AQA GCSE Biology | 8461

SPECIFICATION POINT 4.2.3.1

Plant tissues

Past-paper questions

Tier	**Higher**
Question groups	**8**
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.

4.2.3.1 Plant tissues

Question 01

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

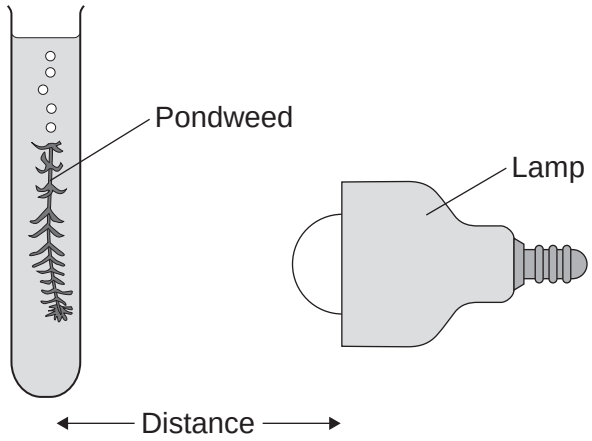
4.2.3.1 Plant tissues

Question 02

1 Some students investigated the effect of light intensity on the rate of photosynthesis.

They used the apparatus shown in **Diagram 1**.

Diagram 1



The students:

- placed the lamp 10 cm from the pondweed
- counted the number of bubbles of gas released from the pondweed in 1 minute
- repeated this for different distances between the lamp and the pondweed.

1 (a) The lamp gives out heat as well as light.

What could the students do to make sure that heat from the lamp did **not** affect the rate of photosynthesis?

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(1 mark)

4.2.3.1 Plant tissues

Question 02 · continued

1 (b) The table shows the students' results.

Distance in cm	Number of bubbles per minute
10	84
15	84
20	76
40	52
50	26

1 (b) (i) At distances between 15cm and 50cm, light was a limiting factor for photosynthesis.

What evidence is there for this in the table?

.....

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(1 mark)

1 (b) (ii) Give **one** factor that could have limited the rate of photosynthesis when the distance was between 10cm and 15cm.

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(1 mark)

Question 1 continues on the next page

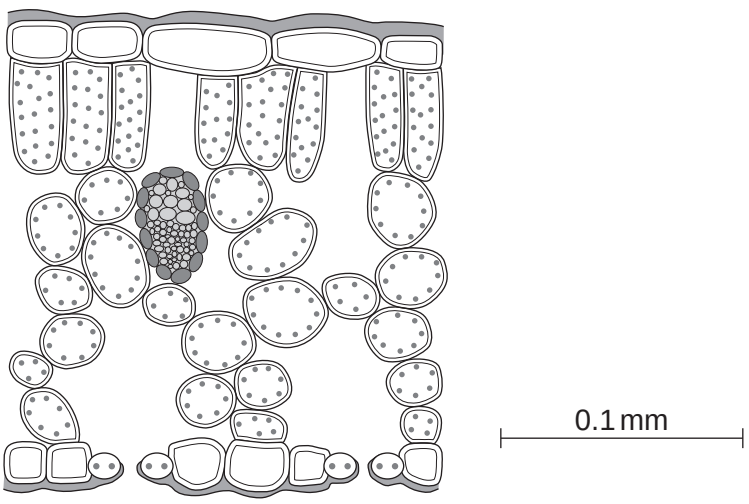
4.2.3.1 Plant tissues

Question 02 · continued

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

Diagram 2 shows a section through a plant leaf.

Diagram 2



Describe the structure of the leaf and the functions of the tissues in the leaf.

You should use the names of the tissues in your answer.

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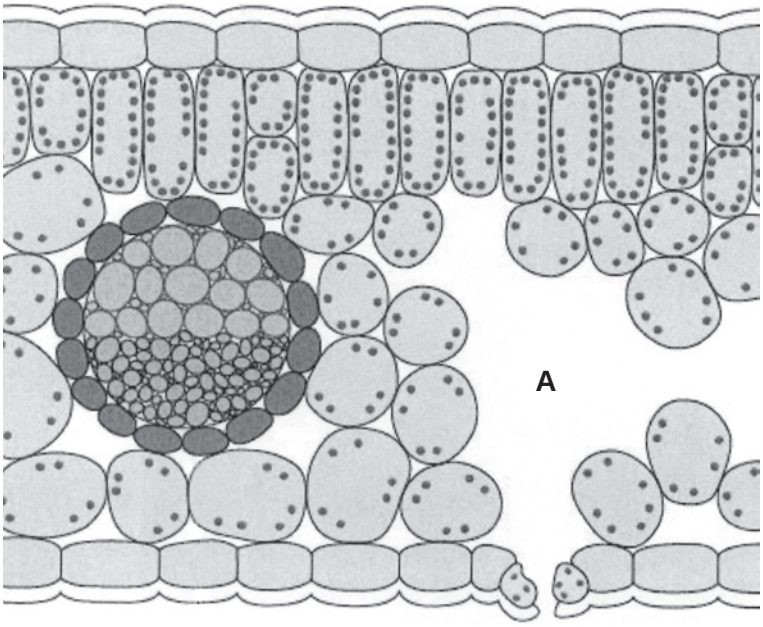
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4.2.3.1 Plant tissues

Question 03

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

4.2.3.1 Plant tissues

Question 04

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.

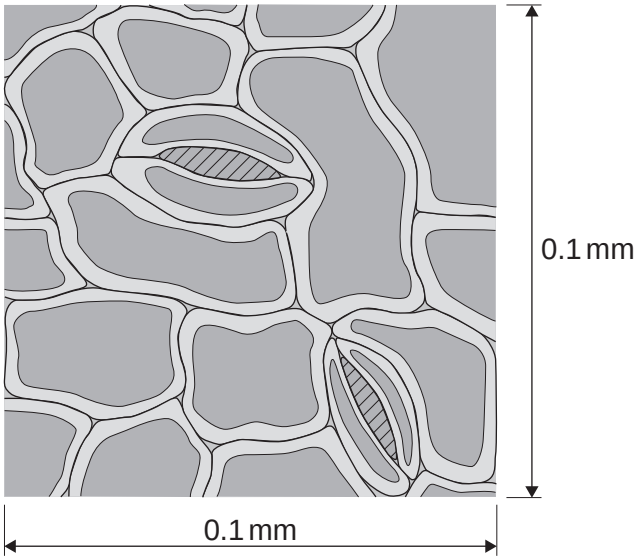
[1 mark]

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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

4.2.3.1 Plant tissues

Question 04 · 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

4.2.3.1 Plant tissues

Question 04 · 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

4.2.3.1 Plant tissues

Question 05

0 5 **Table 2** gives the classification of four plant species.

Table 2

Group	Species 1	Species 2	Species 3	Species 4
Kingdom	*Plantae*	*Plantae*	*Plantae*	*Plantae*
Phylum	*Spermatophyta*	*Spermatophyta*	*Spermatophyta*	*Spermatophyta*
Class	*Monocotyledonae*	*Dicotyledonae*	*Monocotyledonae*	*Dicotyledonae*
Order	*Poales*	*Fabales*	*Poales*	*Scrophulariales*
Family	*Cyperaceae*	*Fabaceae*	*Poaceae*	*Scrophulariaceae*
Genus	*Eriophorum*	*Pisum*	*Poa*	*Antirrhinum*
Species	*angustifolium*	*sativum*	*annua*	*majus*

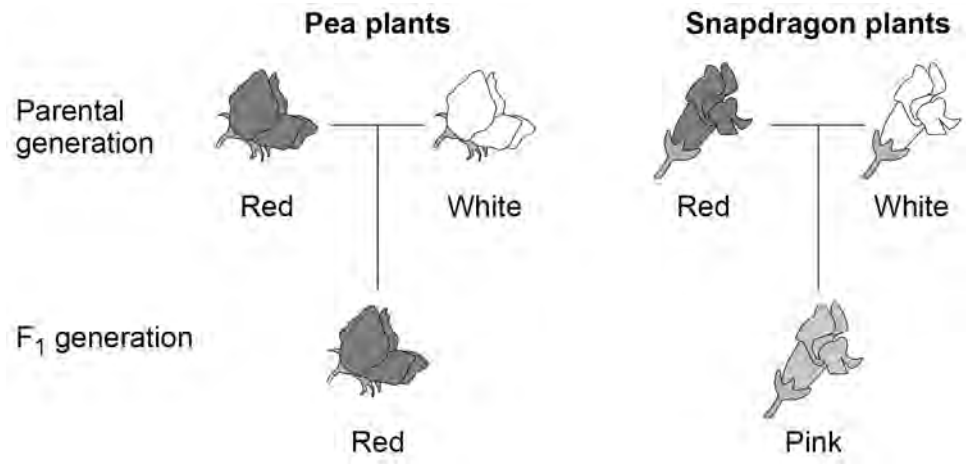
0 5 . 1 Species **1** and **3** are the most closely related.

What information in **Table 2** gives evidence for this?

[1 mark]

Figure 6 shows the inheritance of flower colour in two species of plant.

Figure 6



- In pea plants and in snapdragon plants, flower colour is controlled by one pair of alleles.
- In **Figure 6** the parental generation plants are homozygous for flower colour.
- In heterozygous **pea** plants, the allele for red flower colour is dominant.
- In heterozygous **snapdragon** plants, the alleles for flower colour are both expressed.

Question 05 · continued

Use the following symbols for alleles in your answers to Questions **05.2** to **05.4**:

Pea plants	**Snapdragon plants**
R = allele for red flowers	C^R = allele for red flowers
r = allele for white flowers	C^W = allele for white flowers

0 5 . 2 What is the genotype of the red-flowered pea plants in the F_1 generation?

[1 mark]

_____

0 5 . 3 What is the genotype of a white-flowered snapdragon plant?

[1 mark]

_____

A gardener crossed two pink-flowered snapdragon plants.

0 5 . 4 Draw a Punnett square diagram to show why only some of the next generation plants had pink flowers.

Identify the phenotypes of all the offspring plants.

[3 marks]

0 5 . 5 What percentage of the offspring would you expect to have pink flowers?

[1 mark]

Percentage = _____ %

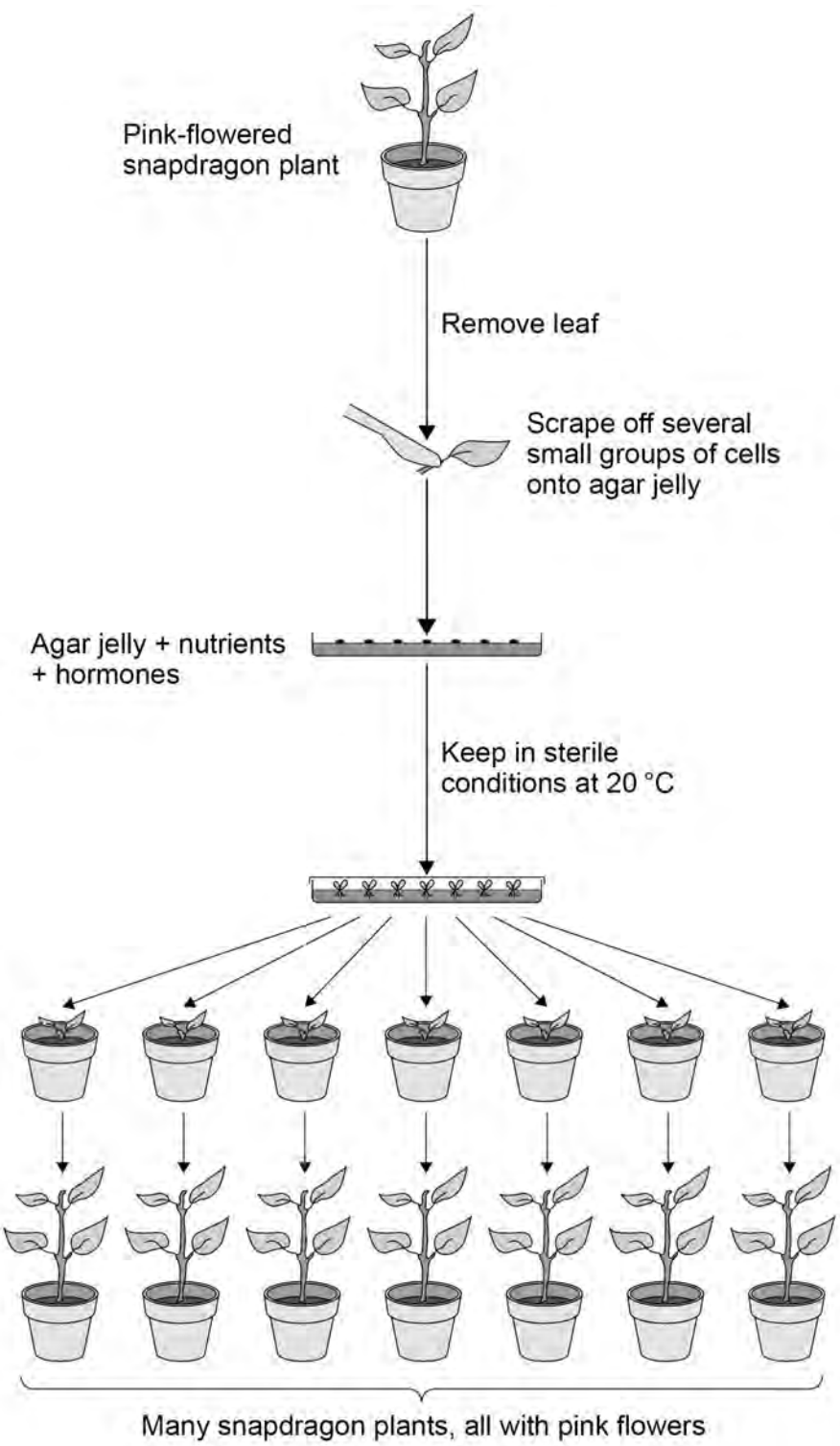
4.2.3.1 Plant tissues

Question 05 · continued

Commercially, hundreds of pink-flowered snapdragon plants can be produced from one pink-flowered plant.

Figure 7 shows a tissue culture technique used for producing many plants from one plant.

Figure 7



4.2.3.1 Plant tissues

Question 05 · continued

0 5 . 6 Give a reason for each of the following steps shown in **Figure 7**.

[5 marks]

Several groups of cells are scraped off the leaf: _____

Nutrients are added to the agar jelly: _____

Hormones are added to the agar jelly: _____

The plant cells are kept in **sterile** conditions: _____

The plant cells are kept at **20 °C**: _____

0 5 . 7 Explain why the method shown in **Figure 7** produces **only** pink-flowered plants.

[2 marks]

14

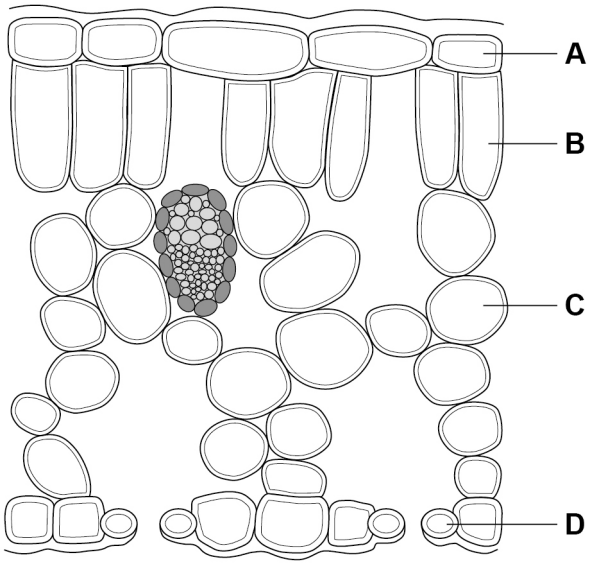
4.2.3.1 Plant tissues

Question 06

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]

4.2.3.1 Plant tissues

Question 06 · 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

4.2.3.1 Plant tissues

Question 06 · continued

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

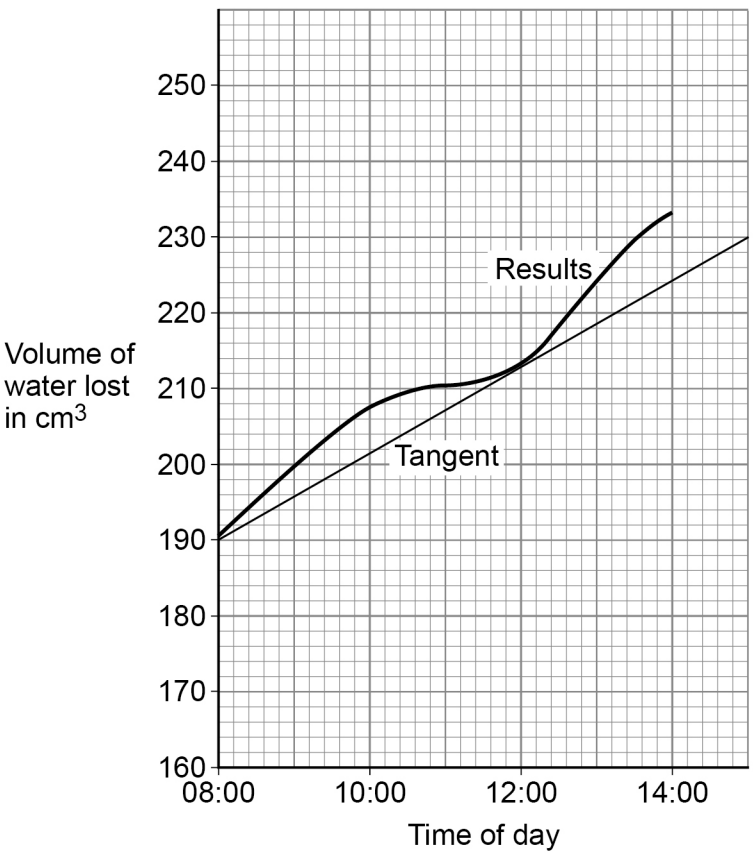
[6 marks]

4.2.3.1 Plant tissues

Question 06 · continued

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

Figure 10



4.2.3.1 Plant tissues

Question 06 · 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

4.2.3.1 Plant tissues

Question 07

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		

4.2.3.1 Plant tissues

Question 07 · continued

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**.

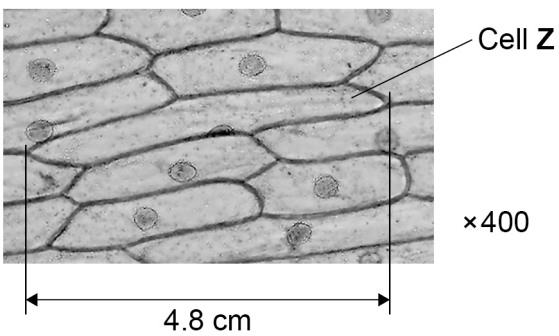
Question 3 continues on the next page

4.2.3.1 Plant tissues

Question 07 · continued

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]

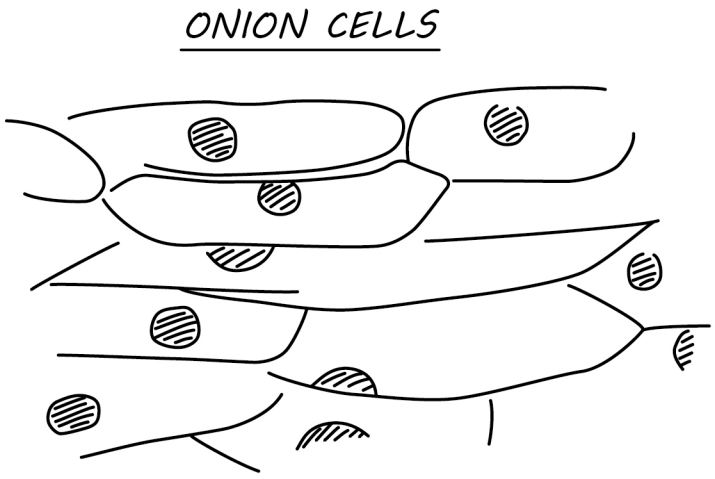
Real length of cell **Z** = _____ μm

4.2.3.1 Plant tissues

Question 07 · continued

Figure 4 shows the student's drawing of **Figure 3**.

Figure 4



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

4.2.3.1 Plant tissues

Question 08

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

4.2.3.1 Plant tissues

Question 08 · 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]

4.2.3.1 Plant tissues

Question 08 · 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

4.2.3.1 Plant tissues

Question 08 · 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]

_____

_____

4.2.3.1 Plant tissues

Question 08 · 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. ☐

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Turn over for the next question