

# GCSE Biology

## Worksheet: Plant tissues

|                |                   |                       |                            |
|----------------|-------------------|-----------------------|----------------------------|
| TIME<br>35 min | TOTAL<br>32 marks | CALCULATOR<br>Allowed | DIFFICULTY<br>Easy, Medium |
|----------------|-------------------|-----------------------|----------------------------|

Topics: Plant tissues

NAME

CLASS

DATE

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

A student painted clear nail varnish onto the lower surface of a leaf from a sunflower. When the varnish was dry, the student peeled it off and looked at it with a light microscope. The student counted the stomata in five fields of view.

Table 1 shows the results.

Table 1

| Field of view     | 1  | 2  | 3  | 4  | 5  |
|-------------------|----|----|----|----|----|
| Number of stomata | 31 | 35 | 32 | 33 | 34 |

0 1 . 1

Calculate the mean number of stomata in one field of view.

[1 mark]

0 1 . 2

Give the reason why the student counted the stomata in five different fields of view.

[1 mark]

0 1 . 3

Name the cells that surround each stoma and control its size.

.....

.....

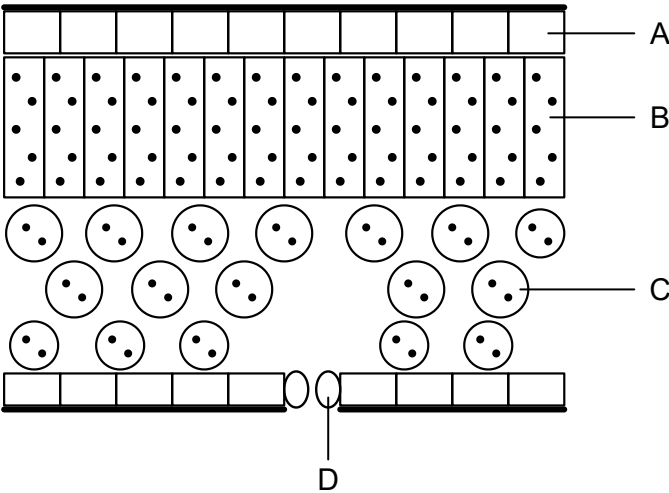
.....

[1 mark]

0 2

Figure 1 shows a cross-section through part of a leaf.

Figure 1



0 2 . 1

Name tissues **B** and **C**.

.....

.....

.....

.....

[2 marks]

0 2 . 2

Give the function of cell **D**.

.....

.....

[1 mark]

0 2 . 3

Layer **A** is covered by a waxy cuticle.  
Give the function of the waxy cuticle.

.....

.....

[1 mark]

0 2 . 4

Which layer contains the most chloroplasts?  
Tick (✓) **one** box.

- A
- B
- C

☐

☐

☐

[1 mark]

0 3

A leaf contains several different plant tissues.

0 3 . 1

Explain how the palisade mesophyll is adapted for photosynthesis.

.....

.....

.....

.....

[2 marks]

0 3 . 2

Explain how the spongy mesophyll is adapted for gas exchange.

.....

.....

.....

.....

[2 marks]

0 3 . 3

The upper epidermis is transparent.  
Suggest why this is an advantage.

.....

.....

[1 mark]

0 3 . 4

Meristem tissue is found at the growing tips of shoots and roots.  
Give the function of meristem tissue.

.....

.....

[1 mark]

0 4

A student counted the chloroplasts in 10 palisade mesophyll cells and 10 spongy mesophyll cells from the same leaf.  
Table 2 shows the results.

Table 2

| Cell               | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
|--------------------|----|----|----|----|----|----|----|----|----|----|
| Palisade mesophyll | 42 | 38 | 45 | 40 | 36 | 44 | 41 | 39 | 43 | 42 |
| Spongy mesophyll   | 12 | 15 | 10 | 14 | 11 | 13 | 31 | 12 | 14 | 9  |

0 4 . 1

Calculate the mean number of chloroplasts in a palisade mesophyll cell.

.....

.....

.....

.....

[1 mark]

0 4 . 2

One result for the spongy mesophyll cells is anomalous.

Identify the anomalous result and calculate the mean number of chloroplasts in a spongy mesophyll cell without it.

Give your answer to 3 significant figures.

.....

.....

.....

.....

.....  
[2 marks]

0 4 . 3

Calculate how many times more chloroplasts a palisade mesophyll cell has than a spongy mesophyll cell, on average.

.....

.....

.....

.....  
[1 mark]

0 4 . 4

Suggest **one** reason for the anomalous result.

.....

.....

[1 mark]

0 4 . 5

The student concluded:

‘All leaves have about 41 chloroplasts in each palisade mesophyll cell.’

Explain why this conclusion is not valid.

.....

.....

.....

.....

[2 marks]

0 5

Leaves are plant organs adapted for photosynthesis.

0 5 . 1

Explain why a leaf is described as an organ.

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[2 marks]

0 5 . 2

Light enters a leaf through its upper surface.

Put these tissues in the order that light passes through them.

- lower epidermis
- palisade mesophyll
- spongy mesophyll
- upper epidermis

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[1 mark]

0 5 . 3

Most leaves are thin.

Explain **one** advantage of this.

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[2 marks]

0 5 . 4

Name the tissue that transports water into the leaf.

.....

.....

.....

[1 mark]

0 6

A student painted clear nail varnish onto the lower surface of a leaf from a geranium. When the varnish was dry, the student peeled it off and looked at it with a light microscope. The student counted the stomata in five fields of view.  
Table 3 shows the results.

Table 3

| Field of view     | 1  | 2  | 3  | 4  | 5  |
|-------------------|----|----|----|----|----|
| Number of stomata | 16 | 17 | 18 | 15 | 14 |

0 6 . 1

Calculate the mean number of stomata in one field of view.

.....

.....

.....

[1 mark]

0 6 . 2

The area of one field of view was 0.10 mm<sup>2</sup>.  
Calculate the mean number of stomata per mm<sup>2</sup> of the lower surface.

.....

.....

.....

.....

Number of stomata = ..... per mm<sup>2</sup>

[2 marks]

0 6 . 3

Explain why leaves have stomata.

.....

.....

.....

.....

**[2 marks]**

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### END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

# Mark scheme

## GCSE Biology · Worksheet: Plant tissues · 32 marks

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### Question 1 (3 marks)

01.1 [1 mark]

**Answer:** 33

- $(165 \div 5 =) 33$  (1)
- 

01.2 [1 mark]

- the number of stomata varies across the leaf, so a mean of several counts is more representative (1)
- 

01.3 [1 mark]

**Answer:** guard cells

- guard cells (1)
- 

### Question 2 (5 marks)

02.1 [2 marks]

**Answer:** B palisade mesophyll; C spongy mesophyll

- B – palisade mesophyll (1)
- C – spongy mesophyll (1)

**Notes:** Allow 'palisade layer' and 'spongy layer'.

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02.2 [1 mark]

- to open and close the stoma / to control gas exchange and water loss (1)

**Notes:** Cell D is a guard cell.

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02.3 [1 mark]

- to reduce water loss (by evaporation) (1)
- 

02.4 [1 mark]

**Correct:** B

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### Question 3 (6 marks)

#### 03.1 [2 marks]

- the cells contain many chloroplasts (to absorb light) (1)
- the layer is near the upper surface of the leaf, so receives the most light (1)

**Notes:** Allow 'cells are tightly packed' for the second point.

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#### 03.2 [2 marks]

- it has (many) air spaces (1)
  - so gases such as carbon dioxide can diffuse (quickly) to the photosynthesising cells (1)
- 

#### 03.3 [1 mark]

- light can pass through to the palisade cells (for photosynthesis) (1)
- 

#### 03.4 [1 mark]

- its cells divide (by mitosis) to make new cells that can differentiate / for growth (1)
-

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## Question 4 (7 marks)

### 04.1 [1 mark]

**Answer:** 41

- $(410 \div 10 =) 41$  (1)

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### 04.2 [2 marks]

**Answer:** anomaly 31; mean 12.2

- 31 (cell 7) is anomalous (1)
- $(110 \div 9 =) 12.2$  (1)

**Notes:** A mean of 14.1 (anomaly included) scores 1 mark only if 31 is identified.

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### 04.3 [1 mark]

**Answer:** 3.4 times

- $(41 \div 12.2 =) 3.4$  (1)

**Notes:** Allow ECF from their means.

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### 04.4 [1 mark]

- the cell counted was a palisade cell / was next to the palisade layer / the chloroplasts were counted incorrectly (1)

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### 04.5 [2 marks]

- only one leaf (from one plant / one species) was used, and only 10 cells were counted (1)
  - the number of chloroplasts is likely to vary between species / between leaves grown in different light, e.g. sun and shade leaves (1)
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## Question 5 (6 marks)

### 05.1 [2 marks]

- it is made of several different tissues (1)
- that work together to carry out a function, e.g. photosynthesis (1)

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### 05.2 [1 mark]

**Answer:** upper epidermis → palisade mesophyll → spongy mesophyll → lower epidermis

- upper epidermis, palisade mesophyll, spongy mesophyll, lower epidermis (1)

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### 05.3 [2 marks]

- short distance for carbon dioxide to diffuse to the cells / light can reach all of the cells (1)
- so the rate of photosynthesis is high (1)

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### 05.4 [1 mark]

**Answer:** xylem

- xylem (1)
- 

## Question 6 (5 marks)

### 06.1 [1 mark]

**Answer:** 16

- $(80 \div 5 =) 16$  (1)

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### 06.2 [2 marks]

**Answer:** 160

- $16 \div 0.10$  (1)
- 160 (1)

**Notes:** Allow ECF from their mean.

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### 06.3 [2 marks]

- carbon dioxide diffuses into the leaf (for photosynthesis) through the stomata (1)
  - oxygen and water vapour diffuse out through the stomata (1)
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