AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.3.2

Plant organ system

Past-paper questions

Tier	**Higher**
Question groups	**15**
Available paper years	**2008–2023**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.2.3.2 Plant organ system

Question 01

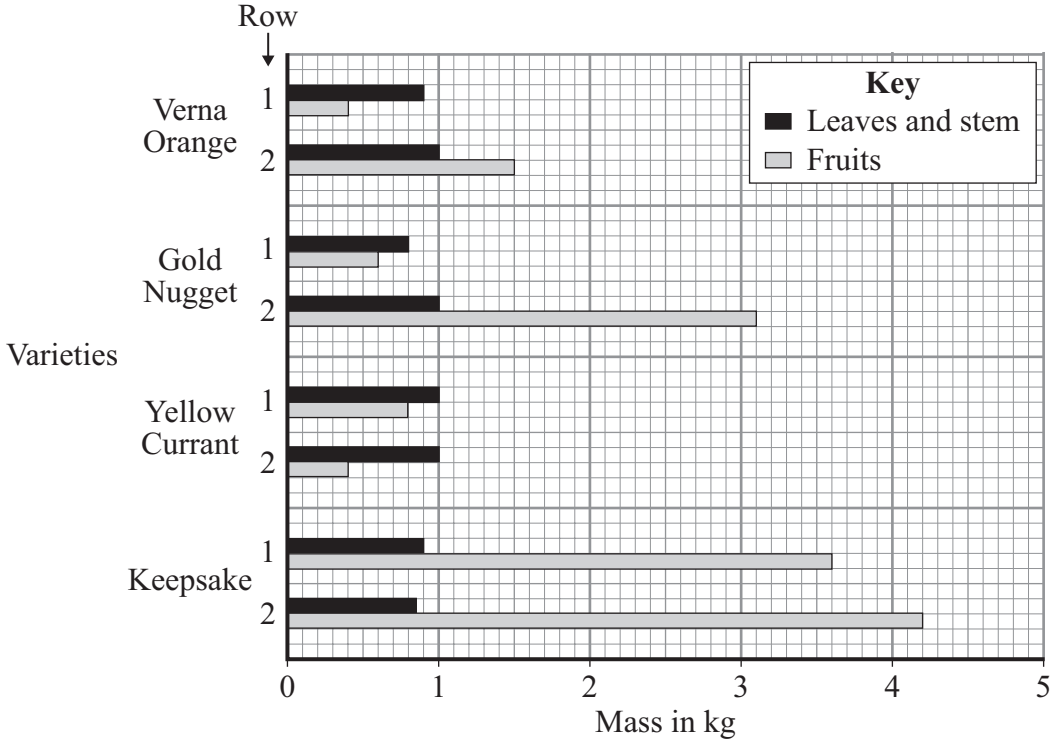
March 2008 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

The bar chart shows the mass of tomato fruits and of leaves and stems for four varieties of tomato plant.

Five plants of each variety were taken from each of two rows growing next to each other.

All plants were provided with the same type of soil and volume of water.



8A Which one of the following is true?

1 In Verna Orange plants, the mass of the leaves and stems is greater than the mass of the fruits.

2 In Keepsake plants, the mass of the fruits is greater than the mass of the leaves and stems.

3 In Gold Nugget plants, the mass of the fruits is less than the mass of the leaves and stems.

4 In Yellow Currant plants, the mass of the leaves and stems is less than the mass of the fruits.

4.2.3.2 Plant organ system

Question 01 · continued March 2008 | BLY1BP | Original Q8 | Legacy

8B The mean mass of fruits per row from a Gold Nugget plant is . . .

1 0.90 kg

2 1.375 kg

3 1.85 kg

4 3.70 kg

8C One student suggested that, 'tomatoes in row 2 produce more fruit than those in row 1'.

Which tomato plants do **not** support this suggestion?

1 Verna Orange

2 Gold Nugget

3 Yellow Currant

4 Keepsake

8D How could a new variety of tomato plant with a greater yield of tomato fruits be produced?

1 breeding together two Keepsake plants

2 taking cuttings from existing varieties

3 using tissue culture

4 breeding together different varieties of tomato plant

4.2.3.2 Plant organ system

Question 02

June 2008 | BLY3H | Original Q2 | Legacy

2 A group of students looked at stomata on four different species of plants, **A**, **B**, **C** and **D**. They estimated the number of stomata per cm^2 on the upper and lower surfaces of the leaves of the four species.

Their results are shown in the table.

Plant species	Estimated number of stomata per cm^2 of leaf surface	
	Upper surface of leaf	Lower surface of leaf
A	4000	28 000
B	0	800
C	8500	15 000
D	8000	26 000

2 (a) Which plant species probably lives in a dry region? ☐

Explain the reason for your answer.

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(3 marks)

2 (b) All four species have more stomata on the lower surface of their leaves than on the upper surface.

Suggest how this could help the plants to survive better.

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(2 marks)

5

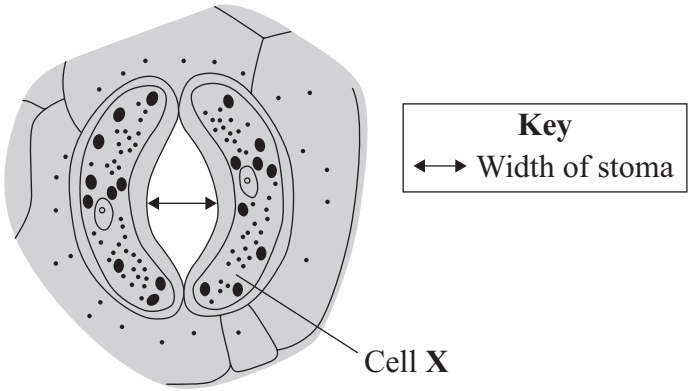
4.2.3.2 Plant organ system

Question 03

June 2009 | BLY3H | Original Q4 | Legacy

4 Plant leaves have many stomata.

The diagram shows a stoma.



4 (a) Name cell **X** .....

(1 mark)

4 (b) The table shows the mean widths of the stomata at different times of the day for two different species of plant.
Species **A** normally grows in hot, dry deserts.
Species **B** grows in the UK.

	Time of day in hours	Mean width of stomata as a percentage of their maximum width	
		Species A	Species B
Dark	0	95	5
	2	86	5
	4	52	6
Light	6	6	40
	8	4	92
	10	2	98
	12	1	100
	14	0	100
	16	1	96
	18	5	54
Dark	20	86	6
	22	93	5
	24	95	5

4.2.3.2 Plant organ system

Question 03 · continued

for mark

The data in the table show that species **A** is better adapted than species **B** to living in hot, dry deserts.

Explain how.

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(4 marks)

(Extra space) .....

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4.2.3.2 Plant organ system

Question 04

June 2011 | BLY2H | Original Q1 | Legacy

1 Cells contain a solution of salts and sugars.

A student is investigating how cells change when they are put into water.

1 (a) The student:

- looks at a plant cell using a microscope
- adds water to the cell.

The plant cell swells up.

Explain why, as fully as you can.

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(3 marks)

1 (b) When **animal** cells are put in water, they swell up, and then burst.
When **plant** cells are put in water, they swell up, but do **not** burst.

How does the structure of plant cells prevent them from bursting?

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(1 mark)

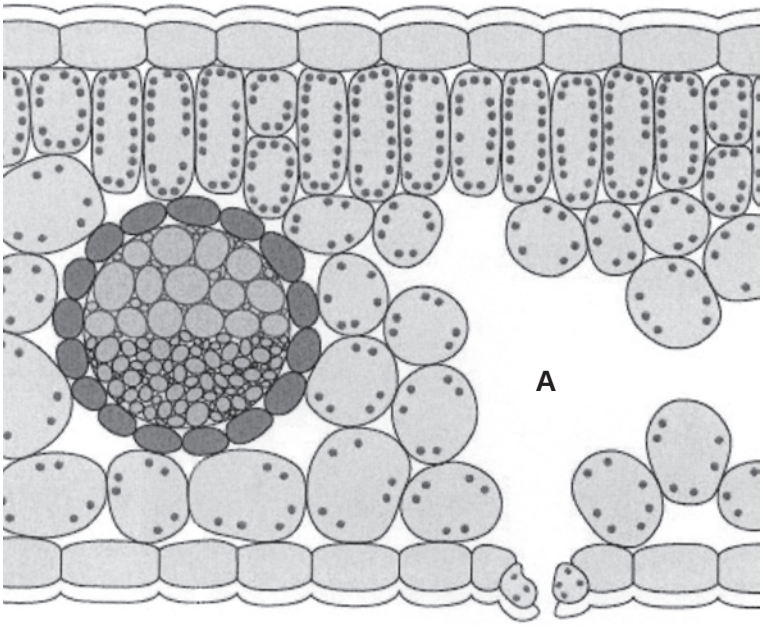
4

4.2.3.2 Plant organ system

Question 05

June 2013 | BL2HP | Original Q1 | Legacy

1 The diagram shows a section through a plant leaf.



1 (a) Use words from the box to name **two** tissues in the leaf that transport substances around the plant.

epidermis	**mesophyll**	**phloem**	**xylem**

..... and .....

(1 mark)

1 (b) Gases *diffuse* between the leaf and the surrounding air.

1 (b) (i) What is *diffusion*?

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(2 marks)

1 (b) (ii) Name **one** gas that will diffuse from point **A** to point **B** on the diagram on a sunny day.

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(1 mark)

4

4.2.3.2 Plant organ system

Question 06

June 2013 | BL3HP | Original Q4 | Legacy

4 Plants exchange substances with the environment.

4 (a) Plant roots absorb water mainly by osmosis.
Plant roots absorb ions mainly by active transport.

Explain why roots need to use the two different methods to absorb water and ions.

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(4 marks)

4 (b) What is meant by the *transpiration stream*?

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(3 marks)

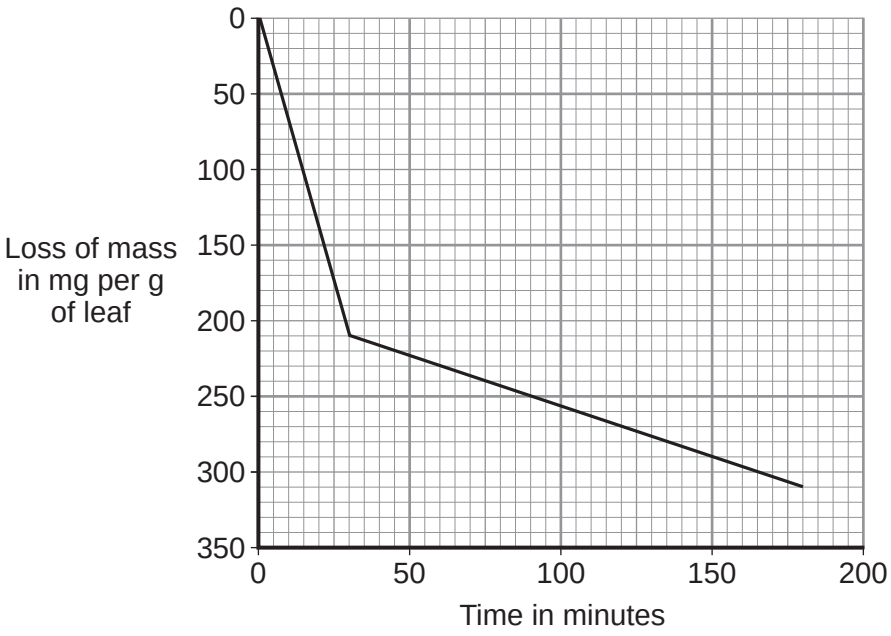
4.2.3.2 Plant organ system

Question 06 · continued

4 (c) Students investigated the loss of water vapour from leaves.

The students:
- cut some leaves off a plant
- measured the mass of these leaves every 30 minutes for 180 minutes.

The graph shows the students' results.



4 (c) (i) The rate of mass loss in the first 30 minutes was 7 milligrams per gram of leaf per minute.

Calculate the rate of mass loss between 30 minutes and 180 minutes.

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Rate of mass loss = ... milligrams per gram of leaf per minute

(2 marks)

4 (c) (ii) The rate of mass loss between 0 and 30 minutes was very different from the rate of mass loss between 30 and 180 minutes.

Suggest an explanation for the difference between the two rates.

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(2 marks)

11

4.2.3.2 Plant organ system

Question 07

June 2014 | BL3HP | Original Q5 | Legacy

5 The leaves of most plants have stomata.

5 (a) (i) Name the cells which control the size of the stomata.

[1 mark]

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5 (a) (ii) Give **one** function of stomata.

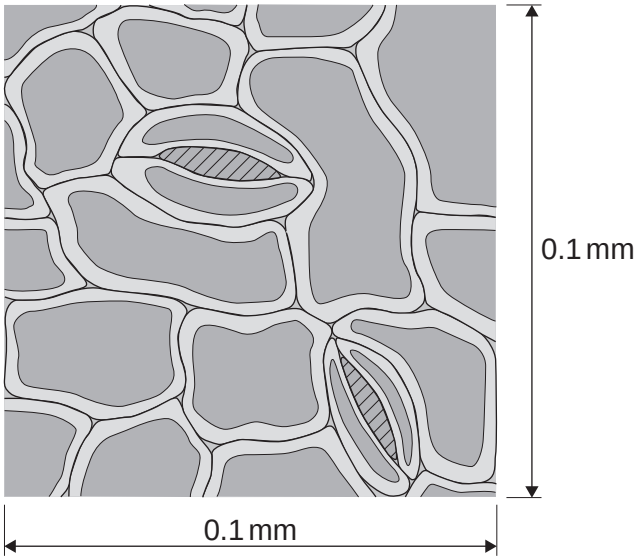
[1 mark]

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5 (b) **Figure 5** shows part of the surface of a leaf.

Figure 5



The length and width of this piece of leaf surface are both 0.1 mm.

5 (b) (i) Calculate the number of stomata per mm^2 of this leaf surface.

[2 marks]

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..... per mm^2

4.2.3.2 Plant organ system

Question 07 · continued

5 (b) (ii) A different plant species has 400 stomata per mm^2 of leaf surface.

Having a large number of stomata per mm^2 of leaf surface can be a disadvantage to a plant.

Give **one** disadvantage.

[1 mark]

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5 (c) A student investigated the loss of water from plant leaves.

The student did the following:

- Step 1: took ten leaves from a plant
- Step 2: weighed all ten leaves
- Step 3: hung the leaves up in a classroom for 4 days
- Step 4: weighed all ten leaves again
- Step 5: calculated the mass of water lost by the leaves
- Step 6: repeated steps **1** to **5** with grease spread on the upper surfaces of the leaves
- Step 7: repeated steps **1** to **5** with grease spread on both the upper and lower surfaces of the leaves.

All the leaves were taken from the same type of plant.

Table 2 shows the student's results.

Table 2

Treatment of leaves	Mass of water the leaves lost in g
No grease was used on the leaves	0.98
Grease on upper surfaces of the leaves	0.86
Grease on upper and lower surfaces of the leaves	0.01

4.2.3.2 Plant organ system

Question 07 · continued

5 (c) (i) What mass of water was lost in 4 days through the upper surfaces of the leaves?

[1 mark]

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Mass = ... g

5 (c) (ii) Very little water was lost when the lower surfaces of the leaves were covered in grease.

Explain why.

[3 marks]

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9

4.2.3.2 Plant organ system

Question 08

2 (a) Carbon dioxide enters a plant through stomata on the leaves.

Name the cells that control the size of the stomata.

[1 mark]

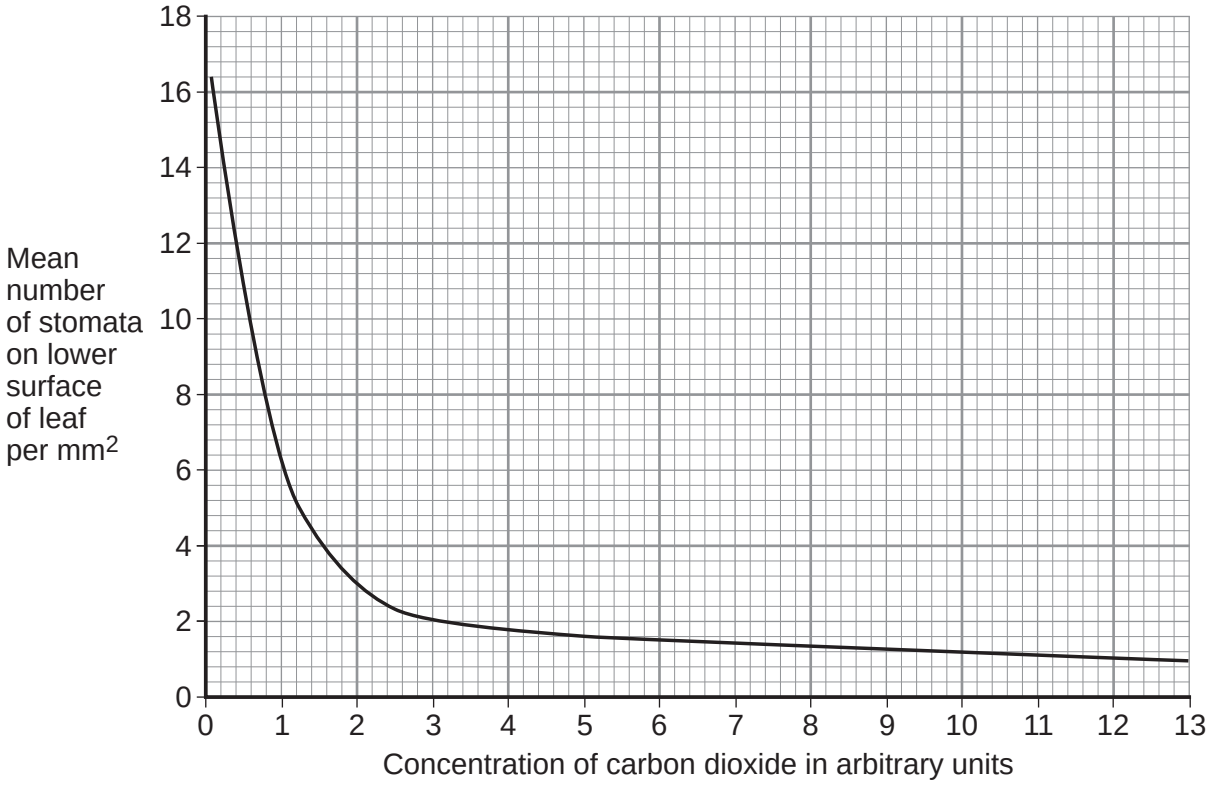
_____

2 (b) Scientists grew tomato plants in air containing different concentrations of carbon dioxide.

The scientists recorded the number of stomata found on the lower surface of the leaves of plants grown at each carbon dioxide concentration.

Figure 2 shows the results.

Figure 2



4.2.3.2 Plant organ system

Question 08 · continued

2 (b) (i) Describe the relationship between the mean number of stomata per mm^2 and carbon dioxide concentration.

[2 marks]

2 (b) (ii) Suggest a reason for the relationship you described in part **(b)(i)**.

[1 mark]

2 (c) (i) Suggest **one** disadvantage to a plant of having a large number of stomata per mm^2 on each leaf.

[1 mark]

2 (c) (ii) Suggest **one** environmental condition where a large number of stomata per mm^2 on each leaf would be a disadvantage.

[1 mark]

6

4.2.3.2 Plant organ system

Question 09

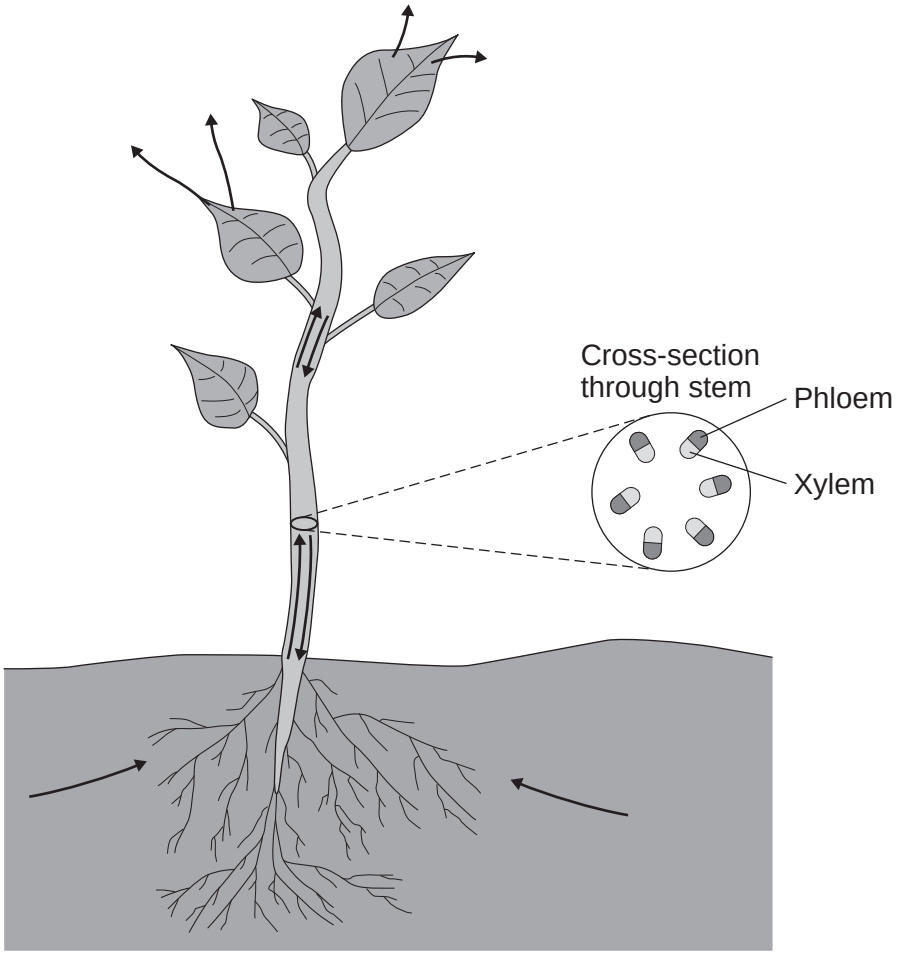
June 2016 | BL3HP | Original Q3 | Legacy

3 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Plants transport many substances between their leaves and roots.

Figure 3 shows the direction of movement of substances through a plant.

Figure 3



4.2.3.2 Plant organ system

Question 09 · continued

Describe how **ions**, **water** and **sugar** are obtained and transported through plants.

In your answer you should refer to materials moving upwards in a plant and to materials moving downwards in a plant.

[6 marks]

Extra space

6

4.2.3.2 Plant organ system

Question 10

June 2017 | BL3HP | Original Q5 | Legacy

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]

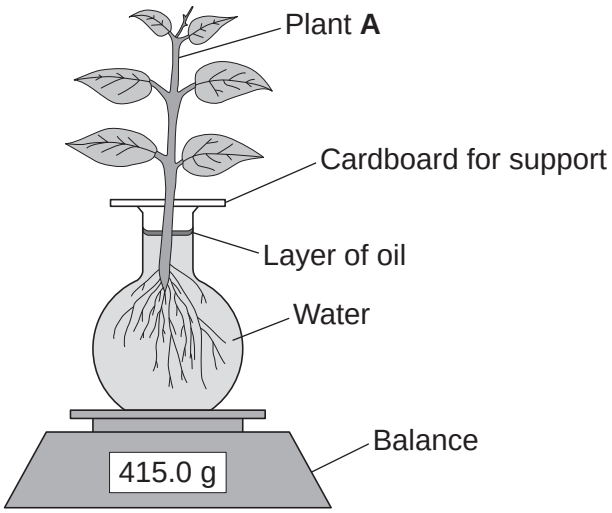
Table 2

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**.

4.2.3.2 Plant organ system

Question 10 · continued

Figure 5 shows his results.

Figure 5

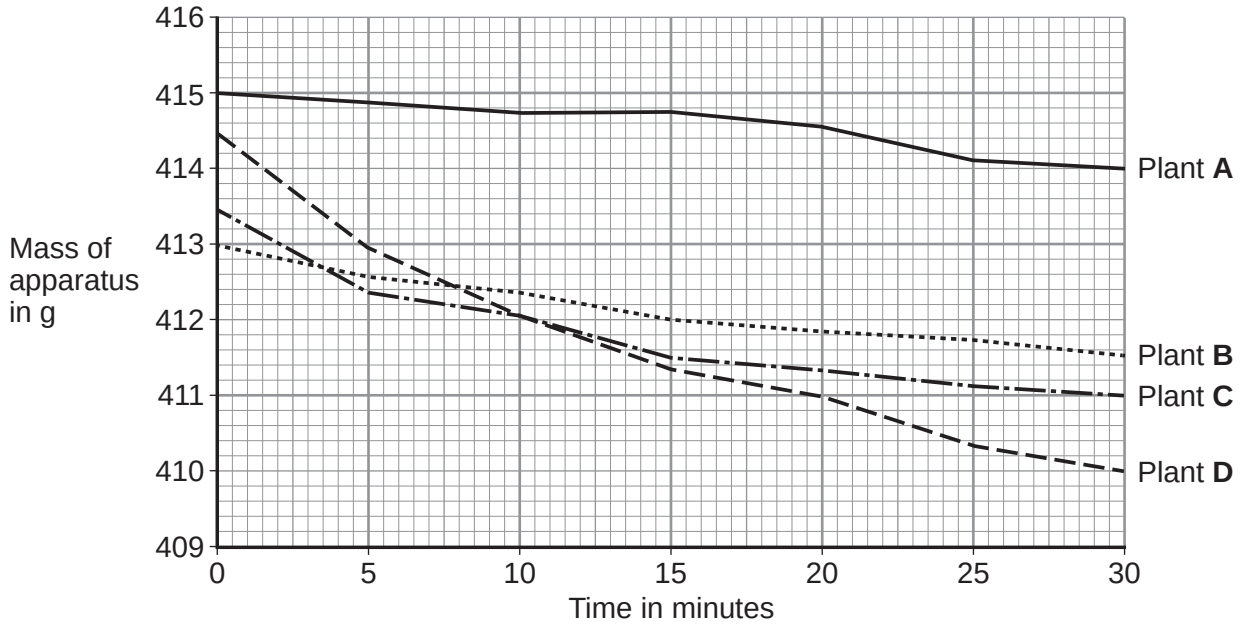


Table 3 shows information about the four plant species.

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]

4.2.3.2 Plant organ system

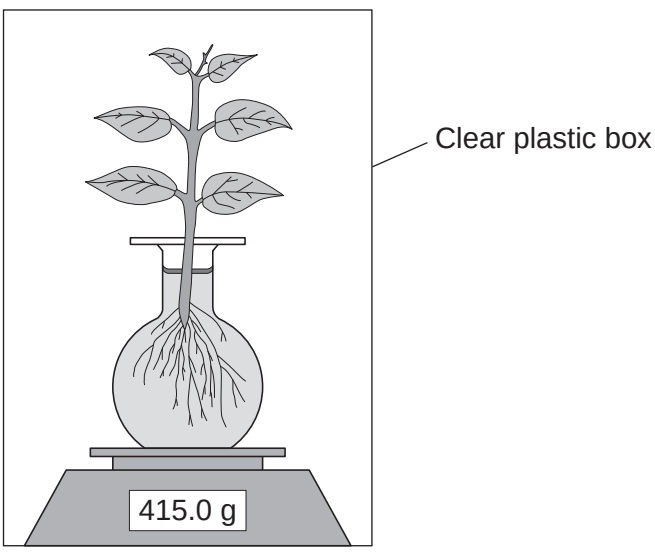
Question 10 · continued

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]

8

4.2.3.2 Plant organ system

Question 11

June 2019 | 8461/1H | Original Q4

0 4 Water moves from a plant to the atmosphere through the leaves.

0 4 . 1 How is the volume of water lost from the leaves controlled?

[1 mark]

0 4 . 2 Describe the transport of water through a plant from the roots to the atmosphere.

[3 marks]

Question 4 continues on the next page

4.2.3.2 Plant organ system

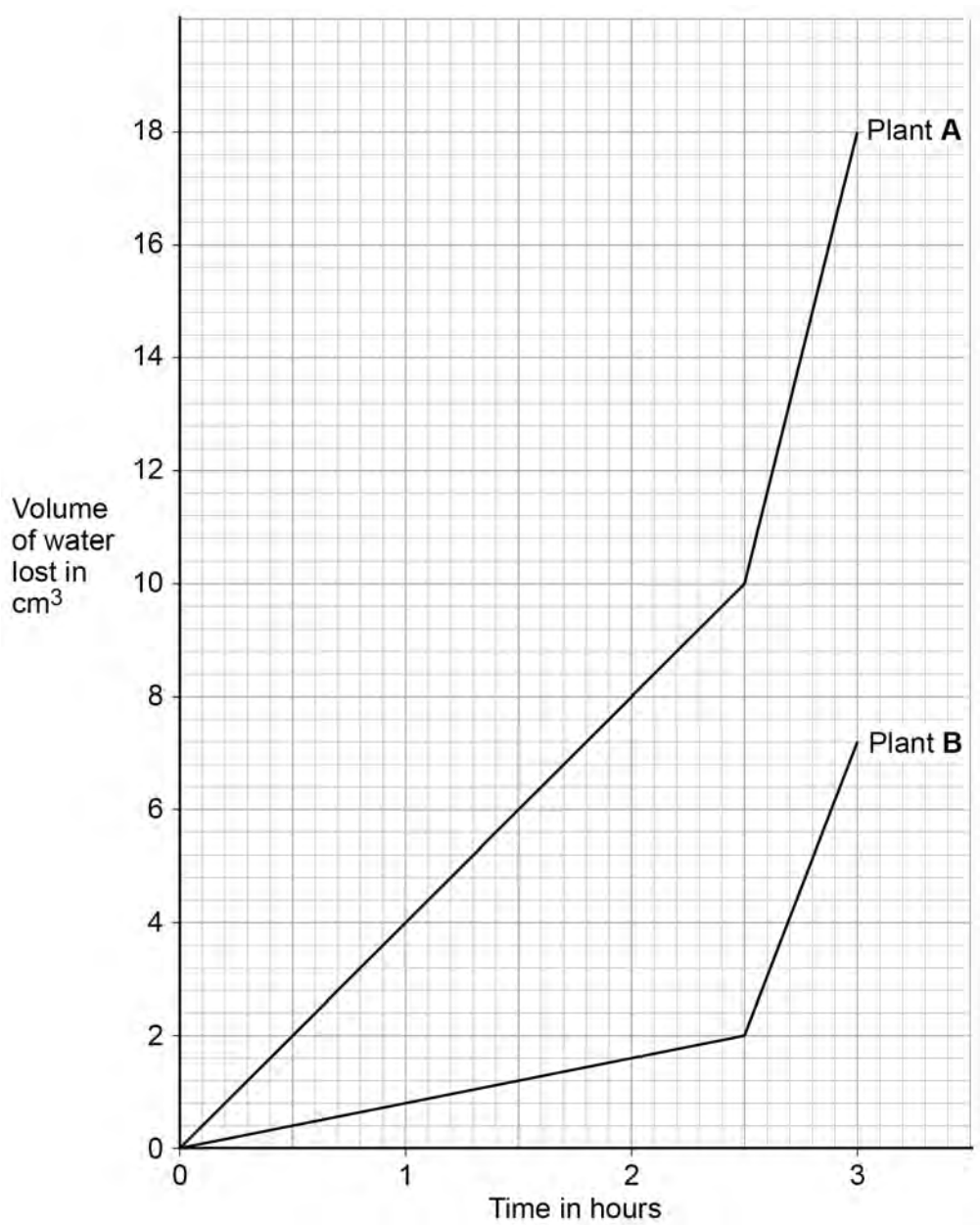
Question 11 · continued

A student investigated the volume of water lost from two plants of different species.

Both plants were kept together.

Figure 5 shows the student's results.

Figure 5



4.2.3.2 Plant organ system

Question 11 · continued

0 4 . 3 Suggest **one** reason for the difference in the rate of water loss from the two plants in the first 2.5 hours.

[1 mark]

Both plants were moved to a different place at 2.5 hours.

0 4 . 4 Calculate the rate of water loss per hour in plant **B** from 2.5 hours to 3 hours.

Give your answer to **2** significant figures.

[3 marks]

Rate of water loss = _____ cm^3/hour

0 4 . 5 Suggest **two** reasons why the rate of water loss in both plants changed after 2.5 hours.

[2 marks]

1 _____

2 _____

10

4.2.3.2 Plant organ system

Question 12

November 2020 | 8461/1H | Original Q2

0 2 Diffusion is an important process in animals and plants.

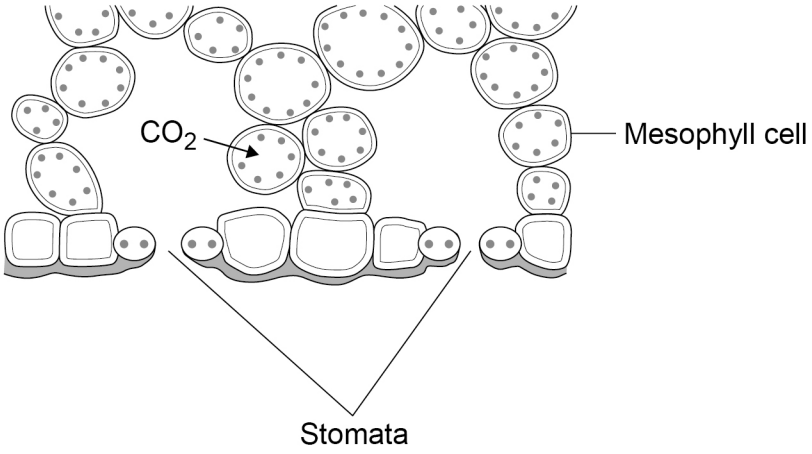
0 2 . 1 What is meant by the term diffusion?

[2 marks]

Question 12 · continued

0 2 . 2 **Figure 2** shows part of a leaf.

Figure 2



Molecules of carbon dioxide diffuse from the air into the mesophyll cells.

Which **two** changes will increase the rate at which carbon dioxide diffuses into the mesophyll cells?

[2 marks]

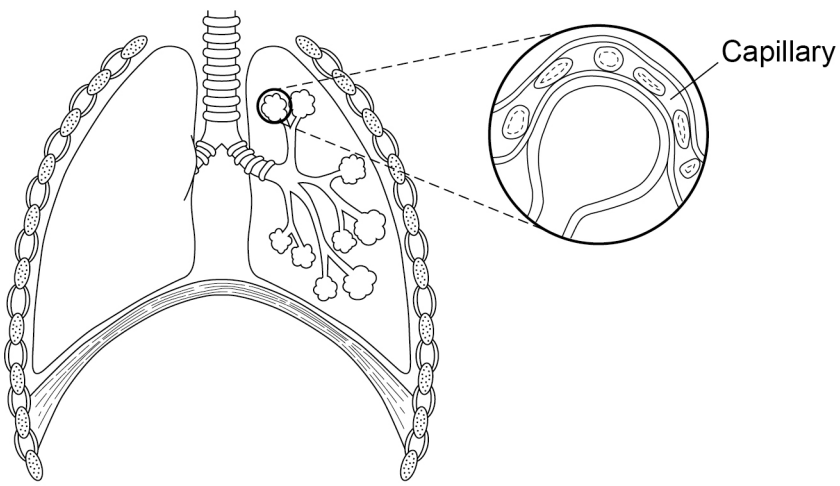
Tick (✓) **two** boxes.

- Decreased number of chloroplasts in the cells ☐
- Decreased surface area of cells in contact with the air ☐
- Increased carbon dioxide concentration in the air ☐
- Increased number of stomata that are open ☐
- Increased oxygen concentration in the air ☐

0 2 . 3 Diffusion also happens in the human lungs.

Figure 3 shows the human breathing system.

Figure 3



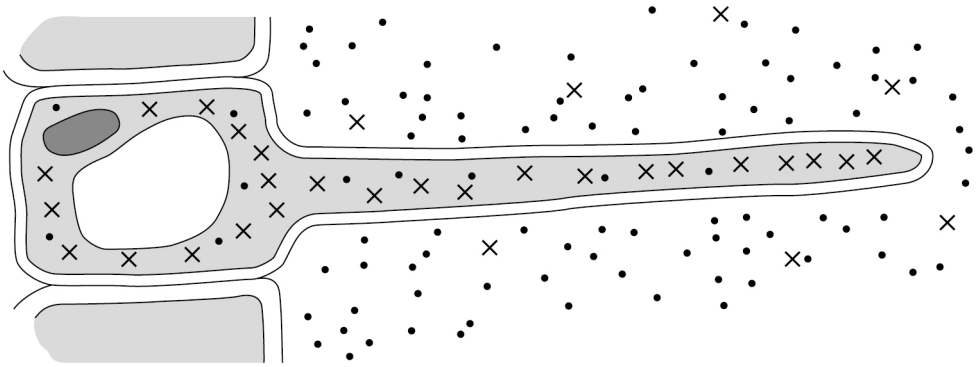
Explain how the human lungs are adapted for efficient exchange of gases by diffusion.
[6 marks]

4.2.3.2 Plant organ system

Question 12 · continued

Figure 4 shows a root hair cell.

Figure 4



Key

Water molecules

Nitrate ions

0 2 . 4 Name the process by which water molecules enter the root hair cell.

[1 mark]

0 2 . 5 Nitrate ions need a different method of transport into the root hair cell.

Explain how the nitrate ions in **Figure 4** are transported into the root hair cell.

Use information from **Figure 4** in your answer.

[3 marks]

Name of process

Explanation

14

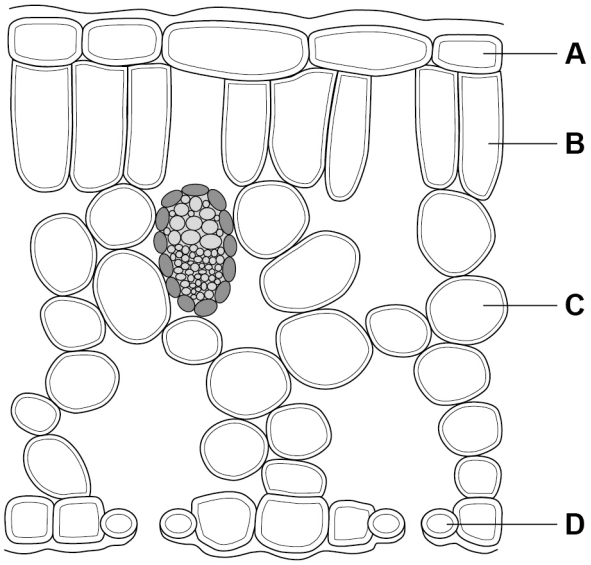
4.2.3.2 Plant organ system

Question 13

November 2021 | 8461/1H | Original Q6

0 6 **Figure 9** shows a cross section of a leaf.

Figure 9



0 6 . 1 Which cell is most transparent?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 6 . 2 Which cell structure in a leaf mesophyll cell is **not** found in a root hair cell?

[1 mark]

4.2.3.2 Plant organ system

Question 13 · continued

Plants lose water through their leaves.

0 6 . 3 Name the cells in a leaf that control the rate of water loss.

[1 mark]

0 6 . 4 Water is taken in by the roots, transported up the plant and lost from the leaves.

Which scientific term describes this movement of water?

[1 mark]

0 6 . 5 Which change would decrease the rate of water loss from a plant's leaves?

[1 mark]

Tick (✓) **one** box.

- Increased humidity ☐
- Increased light intensity ☐
- Increased density of stomata ☐
- Increased temperature ☐

Question 6 continues on the next page

4.2.3.2 Plant organ system

Question 13 · continued

0 6 . 6 Compare the structure and function of xylem tissue and phloem tissue.

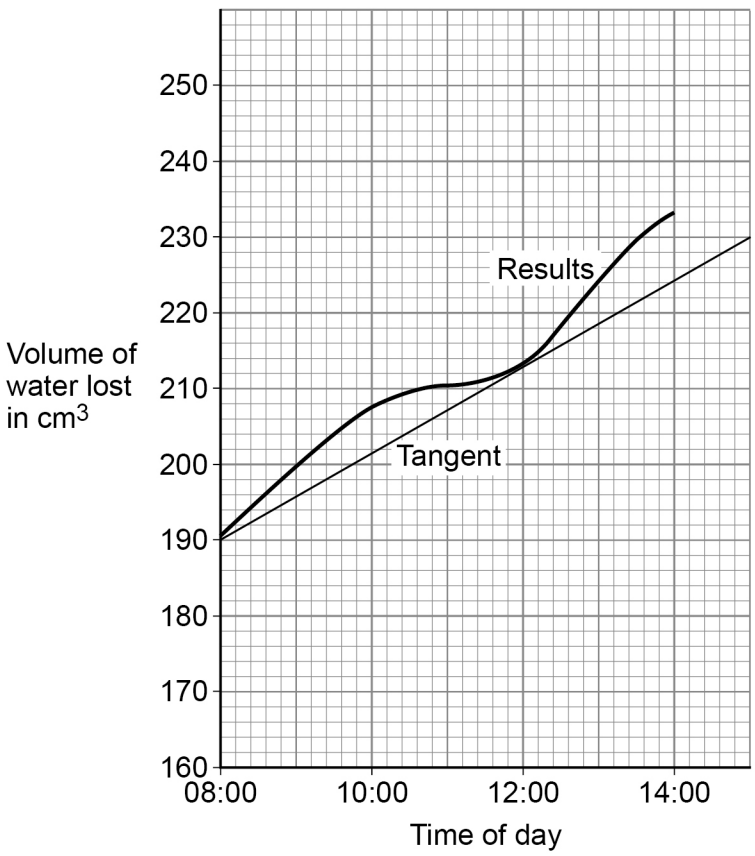
[6 marks]

4.2.3.2 Plant organ system

Question 13 · continued

Figure 10 shows the total volume of water lost from a plant over 6 hours.

Figure 10



4.2.3.2 Plant organ system

Question 13 · continued

0 6 . 7 Determine the rate of water loss at 12:00

Use the tangent on **Figure 10**.

Give your answer:

- in cm^3 per minute
- in standard form.

[4 marks]

Rate of water loss = _____ cm^3 per minute

0 6 . 8 The rate of water loss at midnight was much lower than at 12:00

Explain why.

[2 marks]

17

4.2.3.2 Plant organ system

Question 14

June 2022 | 8461/1H | Original Q5

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]

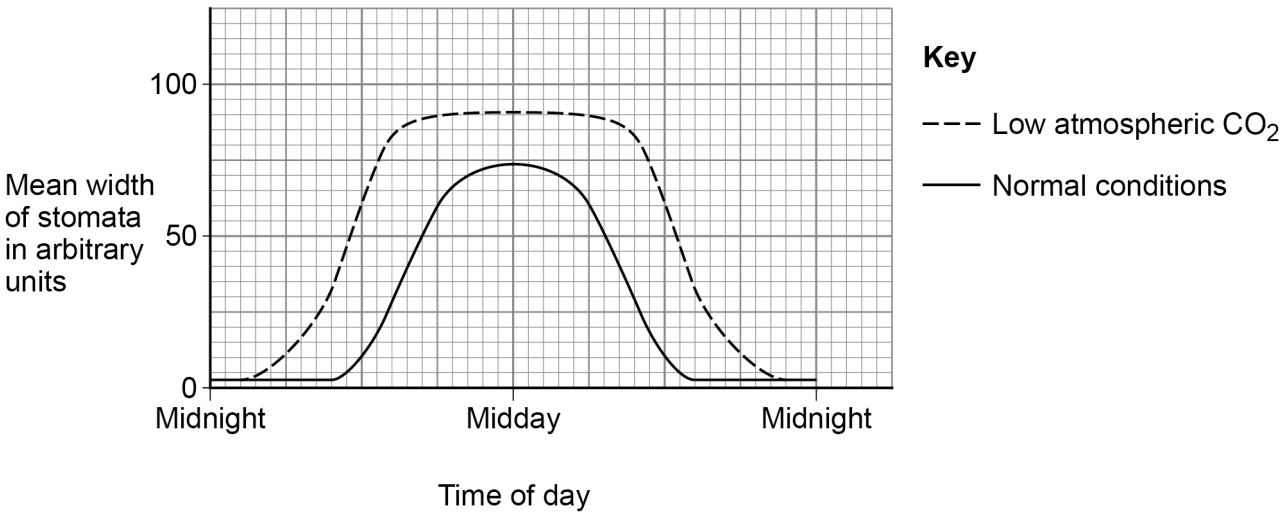
Tick (✓) **one** box.

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

Question 14 · continued

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

Figure 7



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]

4.2.3.2 Plant organ system

Question 14 · continued

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

Turn over for the next question

4.2.3.2 Plant organ system

Question 15

June 2023 | 8461/1H | Original Q1

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]

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]

In the past many drugs were extracted from plants.

0 1 . 3 Aspirin is a painkiller.

Which plant does aspirin originate from?

[1 mark]

Question 1 continues on the next page

4.2.3.2 Plant organ system

Question 15 · continued

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

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

Table 1 shows information about where chemical **A** is found.

Table 1

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

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]

4.2.3.2 Plant organ system

Question 15 · continued

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**.

0 1 . 5 Calculate the mass of chemical **A** in 200 g of the **leaves** with chlorosis.

Give your answer in mg.

[4 marks]

Mass of chemical **A** = _____ mg

0 1 . 6 Suggest **one** reason why the leaves of the deadly nightshade plant have chlorosis.

[1 mark]

Question 1 continues on the next page

4.2.3.2 Plant organ system

Question 15 · continued

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 _____

_____

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]

_____

_____

4.2.3.2 Plant organ system

Question 15 · continued

0 1 . 9 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. ☐

13

Turn over for the next question