

GCSE Combined Science: Trilogy

Worksheet: Plant tissues

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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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.

01

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

01.1

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

[1 mark]

01.2

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.

.....

.....

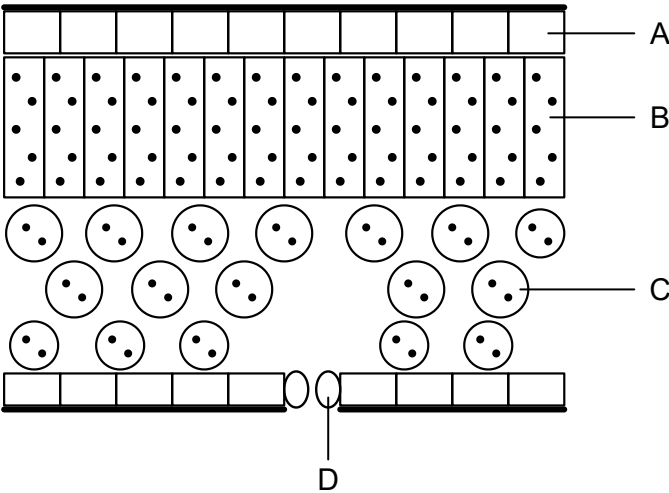
.....

[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.

[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

[1 mark]

0 5 . 3

Most leaves are thin.

Explain **one** advantage of this.

[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 mm².
Calculate the mean number of stomata per mm² of the lower surface.

.....

.....

.....

.....

Number of stomata = per mm²

[2 marks]

0 6 . 3

Explain why leaves have stomata.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

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

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Plant tissues · 32 marks

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'.

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.

02.3 [1 mark]

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

02.4 [1 mark]

Correct: B

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.

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)
-

Question 4 (7 marks)

04.1 [1 mark]

Answer: 41

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

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.

04.3 [1 mark]

Answer: 3.4 times

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

Notes: Allow ECF from their means.

04.4 [1 mark]

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

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)
-

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)

05.2 [1 mark]

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

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

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)

05.4 [1 mark]

Answer: xylem

- xylem (1)
-

Question 6 (5 marks)

06.1 [1 mark]

Answer: 16

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

06.2 [2 marks]

Answer: 160

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

Notes: Allow ECF from their mean.

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)
-