A

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

BIOLOGY

H

Higher Tier Paper 1H

8461/1H

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]

JUN228461 1H01

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 and transport.

0 1 . 1

Complete TABLE 1. [3 marks]

TABLE 1

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

Cells in potatoes are plant cells.

Cells in potatoes do NOT contain chloroplasts.

0 1 . 2

What is the function of chloroplasts?
[1 mark]

0 1 . 3

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

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 cm^3 of 0.4 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.

0 1 . 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**

0 1 . 5

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

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

0 1 . 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:

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

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 2 shows the results.

TABLE 2

Concentration of salt solution in mol/dm^3	Mean percentage (%) change in mass
0.0	9.8
0.1	9.5
0.2	7.0
0.3	0.4
0.4	–1.4

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[Turn over]

0 1 . 7

Complete FIGURE 1, on the opposite page.

You should:

- **label the x-axis**
- **use a suitable scale for the x-axis**
- **plot the data from TABLE 2, on page 10**
- **draw a line of best fit.**

[4 marks]

0 1 . 8

What concentration of salt solution was equal to the concentration of the solution inside the potato pieces?

Use FIGURE 1. [1 mark]

Concentration = _____ mol/dm^3

FIGURE 1

[Turn over]

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0 1 . 9

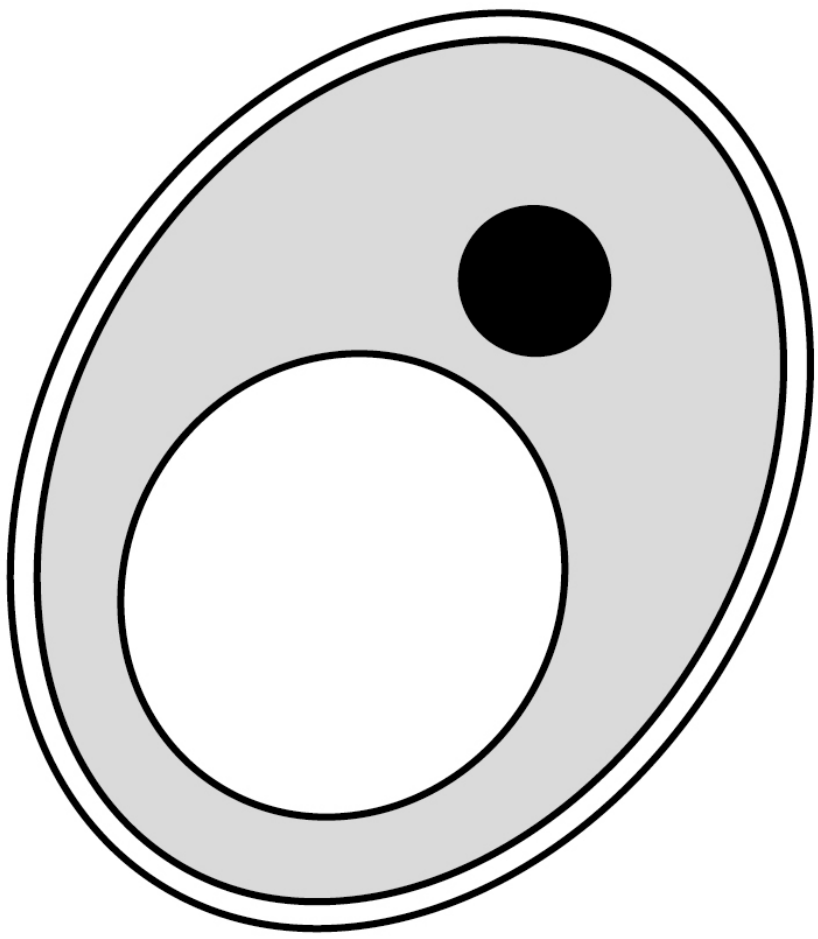
Explain why the potato pieces in the 0.4 mol/dm^3 salt solution decreased in mass. [3 marks]

0 2

Plant cells and fungal cells are similar in structure.

FIGURE 2 shows a fungal cell.

FIGURE 2



0 2 . 1

Name ONE structure in FIGURE 2 which is present in both plant cells and fungal cells but NOT in animal cells. [1 mark]

---

0 2 . 2

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

Tick (✓) ONE box.

☐ **Gonorrhoea**

☐ **Malaria**

☐ **Measles**

☐ **Rose black spot**

[Turn over]

0 2 . 3

A fungal cell divides once every 90 minutes.

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

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 2 . 4

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

Tick (✓) ONE box.

☐ Large intestine

☐ Liver

☐ Salivary glands

☐ Stomach

[Turn over]

0 2 . 5

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]

0 2 . 6

TABLE 3 shows some information about burgers made from meat and meat-free burgers.

TABLE 3

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

Evaluate the use of burgers made from meat compared with meat-free burgers in providing humans with a healthy, balanced diet.

Use information from TABLE 3 and your own knowledge. [6 marks]

24

25

[Turn over]

0 3

A student prepared some onion cells.

The student viewed the onion cells using a light microscope.

This is the method used.

1. **Cut an onion into pieces using a sharp knife.**
2. **Peel off a thin layer of onion epidermis from one piece of onion.**
3. **Place the onion epidermis onto a microscope slide in a single flat layer.**
4. **Add three drops of iodine solution.**
5. **Slowly lower a cover slip at an angle onto the onion epidermis.**
6. **Place the slide on the stage of the microscope.**

0 3 . 1

TABLE 4 shows a risk assessment for this experiment.

Complete TABLE 4. [2 marks]

TABLE 4

HAZARD	RISK	PLAN TO MINIMISE RISK
Iodine solution is an irritant	May cause allergic reaction or skin rash	
Sharp knife		

0 3 . 2

Give a reason for each of the following steps in the method. [3 marks]

A THIN LAYER of onion epidermis is used.

IODINE SOLUTION is added to the onion epidermis.

The cover slip is lowered onto the onion epidermis AT AN ANGLE.

_____

_____

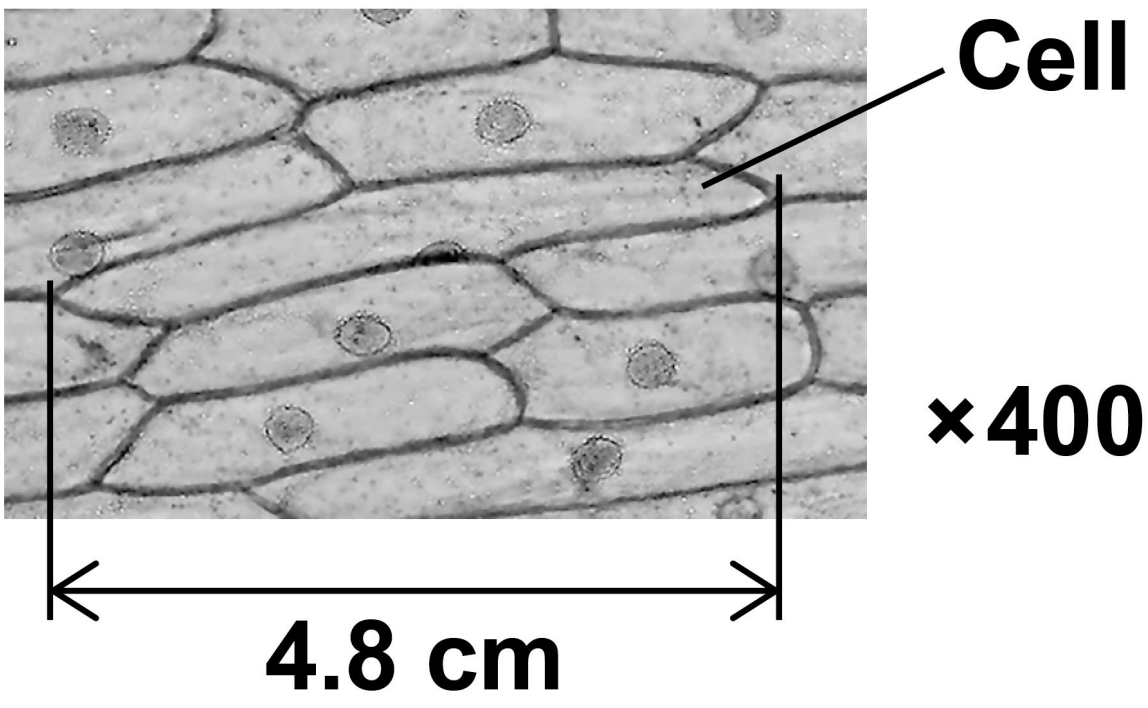
_____

_____

[Turn over]

FIGURE 3 shows what the student saw under the microscope at a magnification of ×400.

FIGURE 3



0 3 . 3

The length of cell Z in FIGURE 3 is 4.8 cm.

Calculate the real length of cell Z.

Give your answer in micrometres (μm).
[5 marks]

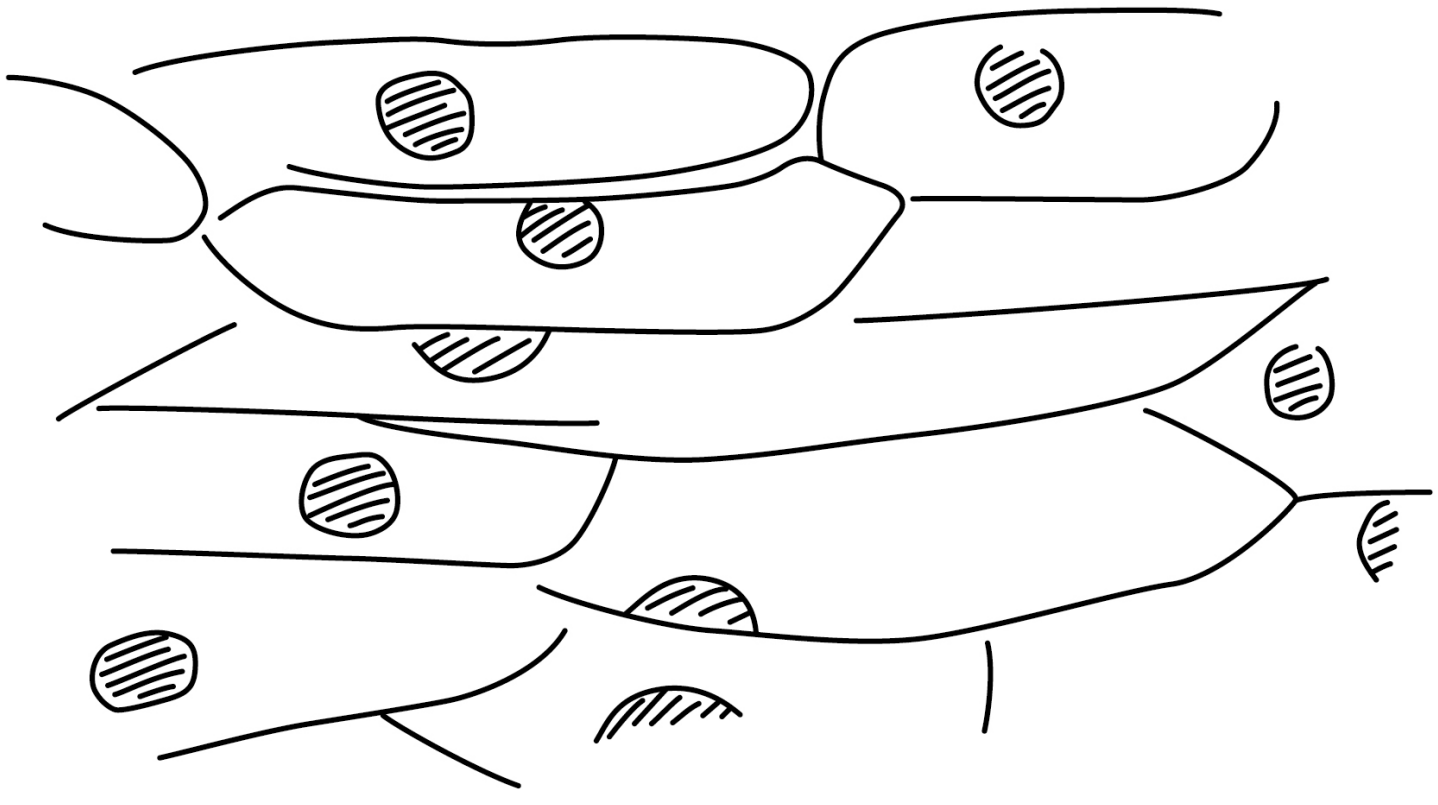
Real length of cell Z = _____ µm

[Turn over]

FIGURE 4 shows the student's drawing of FIGURE 3.

FIGURE 4

ONION CELLS



0 3 . 4

Give TWO ways the student could improve the drawing in FIGURE 4.
[2 marks]

1 _____

_____

2 _____

_____

_____

0 3 . 5

Onion cells can be seen using an electron microscope.

Give TWO ways onion cells would look different when seen using an electron microscope. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

14

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[Turn over]

0 4

Plants and animals have many defence responses.

0 4 . 1

TABLE 5, on the opposite page, shows some plant defences.

Identify whether each defence is a chemical response or a physical response. [2 marks]

Tick (✓) ONE box in each row.

TABLE 5

	TYPE OF RESPONSE	
PLANT DEFENCE	**CHEMICAL**	**PHYSICAL**
Thick, waxy layer on leaf surface		
Berries that are poisonous		
Bark on trees that falls off		

[Turn over]

Mimicry is a mechanical adaptation seen in both plants and animals.

FIGURE 5 shows two insects.

FIGURE 5

HORNET **HORNET MOTH**

0 4 . 2

Hornets are insects that sting other animals and cause pain.

Hornet moths do NOT sting other animals.

Suggest how mimicry helps the HORNET MOTH survive. [1 mark]

_____

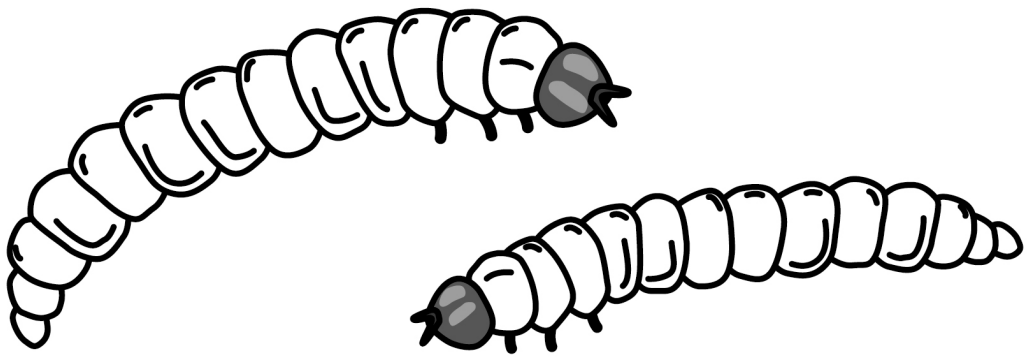
_____

_____

Adult hornet moths lay eggs that hatch into larvae.

FIGURE 6 shows the larvae of a hornet moth.

FIGURE 6



0 4 . 3

The larvae of the hornet moth:

- live inside the roots of trees
- use the tree roots as a source of food
- cause damage to the tree roots.

Explain why a tree might die if the roots of the tree are damaged. [6 marks]

[Turn over]

0 4 . 4

The larvae of the hornet moth form when fertilised eggs divide by mitosis.

Describe how mitosis produces two genetically identical cells. [4 marks]

[Turn over]

0 4 . 5

The cells which are first formed from the fertilised eggs of the hornet moth are stem cells.

Name the process by which these stem cells then form specialised cells.
[1 mark]

_____

_____

14

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[Turn over]

0 5

Water and carbon dioxide are exchanged between leaves and the atmosphere through pores called stomata.

0 5 . 1

Name the cells that control the opening and closing of the stomata. [1 mark]

Water moves through a plant in the transpiration stream.

0 5 . 2

Describe TWO differences between the transpiration stream and translocation. [2 marks]

1 _____

_____

2 _____

_____

_____

0 5 . 3

Which environmental conditions would cause the rate of transpiration to be greatest in a plant? [1 mark]

Tick (✓) ONE box.

- ☐ **Cold with low humidity**
- ☐ **Cold with high humidity**
- ☐ **Warm with low humidity**
- ☐ **Warm with high humidity**

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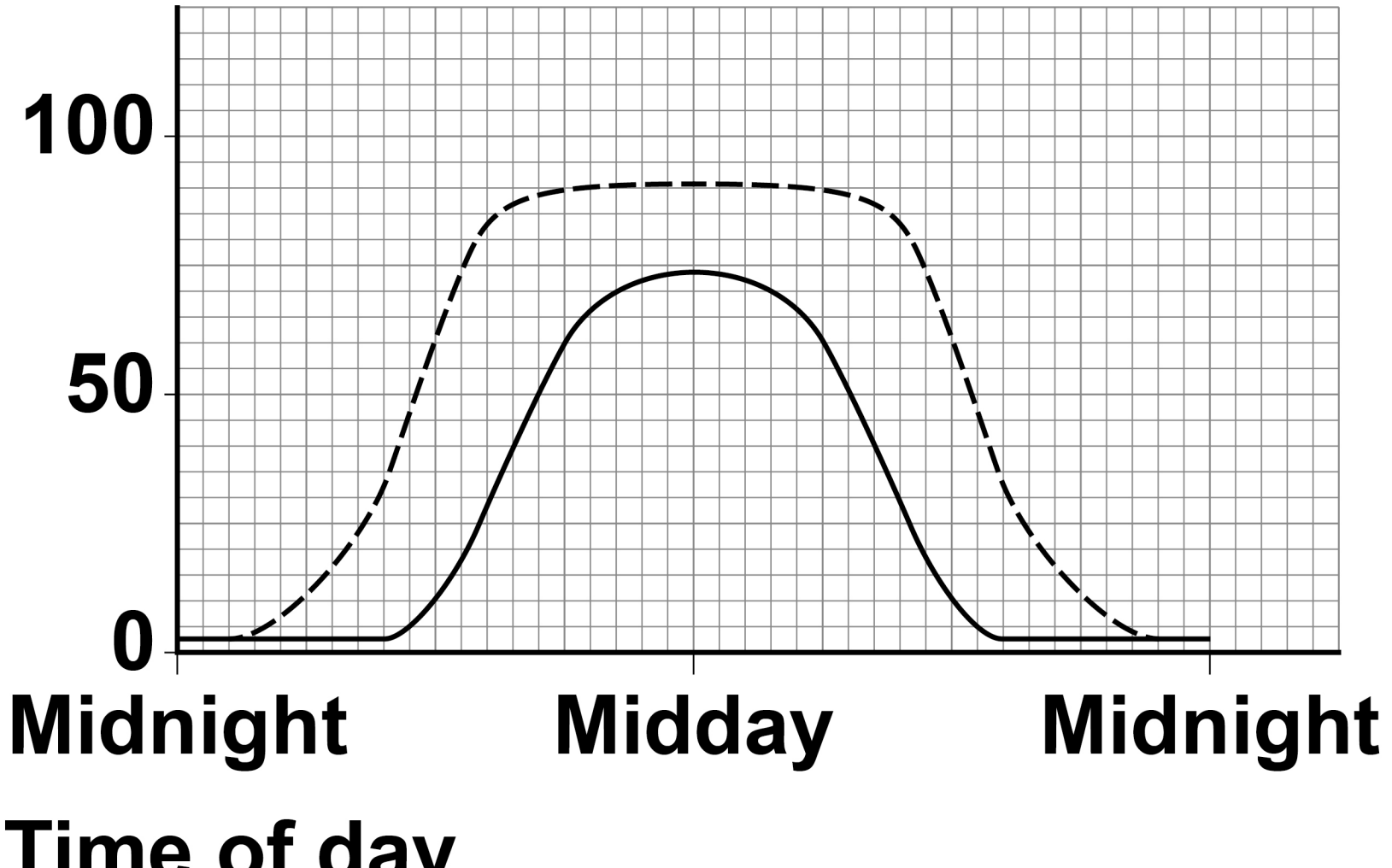
[Turn over]

FIGURE 7 shows information about the mean width of the stomata in a plant.

FIGURE 7



KEY

--- Low atmospheric CO_2

—— Normal conditions

0 5 . 4

The changes in the mean width of the stomata in NORMAL CONDITIONS are an advantage to the plant.

Explain how. [4 marks]

0 5 . 5

The changes in the mean width of the stomata in low atmospheric carbon dioxide are different from the changes in normal conditions.

Explain how the difference helps the plant to survive in low atmospheric carbon dioxide. [2 marks]

10

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[Turn over]

0 6

TABLE 6 shows information about five different organisms.

TABLE 6

Organism	Surface area in m^2	Volume in m^3	Surface area to volume ratio
A	6.04×10^{-8}	1.65×10^{-12}	36606:1
B	3.21×10^{-3}	1.25×10^{-6}	2568:1
C	9.96×10^{-3}	1.35×10^{-4}	X:1
D	4.61×10^{-1}	1.57×10^{-2}	29:1
E	1.99×10^{1}	6.12×10^{0}	3:1

0 6 . 1

Calculate value X in TABLE 6.

Give your answer to the nearest whole number. [3 marks]

X (nearest whole number) = _____

0 6 . 2

What is the relationship between the size of an organism and its surface area to volume ratio?

Use TABLE 6, on page 54. [1 mark]

0 6 . 3

Organism B exchanges gases with the environment directly through its skin.

Organism D exchanges gases with the environment using its respiratory system.

Explain why organism D requires a respiratory system, but organism B does not require a respiratory system.
[2 marks]

TABLE 6 is repeated below.

TABLE 6

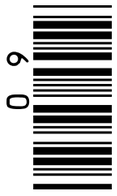
Organism	Surface area in m^2	Volume in m^3	Surface area to volume ratio
A	6.04×10^{-8}	1.65×10^{-12}	36606:1
B	3.21×10^{-3}	1.25×10^{-6}	2568:1
C	9.96×10^{-3}	1.35×10^{-4}	X:1
D	4.61×10^{-1}	1.57×10^{-2}	29:1
E	1.99×10^{1}	6.12×10^{0}	3:1

58

TABLE 7 shows information about organism D and organism E.

TABLE 7

Organism	Metabolic rate in arbitrary units
D	890
E	75



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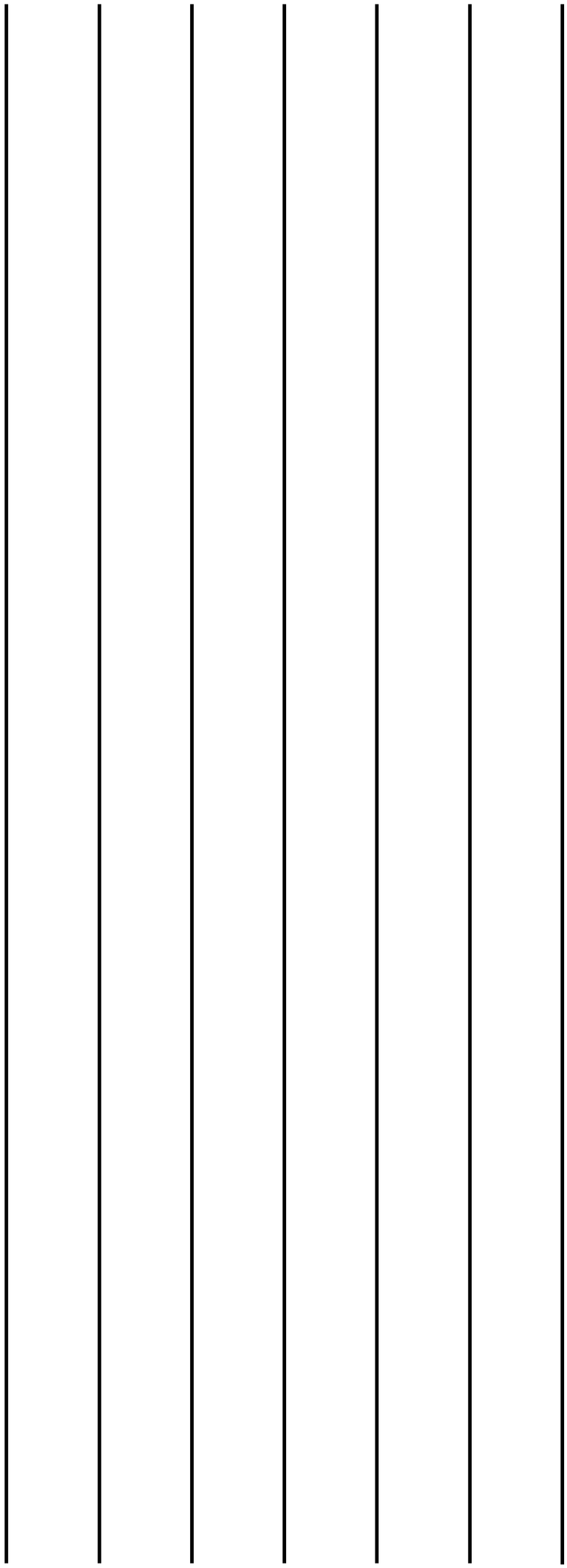
0 6 . 4

Organisms D and E both keep a constant body temperature (warm-blooded).

Explain why the metabolic rate of organism D is greater than the metabolic rate of organism E.

Use information from TABLE 6 and TABLE 7. [4 marks]




6 2

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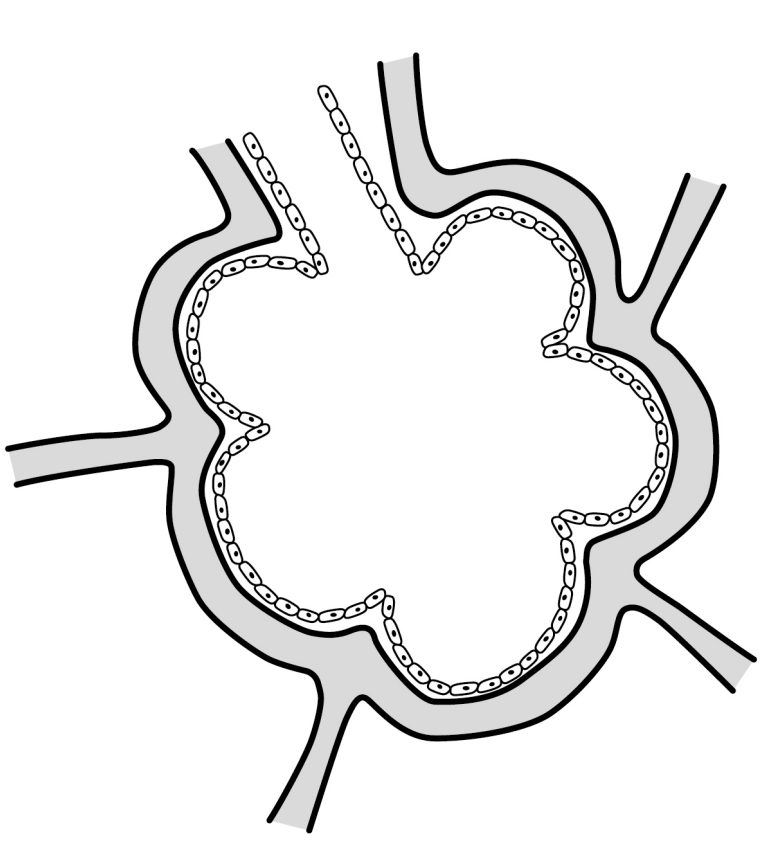
[Turn over]

0 6 . 5

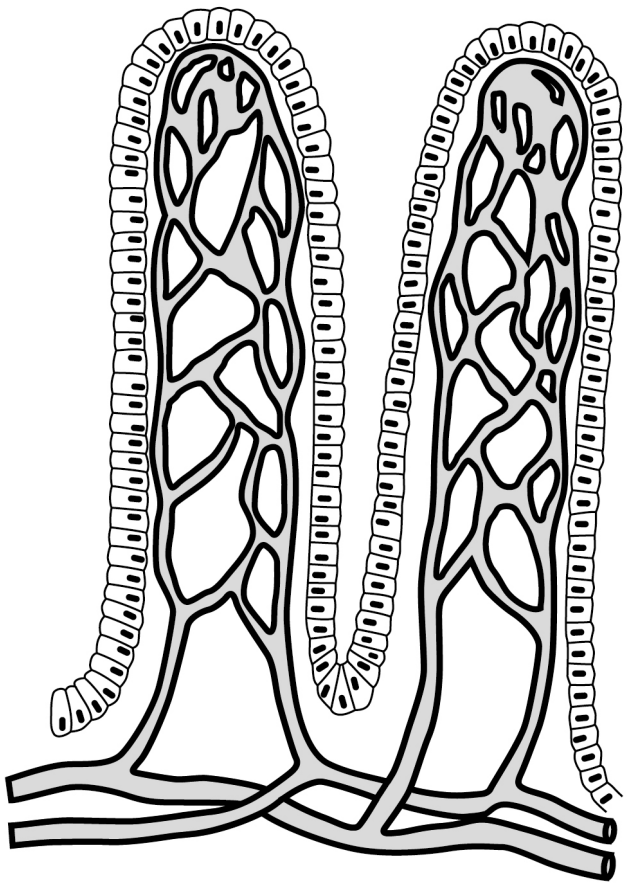
Organism D and organism E both have alveoli in the lungs and villi in the small intestine.

FIGURE 8 shows some alveoli and some villi.

FIGURE 8



Alveoli



Villi

Describe how the alveoli and the villi are adapted to increase absorption.
[4 marks]

0 7

Human immunodeficiency virus (HIV) is a pathogen.

0 7 . 1

Give ONE way HIV can spread from one person to another person. [1 mark]

_____

_____

TABLE 8, on the opposite page, shows information about new cases of HIV diagnosed in the UK.

TABLE 8

YEAR	Number of new HIV cases in women	Number of new HIV cases in men
2010	376	2266
2012	361	2310
2014	397	2370
2016	298	1886
2018	242	1288

[Turn over]

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0 7 . 2

Describe the trends shown in TABLE 8 between 2010 and 2018. [2 marks]

0 7 . 3

Suggest ONE reason for the change in the number of new HIV cases between 2014 and 2018. [1 mark]

[Turn over]

REPEAT OF TABLE 8

YEAR	Number of new HIV cases in women	Number of new HIV cases in men
2010	376	2266
2012	361	2310
2014	397	2370
2016	298	1886
2018	242	1288

0 7 . 4

Calculate the ratio of new cases of HIV in women to new cases of HIV in men in 2018.

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

Ratio (3 significant figures) = _____ : 1

[Turn over]

0 7 . 5

In the UK population the total number of women is greater than the total number of men.

The data in TABLE 8 is used to compare the proportions of new cases of HIV in the population for men and women.

Suggest how the data could be presented differently so that a more valid comparison can be made. [1 mark]

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

0 7 . 6

Explain how a vaccine for HIV could work to prevent a person developing HIV infection. [4 marks]

A person with late stage HIV infection has AIDS.

Scientists have produced monoclonal antibodies for HIV.

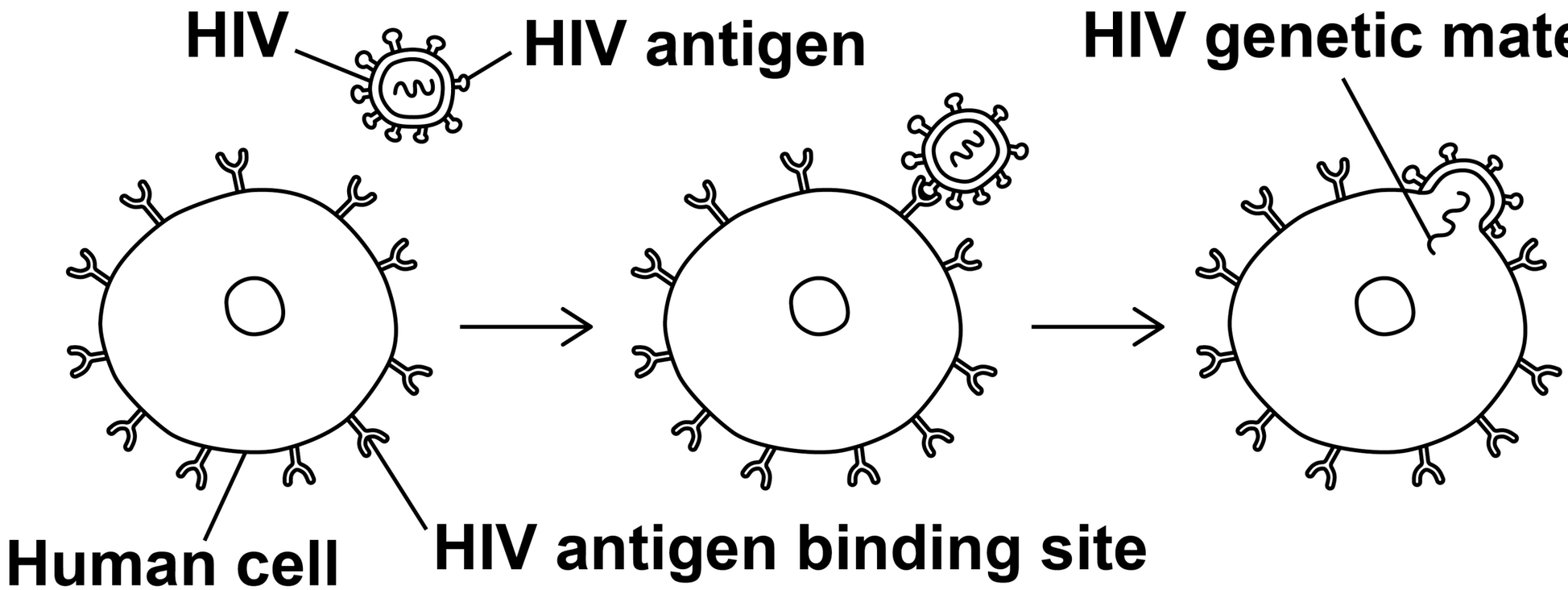
The monoclonal antibodies can prevent a person infected with HIV developing AIDS.

0 7 . 7

Describe how the monoclonal antibody for HIV can be produced. [4 marks]

FIGURE 9 shows how HIV enters a human cell.

FIGURE 9



Suggest how the monoclonal antibody for HIV helps to prevent a person infected with HIV developing AIDS.

Use information from FIGURE 9. [3 marks]

END OF QUESTIONS

19

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
2	
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4	
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6	
7	
TOTAL	