

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE BIOLOGY

H

Higher Tier Unit Biology B3

Friday 9 June 2017

Morning

Time allowed: 1 hour

Materials

For this paper you must have:

- a ruler.

You may use a calculator.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 3 should be answered in continuous prose. In this question you will be marked on your ability to:
 - use good English
 - organise information clearly
 - use specialist vocabulary where appropriate.

Advice

- In all calculations, show clearly how you work out your answer.

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



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

1 Large areas of forest are cut down each year. This is called deforestation.

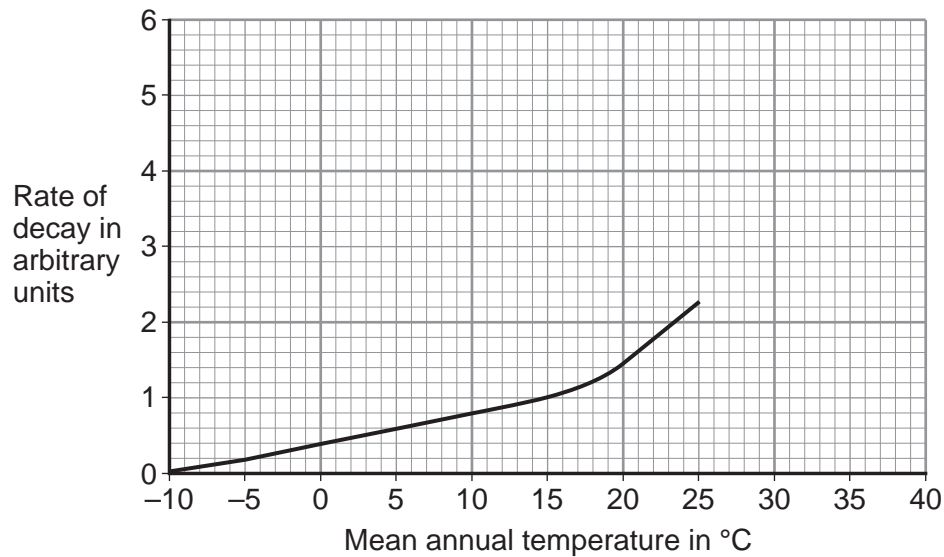
1 (a) Apart from decay, describe how the removal of trees from forests can lead to global warming.

[1 mark]

1 (b) After trees have been cut down, branches and leaves are left on the ground to decay.

Figure 1 shows how the rate of decay changes with the mean annual temperature in different environments.

Figure 1



1 (b) (i) The mean annual temperature in forest **A** is 10 °C.

What is the rate of decay in forest **A**?

[1 mark]

Rate of decay = _____ arbitrary units

1 (b) (ii) Forest **B** has a mean annual temperature of 30 °C.

Use information from **Figure 1** to predict the rate of decay in forest **B**.

[1 mark]

Rate of decay = _____ arbitrary units



1 (c) Describe how decay in forests contributes to global warming.

[2 marks]

5

Turn over for the next question

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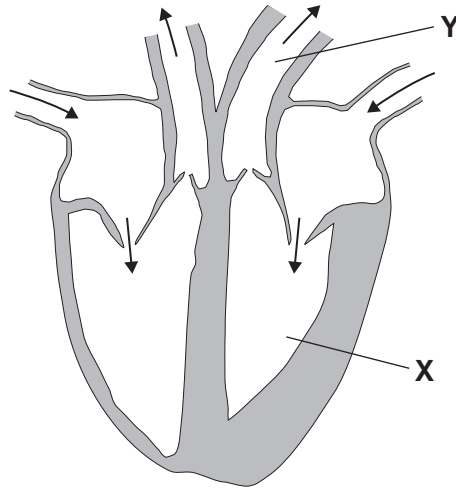
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2 Each year people need to have treatment for heart problems.

Figure 2 shows a human heart.

Figure 2



2 (a) (i) Name part X in **Figure 2**.

[1 mark]

2 (a) (ii) Name part Y in **Figure 2**.

[1 mark]

2 (a) (iii) There are valves inside the heart.

What is the function of these valves?

[1 mark]

Question 2 continues on the next page

Turn over ►



2 (b) Some patients need to have their heart valves replaced.

Table 1 shows the percentage of patients who died from different causes after having heart valve replacements.

Two types of heart valve were used:

- mechanical – made of metal and plastic
- pig tissue – made from pig heart tissue on a metal frame.

The data was collected over 15 years and 400 patients were involved.

Table 1

Cause of death	Percentage of patients who died	
	Mechanical valve	Pig tissue valve
Blood clots blocking coronary arteries	9	9
Bleeding	26	15
Second operation	5	15
Bacterial heart infection	4	8
Heart valves stopped working	0	12

Use information from **Table 1** and your own knowledge to answer the following question.

A patient decides to have a mechanical valve replacement rather than a pig tissue valve replacement.

Suggest reasons for **and** against choosing a mechanical valve.

[4 marks]



2 (c) Some people have narrowed arteries.

Describe how stents can be used to prevent a heart attack in a person with narrowed arteries.

[2 marks]

9

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4 Human activities pollute the air with smoke and gases.

One of these gases is sulfur dioxide.

4 (a) What effect does sulfur dioxide have on our environment?

[1 mark]

Tick (✓) **one** box.

Causes acid rain

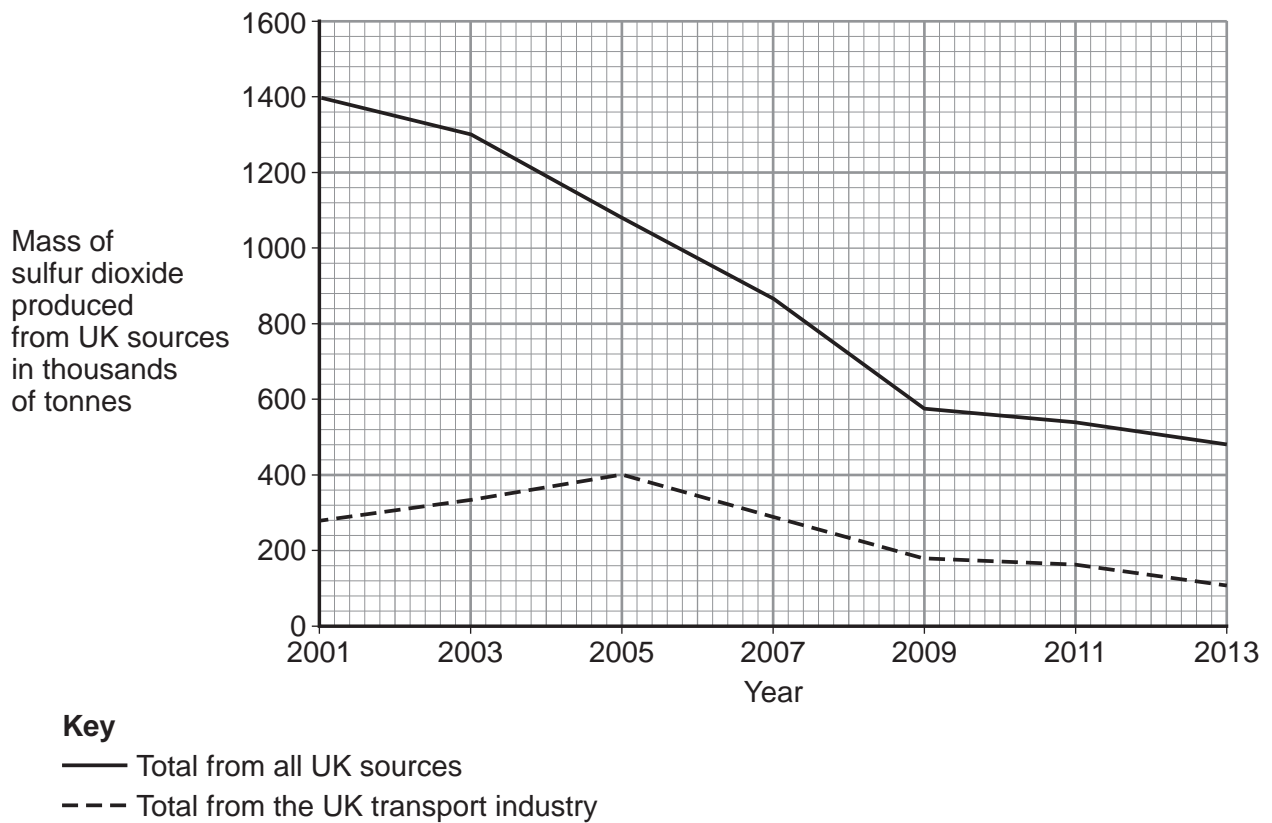
Causes global warming

Causes more carbon sequestering

Causes sea levels to rise

4 (b) **Figure 3** shows how the mass of sulfur dioxide produced from UK sources changed from 2001 to 2013.

Figure 3



4 (b) (i) The mass of sulfur dioxide produced from all UK sources has decreased.

Use information from **Figure 3** to complete the following calculation of the percentage decrease in the mass of sulfur dioxide produced.

[2 marks]

Total mass of sulfur dioxide produced in 2001 = _____ thousand tonnes

Total mass of sulfur dioxide produced in 2013 = 480 thousand tonnes

Decrease in mass of sulfur dioxide produced = _____ thousand tonnes

Percentage decrease working out: _____

Percentage decrease = _____

4 (b) (ii) Use data from **Figure 3** to describe the pattern in the mass of sulfur dioxide produced from the UK transport industry from 2001 to 2013.

[2 marks]

5

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5 Plants have transport systems.

5 (a) In **Table 2**, name **two** tissues that transport substances through a plant. For each tissue, name **one** substance that it transports.

[2 marks]

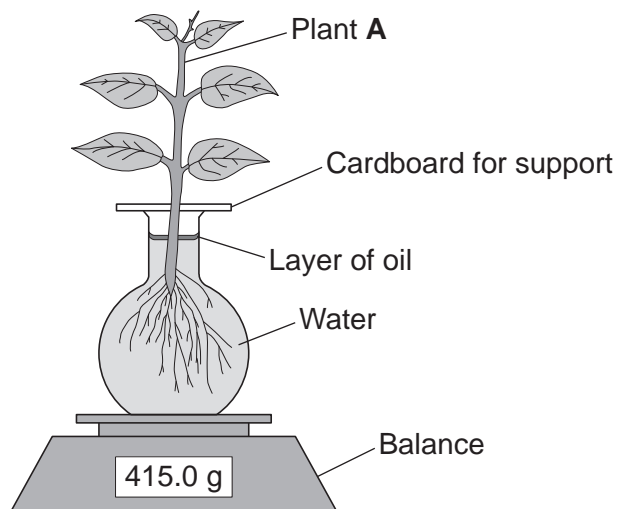
Table 2

Tissue	Substance transported
1 _____	_____
2 _____	_____

5 (b) A student investigated the rate of transpiration in four different plant species, **A**, **B**, **C** and **D**.

He set up the apparatus for plant **A** as shown in **Figure 4**.

Figure 4



In each experiment he:

- recorded the mass of the apparatus at the start of the experiment
- recorded the mass every 5 minutes for 30 minutes
- repeated the experiment with plants **B**, **C** and **D**.



Figure 5 shows his results.

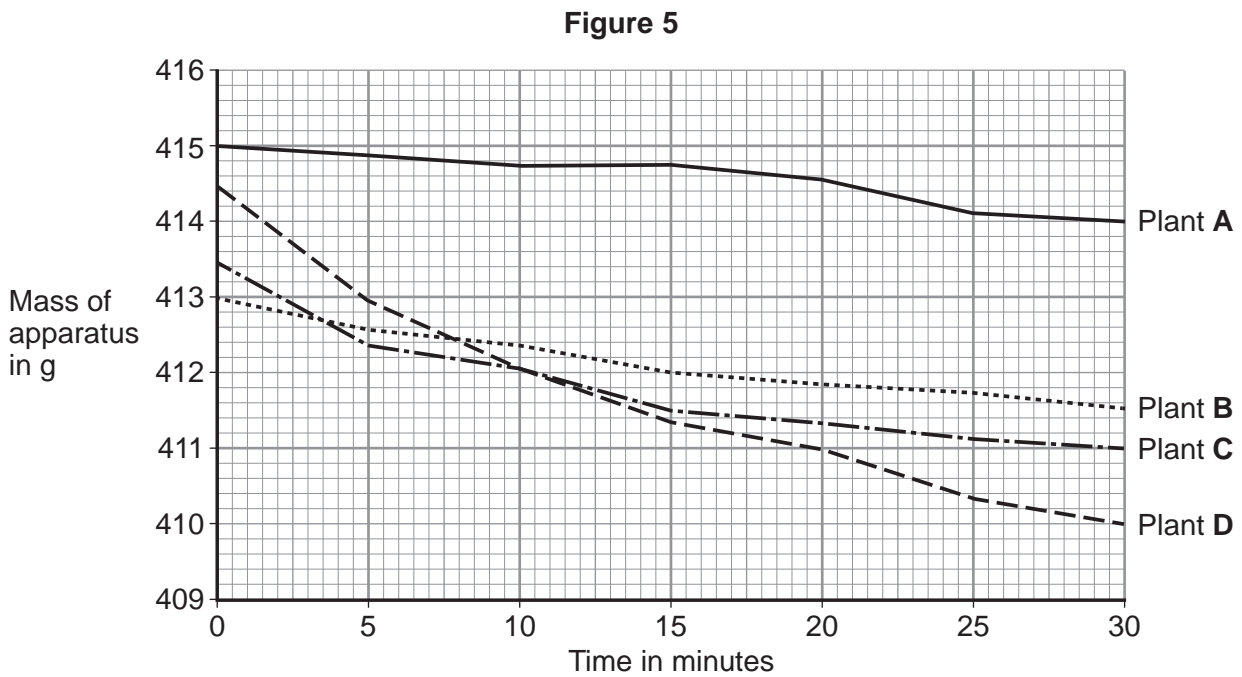


Table 3 shows information about the four plant species.

Table 3

Plant species	Mean number of stomata per mm ² of leaf
Bellflower	42.74
Caraway	117.50
Goosegrass	6.94
Clover	387.33

5 (b) (i) The student concluded that plant D was clover.

Use information from **Figure 5** and **Table 3** to suggest an explanation for the student's conclusion.

[3 marks]

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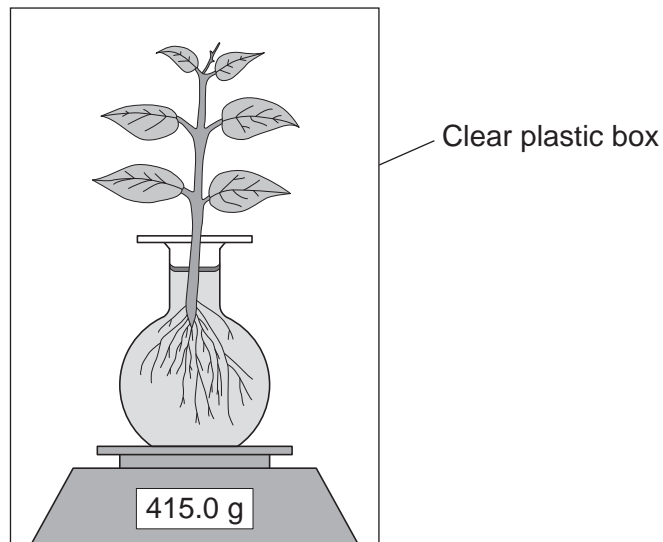


5 (b) (ii) The student carried out another experiment using plant A.

The student used the same apparatus and method.

In this experiment the apparatus was placed in a clear plastic box for the 30 minutes, as shown in **Figure 6**.

Figure 6



Explain what would happen to the rate of water loss due to transpiration in this experiment compared to the first investigation.

[3 marks]



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6 Many people drink sports drinks after exercise.

Table 4 shows some data about five different sports drinks, **P**, **Q**, **R**, **S** and **T**.

Table 4

Sports drink	Concentration of the drink in arbitrary units	Mass per 100 cm ³		
		Sodium ions in mg	Potassium ions in mg	Substance X in g
P	260	45	21	10
Q	170	48	24	9
R	270	112	38	2
S	280	25	6	10
T	493	6	3	13

6 (a) Substance **X** in **Table 4** is used during exercise.

Substance **X** releases energy during exercise.

What is substance **X**?

[1 mark]

6 (b) A sports scientist investigated the effectiveness of sports drinks. She made the following statements:

- the best sports drinks have a slightly lower concentration than blood plasma
- the mean concentration of blood plasma is 280 arbitrary units
- the closer the ratio of sodium ions to potassium ions is to 2:1, the more effective the sports drink.

6 (b) (i) Calculate the ratio of sodium ions to potassium ions in drink **R**.

[1 mark]

Ratio = _____



6 (b) (ii) The scientist stated:

'sports drink **P** is the most effective sports drink'

Use information from part **(b)** and **Table 4** to give reasons why the scientist made this statement.

[2 marks]

6 (b) (iii) Blood cells were placed in a sample of sports drink **T**.

The concentration inside the blood cells was 280 arbitrary units.

Explain what would happen to the blood cells.

[3 marks]

7

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7 A climber falls down a mountain slope into a small pool of cold water.
He is injured and cannot move.
He starts to get cold.

7 (a) How does the body detect a decrease in blood temperature?

[1 mark]

7 (b) The man starts shivering.

Explain how shivering helps to raise his body temperature.

[3 marks]

7 (c) Apart from shivering, explain how the man's body responds to raise his core body temperature.

[3 marks]

7

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8 Some people have coeliac disease. Coeliac disease affects the small intestine.

Symptoms of coeliac disease include:

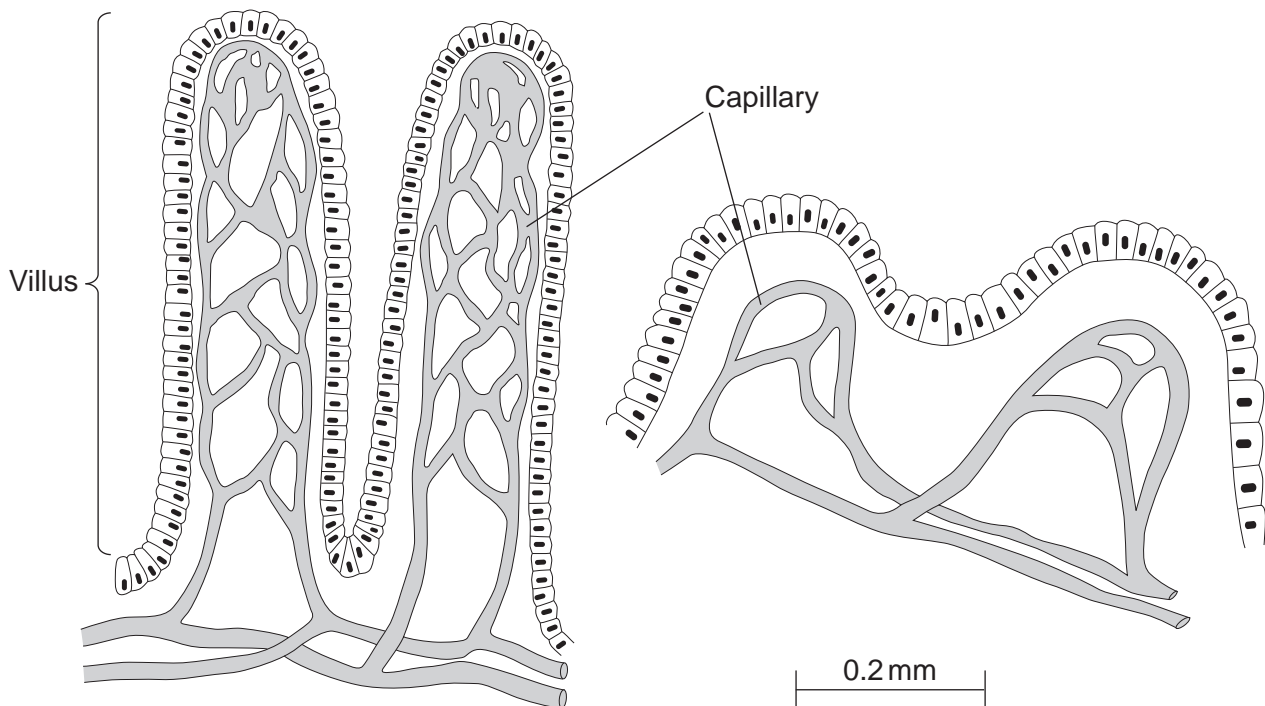
- weight loss
- low levels of vitamins and minerals in the body
- tiredness.

Figure 7 shows the lining of the small intestine of a healthy person and the lining of the small intestine of a person with coeliac disease.

Figure 7

**Lining of the small intestine
of a healthy person**

**Lining of the small intestine
of a person with coeliac disease**



8 (a) Explain how the changes in the villi of a person with coeliac disease may cause the person to lose weight and have low amounts of vitamins and minerals in their body. **[5 marks]**

8 (b) Some of the uptake of glucose in the small intestine occurs by active transport. Describe the process of active transport. **[2 marks]**

7

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9 (a) In a healthy person, blood sugar levels are kept within a narrow range.

Describe what happens in a healthy person when the pancreas detects a rise in blood sugar level.

[2 marks]

9 (b) Glycogen storage disorder is an inherited condition affecting a small number of people.

In some people with the disorder, glycogen does not form properly.

After exercise, a person with this type of glycogen storage disorder can feel very tired and can become unconscious.

Explain why the person has these symptoms after exercise.

[4 marks]

6

END OF QUESTIONS



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