

Leaf structure

Revision notes • How the structures of a dicotyledonous leaf are adapted for photosynthesis.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Leaf structure Spec 6.2

Leaf structure and adaptations Spec 6.2.1, 6.2.2, 6.2.3

A leaf is the organ where most photosynthesis takes place. Most leaves have a **large surface area** and are **thin**.

Why a large surface area and a thin leaf are adaptations for photosynthesis

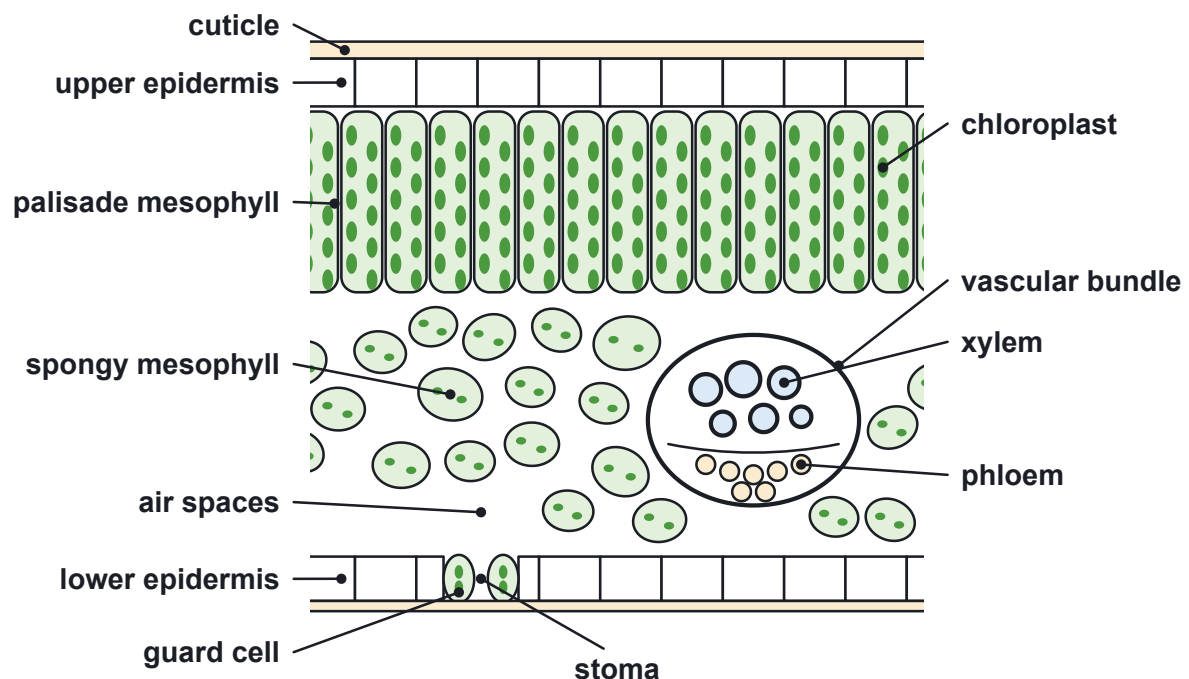
Feature	How it is an adaptation
Large surface area	Absorbs more light, so more photosynthesis can take place
Thin	Light reaches all the cells, and carbon dioxide only has a short distance to diffuse to the cells inside the leaf

Structures in the leaf of a dicotyledonous plant

- **Cuticle:** waxy, waterproof layer on the surface
- **Upper and lower epidermis:** thin layers of cells that protect the leaf
- **Palisade mesophyll:** tall, tightly packed cells near the top of the leaf
- **Spongy mesophyll:** rounded cells with **air spaces** between them
- **Stomata** (single: stoma): pores, mostly in the lower epidermis, each surrounded by two **guard cells**
- **Vascular bundles** (veins) containing **xylem** and **phloem**
- **Chloroplasts:** contain chlorophyll; most are in the palisade cells

How the structures adapt the leaf for photosynthesis

Structure	Adaptation	How it helps photosynthesis
Cuticle	Thin, transparent and waxy	Lets light through; the wax reduces water loss by evaporation
Upper epidermis	Thin and transparent, with no chloroplasts	Lets light pass through to the palisade cells
Palisade mesophyll	Tall cells packed closely together, containing many chloroplasts, near the upper surface	Absorb most of the light; most photosynthesis happens here
Spongy mesophyll	Rounded cells with air spaces between them	Carbon dioxide diffuses through the air spaces to the cells, and oxygen diffuses out. The cells also contain chloroplasts
Stomata and guard cells	Pores that open and close; guard cells change shape	Allow carbon dioxide to diffuse in and oxygen to diffuse out; closing reduces water loss
Xylem	Vessels in the vascular bundle	Bring water to the leaf cells for photosynthesis
Phloem	Tubes in the vascular bundle	Carry sucrose (made from the products of photosynthesis) away to other parts of the plant



Cross-section of a leaf: most photosynthesis happens in the **palisade mesophyll**; carbon dioxide reaches the cells through the **stomata** and **air spaces**.

Exam tip: Always give the adaptation and the reason it helps. For example: 'the air spaces in the spongy mesophyll allow carbon dioxide to diffuse to the photosynthesising cells'.

Quick check

1. State two features of most leaves.
2. Where are most chloroplasts found in a leaf?
3. What is the function of the guard cells?

Quick check answers

Leaf structure

1. Large surface area and thin.
2. In the palisade mesophyll cells.
3. To open and close the stomata.