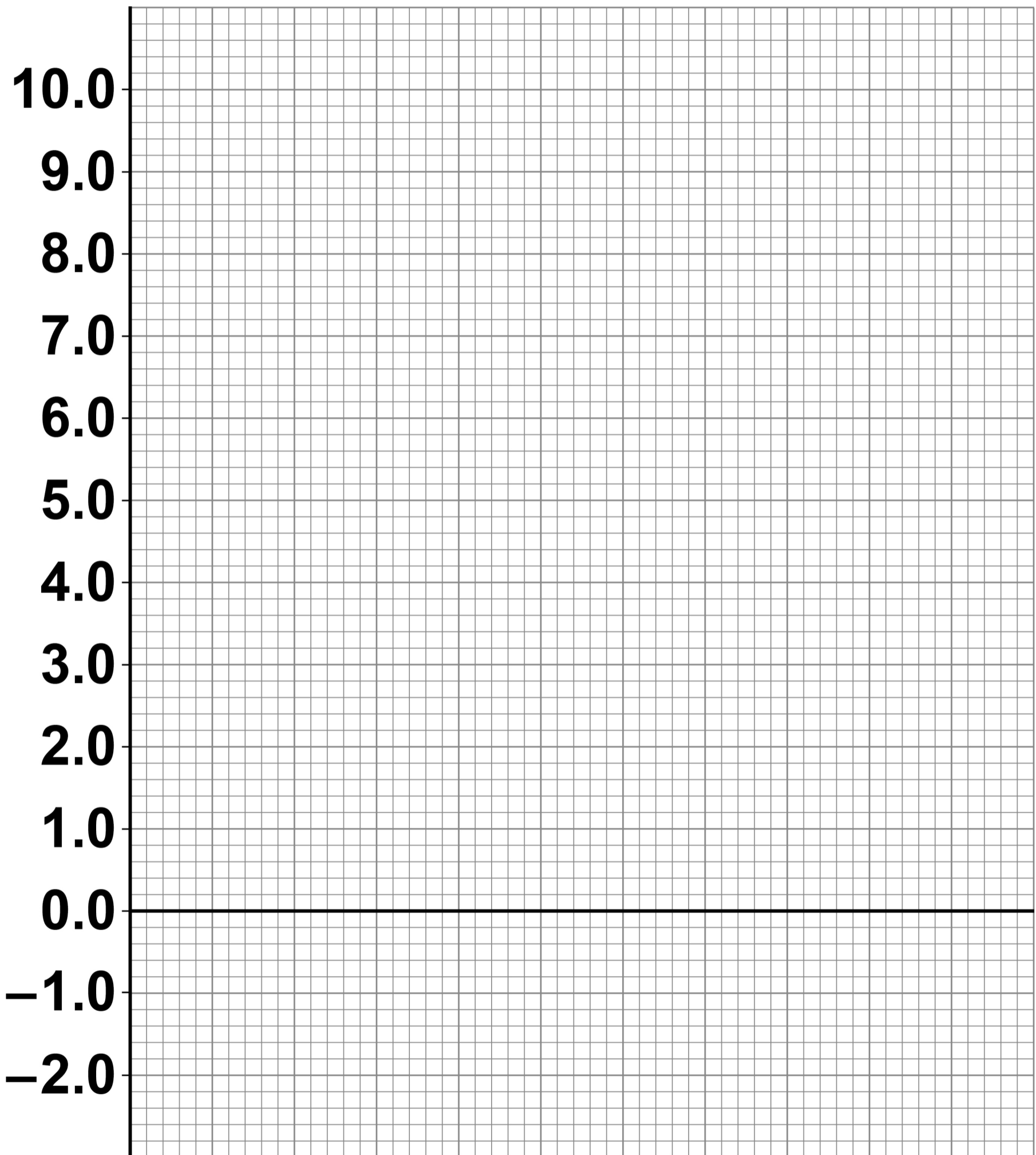
**Use FIGURE 9. [1 mark]**

**Concentration = \_\_\_\_\_ mol/dm<sup>3</sup>**



**FIGURE 9**

**Mean percentage (%) change  
in mass**



**[Turn over]**



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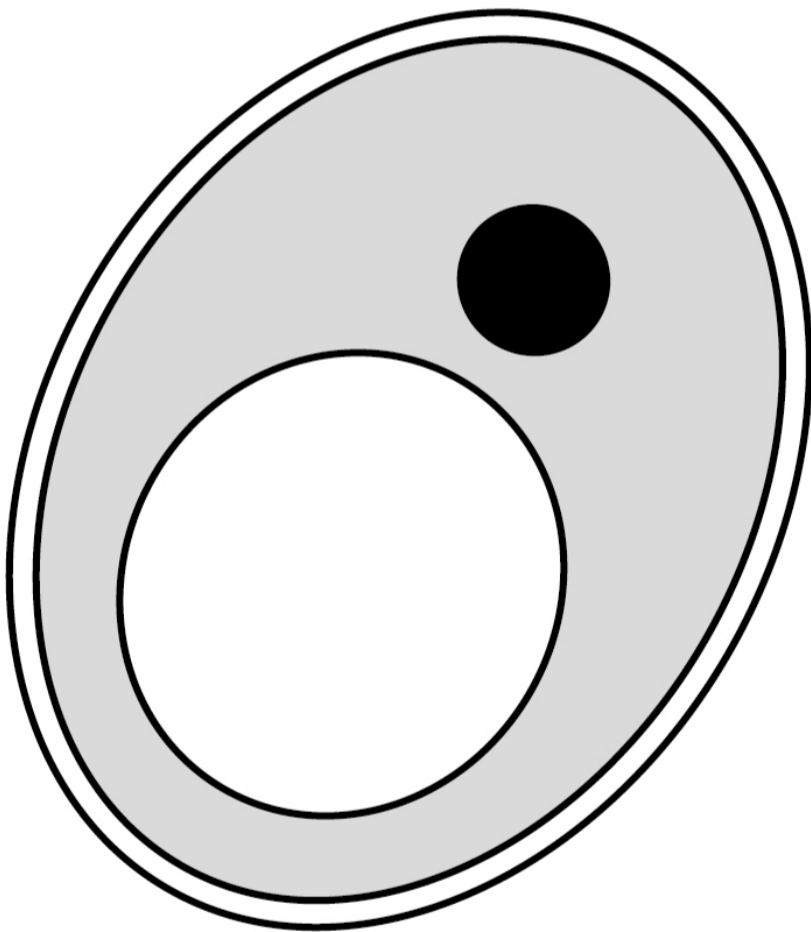


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**Plant cells and fungal cells are similar in structure.**

**FIGURE 10 shows a fungal cell.**

**FIGURE 10**



0	8	.	1
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**Name ONE structure in FIGURE 10 which is present in both plant cells and fungal cells but NOT in animal cells. [1 mark]**

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0	8	.	2
---	---	---	---

**Which disease is caused by a fungus?  
[1 mark]**

**Tick (✓) ONE box.**

**Gonorrhoea**

**Malaria**

**Measles**

**Rose black spot**

**[Turn over]**



0	8	.	3
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**A fungal cell divides once every 90 minutes.**

**How many times would this fungal cell divide in 24 hours? [2 marks]**

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**Number of times cell divides in 24 hours =** \_\_\_\_\_





**Some types of fungal cell are grown to produce high-protein food.**

**The high-protein food can be used to make meat-free burgers.**

**0 8 . 4**

**Where is protein digested in the human digestive system? [1 mark]**

**Tick (✓) ONE box.**

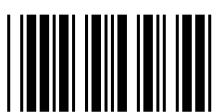
**Large intestine**

**Liver**

**Salivary glands**

**Stomach**

**[Turn over]**



0	8	.	5
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**Which chemical could be used to test if the burgers contain protein? [1 mark]**

**Tick (✓) ONE box.**

**Benedict's reagent**

**Biuret reagent**

**Ethanol**

**Iodine solution**



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**[Turn over]**



08.6

**TABLE 7** shows some information about burgers made from meat and meat-free burgers.

**TABLE 7**

	<b>Mass per 100 g of burger</b>	
	<b>Burgers made from meat</b>	<b>Meat-free burgers</b>
<b>Protein in g</b>	<b>14.0</b>	<b>9.0</b>
<b>Fibre in g</b>	<b>0.9</b>	<b>5.5</b>
<b>Fat in g</b>	<b>16.0</b>	<b>5.2</b>
<b>Carbohydrate in g</b>	<b>15.5</b>	<b>15.1</b>
<b>Cholesterol in mg</b>	<b>120.0</b>	<b>0.0</b>







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**END OF QUESTIONS**

<b>12</b>









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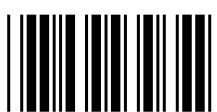
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Question	Mark
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<b>TOTAL</b>	

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