

## 6.2 Leaf structure

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 20 marks

**KEY WORDS** stomata 气孔 • mesophyll 叶肉 • cuticle 角质层 • palisade mesophyll 栅栏叶肉 • adapted 适应

### Objective

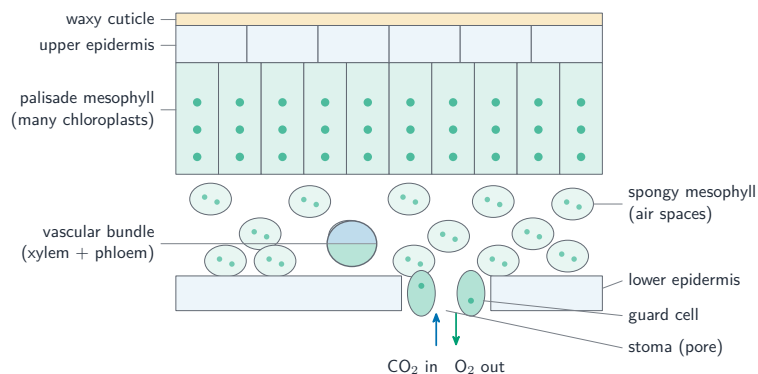
Build the skills to answer exam questions on **leaf structure** 叶的结构 — the tissues of a leaf and how each is **adapted** 适应 for photosynthesis and gas exchange.

**You must be able to:**

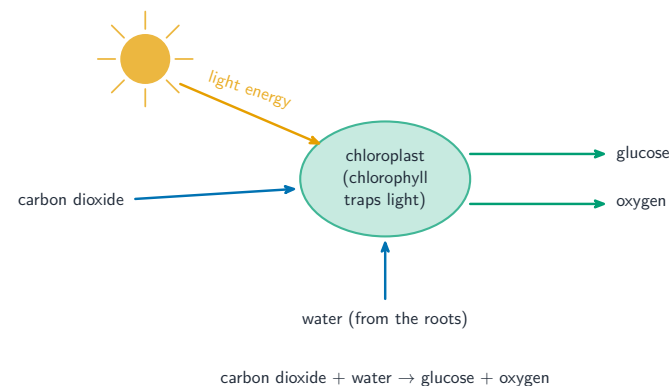
- name the leaf tissues and give the job of each
- explain how leaf features suit photosynthesis
- describe the role of stomata and guard cells

### 1 Worked examples

#### ■ The leaf in cross-section



*Each tissue is adapted for photosynthesis and gas exchange*



*The leaf is the organ of photosynthesis*

- **palisade mesophyll:** packed with chloroplasts, near the top → most photosynthesis.
- **spongy mesophyll:** air spaces → gases move easily.
- **stomata** (lower surface) with **guard cells** → let CO<sub>2</sub> in, O<sub>2</sub> out.

### 2 Practice

2.1 Name the leaf tissue where most photosynthesis happens. [1]

2.2 State the function of the stomata. [1]

### 3 Exam-style questions

3.1 Palisade mesophyll cells are well suited to photosynthesis because they: [1]

- **A** have no chloroplasts
- **B** are packed with chloroplasts near the top of the leaf
- **C** are deep in the leaf
- **D** have a thick cuticle

**3.2** A leaf is broad and thin.

(a) Explain how being broad helps the leaf.

[1]

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(b) Explain how the air spaces in the spongy mesophyll help.

[2]

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**3.3** State the role of the guard cells.

[2]

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**3.4** A cross-section through a leaf shows a waxy cuticle, upper epidermis, palisade mesophyll, spongy mesophyll, xylem and phloem, and a lower epidermis containing stomata and guard cells.

(a) For the **palisade mesophyll**, the **spongy mesophyll** and the **stomata**, state one way each is adapted and explain how that adaptation helps the leaf.

[6]

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(b) Explain why most stomata are found on the lower surface of the leaf.

[2]

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(c) Name the tissue that brings water to the leaf and the tissue that carries sugars away.

[2]

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(d) Explain why a leaf is thin and flat.

[2]

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## Solutions

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**2.1** the palisade mesophyll.

**2.2** they let carbon dioxide in and oxygen out (gas exchange).

**3.1 B.** Palisade cells are packed with chloroplasts near the top.

**3.2** (a) a large surface area catches more light.

(b) the air spaces let gases ( $\text{CO}_2$  and  $\text{O}_2$ ) move easily to and from the cells.

**3.3** the guard cells open and close the stomata to control gas exchange (and water loss).

**3.4** (a) **Palisade mesophyll** — tall cells packed closely at the top of the leaf and full of chloroplasts; this puts the most chloroplasts where the light is strongest, so the maximum light is absorbed. **Spongy mesophyll** — loosely packed cells with large air spaces between them; gases can diffuse quickly to and from every cell. **Stomata** — pores that guard cells open and close; they let carbon dioxide in and oxygen out, and can close to reduce water loss when needed.

(b) The lower surface is shaded and cooler, so less water evaporates from stomata there than would be lost from the hot upper surface.

(c) Water arrives in the **xylem**; sugars leave in the **phloem**.

(d) Flat gives a large surface area to catch light and to exchange gases; thin means carbon dioxide has only a short distance to diffuse to reach the palisade cells.