

Plant tissues & Organs



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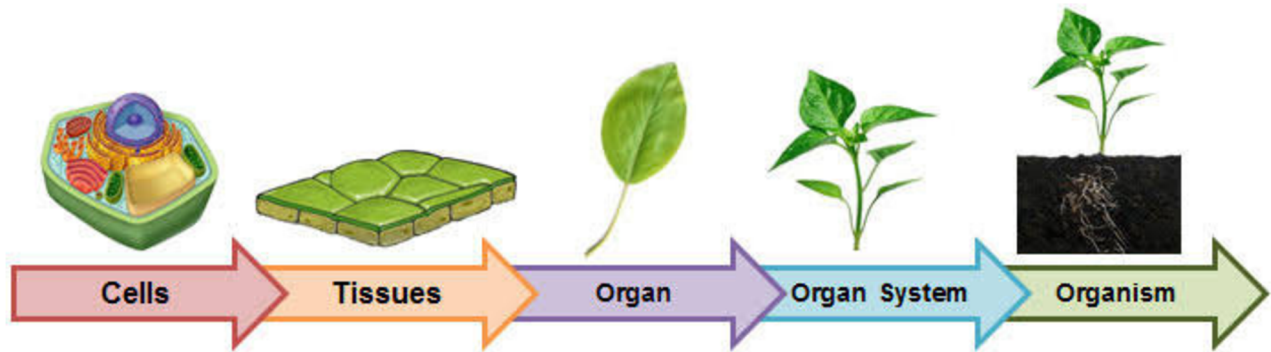
Scope

Topic	Breakdown of topic
Plant tissues	<p><u>Introduce concept</u> of a tissue as a group of similar cells adapted for a particular function: cell differentiation</p> <p><u>Plant tissues:</u> Emphasis on the relationship between basic structure and function.</p> <p><u>Differentiate between:</u></p> <ul style="list-style-type: none"> - meristematic and - permanent tissue <p><u>Permanent tissue:</u></p> <ul style="list-style-type: none"> - epidermis (root hair, guard cells) - parenchyma - collenchyma - sclerenchyma - vascular tissue: xylem & phloem <p><u>Anatomy of dicotyledonous plants:</u></p> <ul style="list-style-type: none"> - root and - stem: <p>Distribution of different tissues</p> <p>Structures of cells in different tissues (link to plant tissues)</p>
Plant organs	<p><u>Definition</u> of an organ</p> <p><u>Location</u> of the different plant organs i.e. roots, stems and leaves</p> <p><u>Anatomy</u> of dicotyledonous plants</p> <p><u>Transverse section of:</u></p> <ul style="list-style-type: none"> - Root - Stem - Leaf <p><u>Functions of dicotyledonous leaves</u> in the following processes:</p> <ul style="list-style-type: none"> - Photosynthesis - Gaseous exchange - Transpiration - Transport by diffusion and osmosis

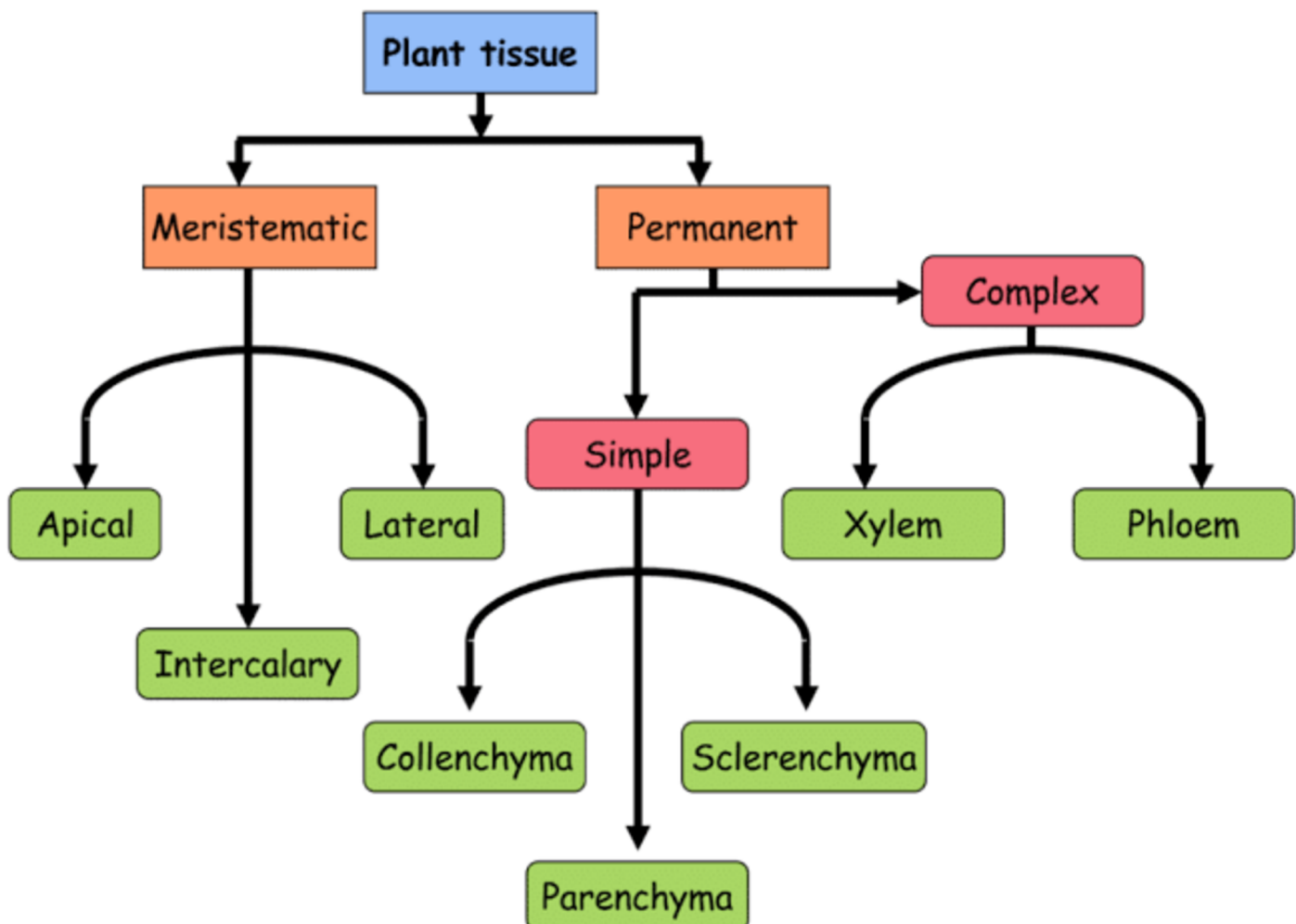
Plant tissues

Notes

Tissues: a group of similar cells adapted for a particular function through cell differentiation.



Note: Cell differentiation means to take on a particular function



Plant tissues

Notes

Plant tissues can be categorised as follows:

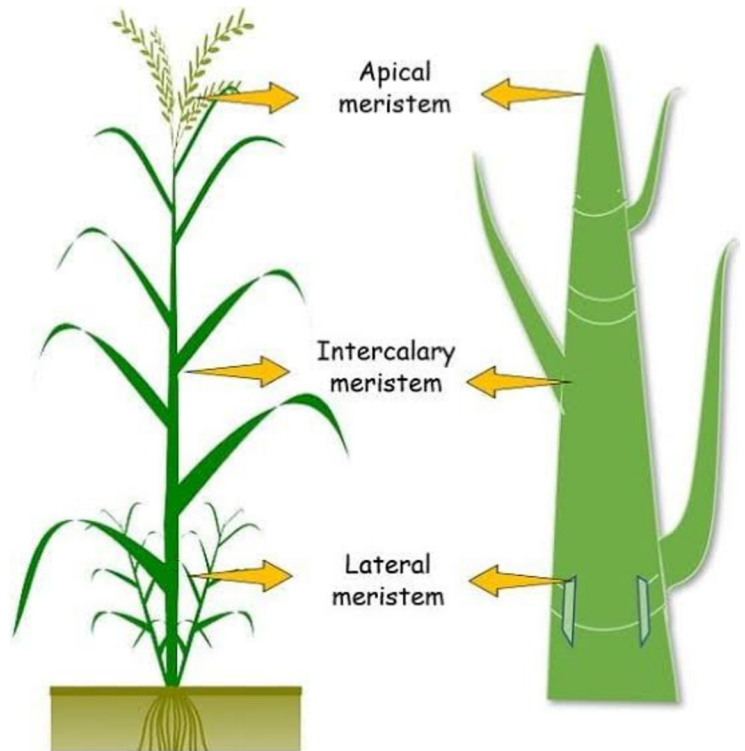
- **Meristematic tissues:** Actively dividing
- **Permanent tissues:** not dividing

Meristematic tissues

These are **undifferentiated** tissues and are actively dividing.

Two types:

- **Apical meristem** (found at the tip of roots & stems, results in growth in length or height)
- **Lateral meristem** (found on the sides of a plant, results in growth in thickness or width)



Cells divide in order to grow

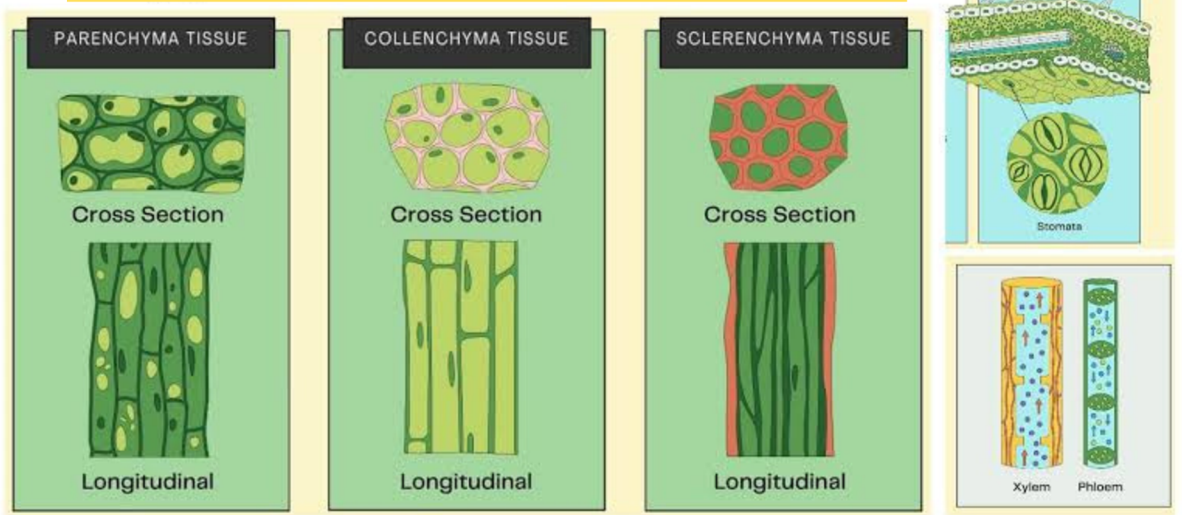
Permanent tissues

These are already **differentiated** tissues and are not dividing.

Examples:

- **Epidermis**
- **Parenchyma**
- **Collenchyma**
- **Sclerenchyma**
- **Vascular tissues**

PERMANENT TISSUES



Permanent tissues

Notes

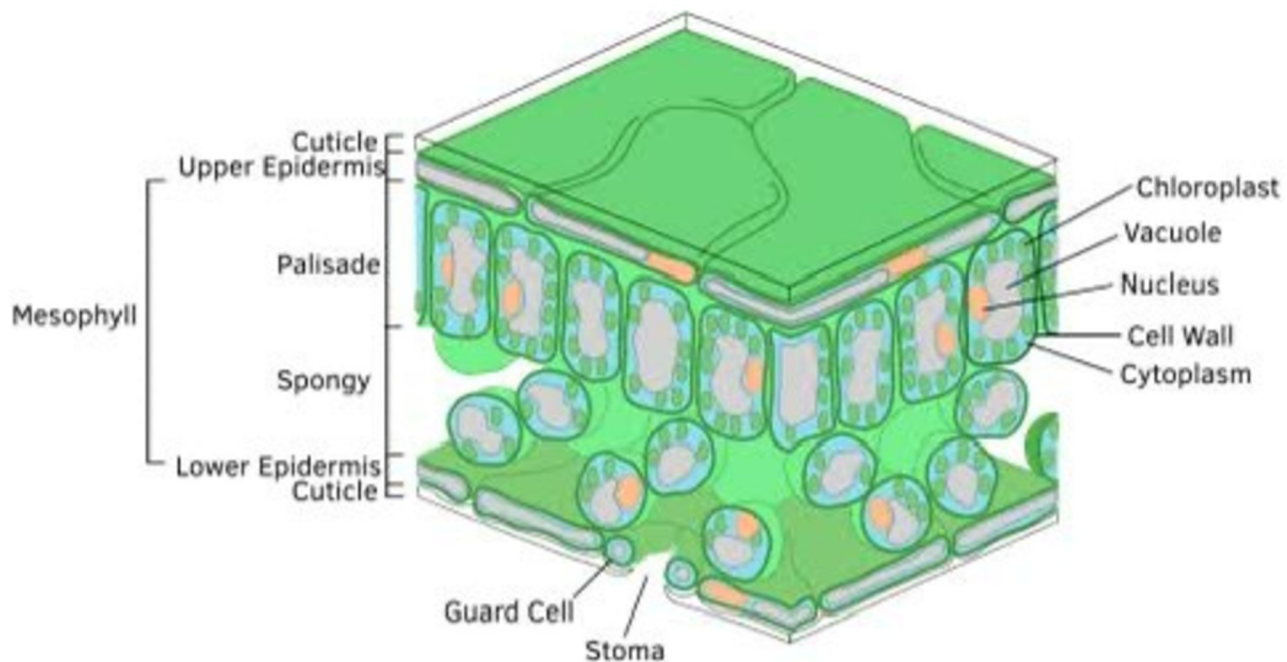
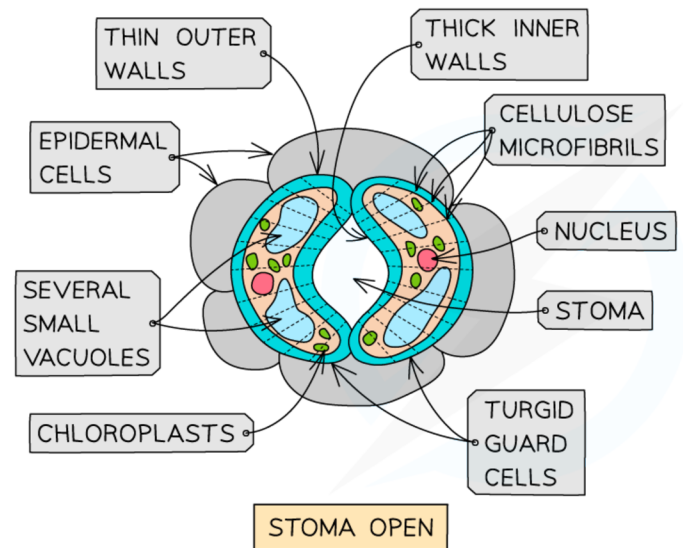
Guard cell

Epidermal tissues

- Made up of a single layer of cells
- Cells are thin walled and brick shaped.
- There are 2 types of specialized epidermal cells:

1. The epidermis of leaves and stems have a specialised epidermal cell called the **guard cell** (with an opening called the stomata)

2. The epidermis of the root has a specialised cell called the **root hair**.



Functions:

- They provide the inner tissues with **protection**.
- They control the **opening and closing** of the **stomata**.
- The stomata allows for the **entry and exit** of **gases**.
- The root hair **absorbs water** and **mineral salts**.

Permanent tissues

Notes

Parenchyma

Location:

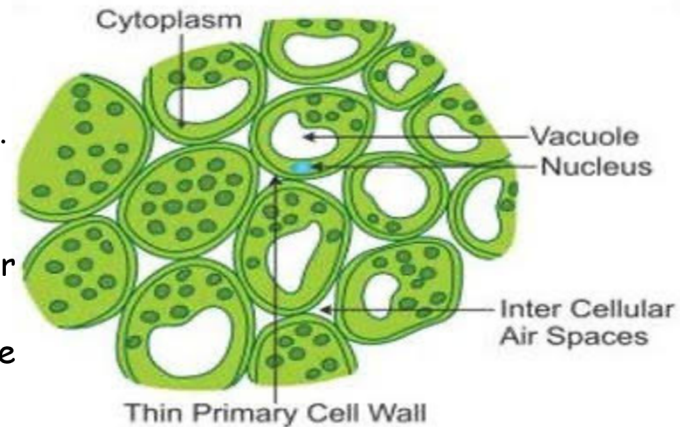
- Found in roots and stems.
- It is found between all the other tissues in these organs.

Appearance:

- It is made up of thin walled, irregularly shaped cells.
- The irregular shape allows for the formation of many air spaces between the cells.
- They are called **chlorenchyma** when they have chloroplast.

Functions:

- Acts as packing tissue
- Acts as a storage organ, when it stores food in the form of starch and other sugars.
- The air spaces between the cells allows for the movement of water and gases.



Collenchyma

Location:

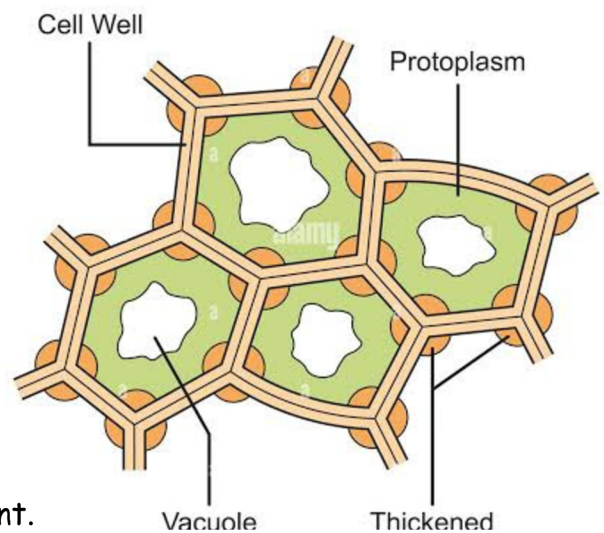
- This tissue is found in stems and leaves.

Appearance:

- This tissue is made up of thick walled, closely packed cells.

Functions:

- Provides strength and support to the aerial parts of the plant.
- It is closely packed making it strong to offer strength and support.
- It has thick cell walls to offer strength and support.



Sclerenchyma

- There are 2 types of sclerenchyma cells.
- the **sclerenchyma fibres** and **stone cells** (sclereid)

Location:

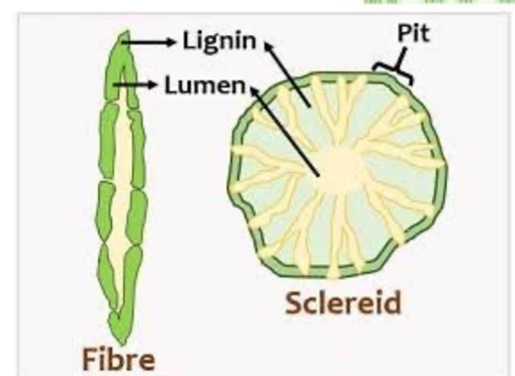
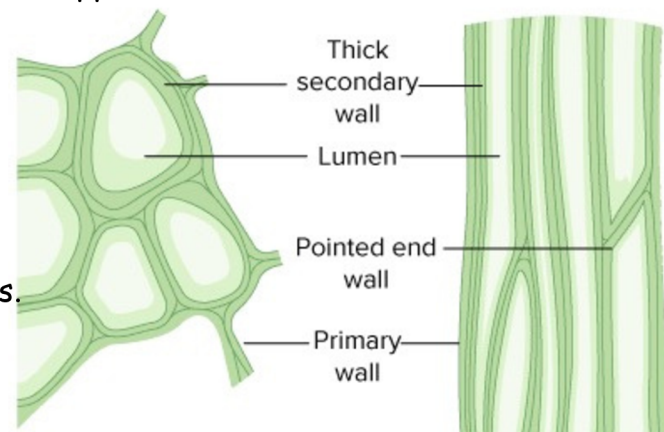
- found in roots, stems, leaves, flowers and fruit of plants.
- Stone cells are also found in the flesh of some fruits.

Appearance:

- It is made up of thick walled cells.
- The cell walls are thickened with lignin.
- These cells are closely packed.
- The cells are dead, there are no cell contents.

Functions:

- They provide strength and support to the plant.
- They have cell walls that are thickened with lignin that enable them to provide support and strength to the plant organ.



Vascular tissues

Notes

Xylem

Location:

- This tissue is found in the roots, stems and leaves

Appearance:

- 2 different types of cells that make up the xylem tissue.
- They are the **xylem vessels** and **xylem tracheids**.

The vessels are cylindrical.

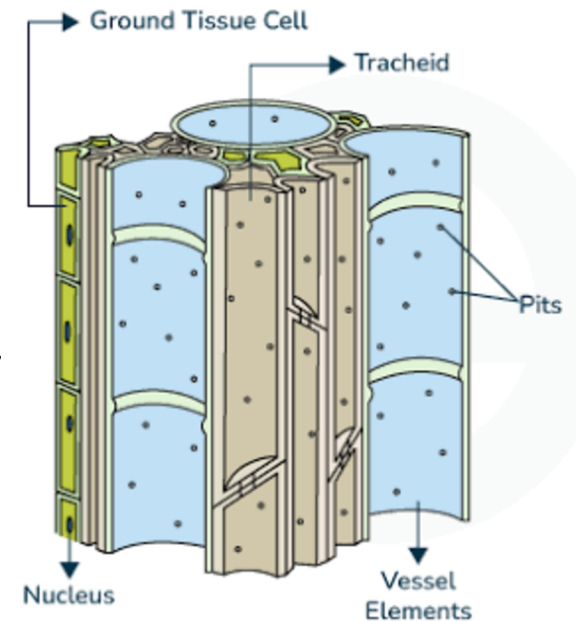
- They have cell walls that are thickened by lignin.
- The cross walls are **perforated**, meaning that they have tiny pores in them.
- They are dead cells with no cell content. The vessels lie end to end, forming a continuous tube.

The tracheids are elongated cells with tapered ends

- Their **cell walls** are also **thickened** with **lignin**.

Functions:

- transport water and mineral salts from the roots to the stems of plants.
- Provide the plant with strength and support.
- Xylem vessels (dead cells with no cells contents to allow **for the easy movement of water**)
- cross walls are absent or perforated to allow for easy movement of water.
- The vessels are round in cross section to prevent distortion when water moves through it.
- The vessels are able to form continuous tubes because they are dead cells with no cell contents and have no cross walls.



Phloem

Location:

- It is found in roots, stems and leaves.

Appearance:

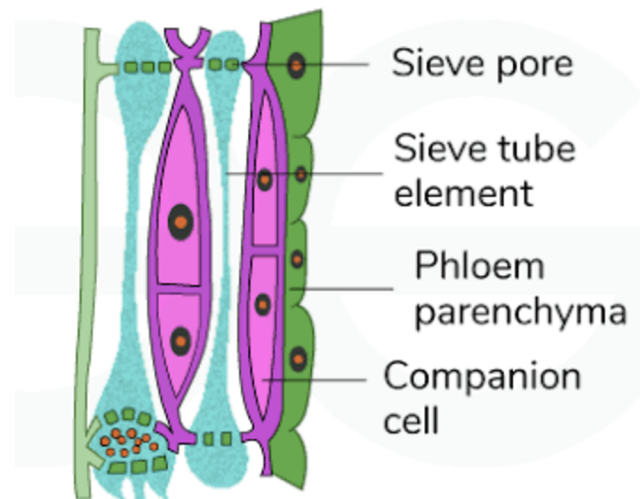
- This tissue is made up 2 different types of cells.

Sieve Tubes:

- These are elongated cells.
- They have thin cell walls that are unthickened.
- The cross walls are perforated.
- They are living cells with cell content.
- The cytoplasm occurs as strands.
- Sieve tubes have no nuclei.

Companion Cells:

- These cells are attached to the sieve tubes.
- They have nuclei.
- They control the function of the sieve tubes.



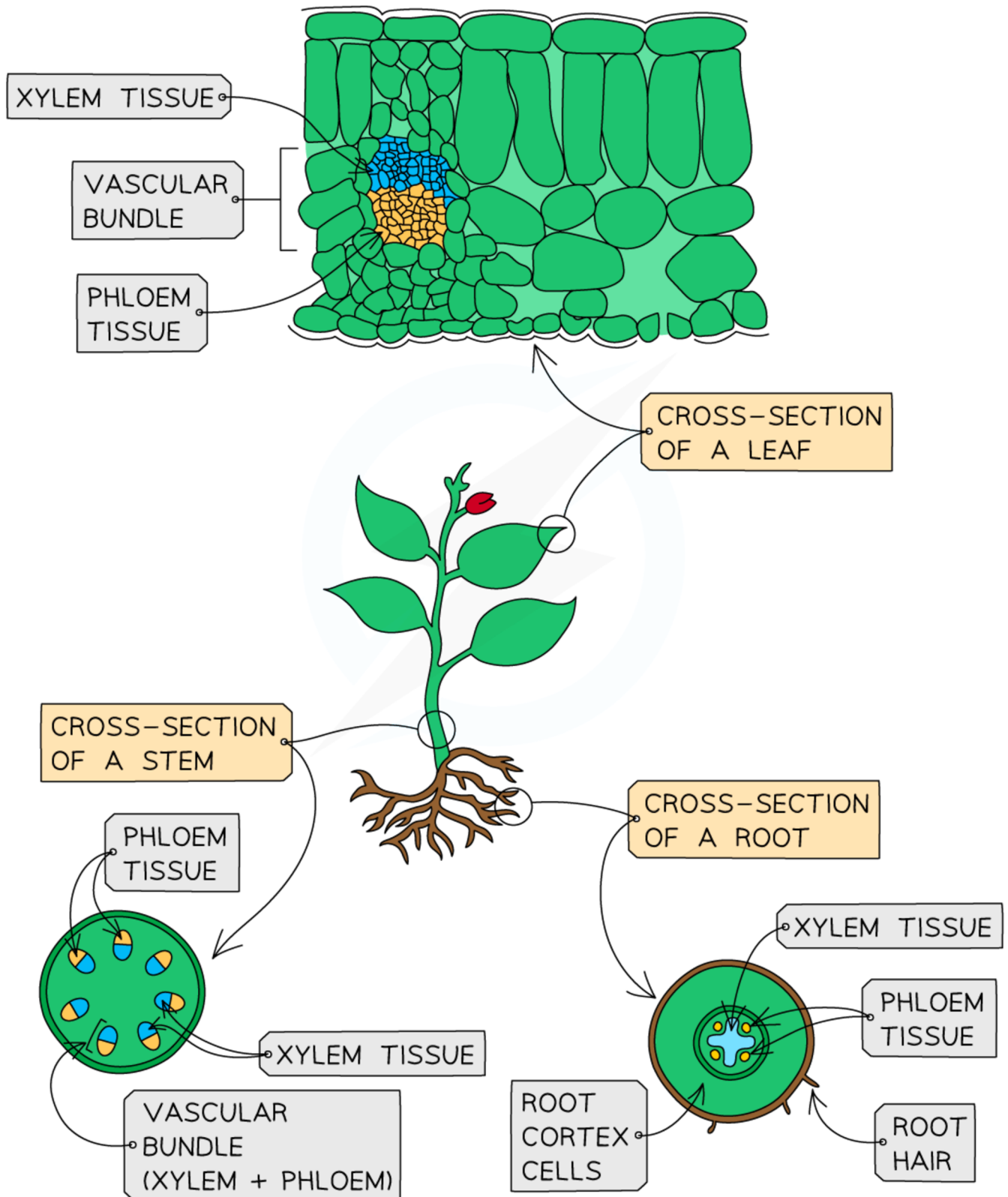
Functions:

- provide strength and support to the plant.
- have cell walls that are thickened with lignin that enable them to provide **support and strength to the plant organ**.

Anatomy of a dicot plant

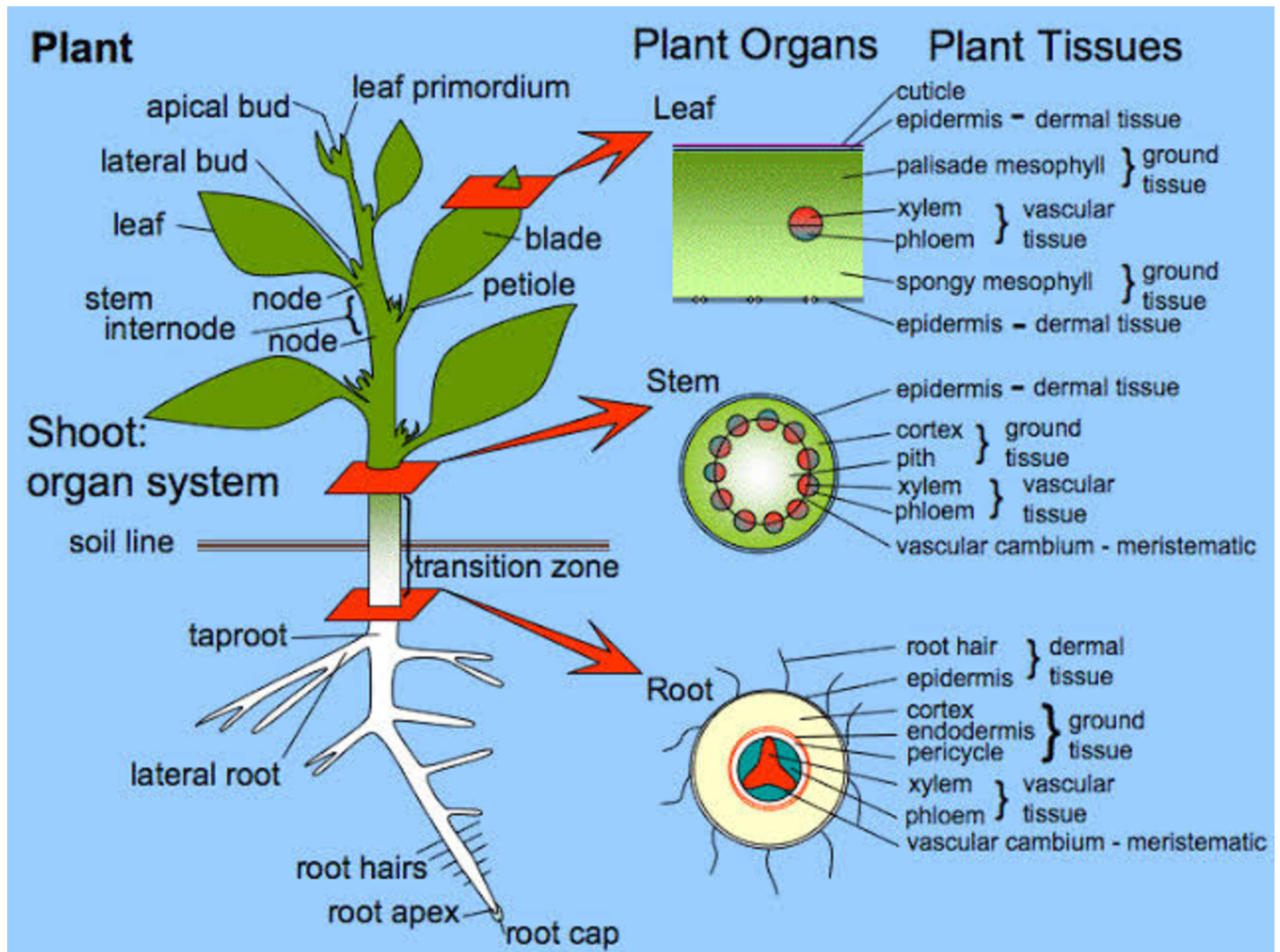
Notes

THE LOCATION OF TRANSPORT (VASCULAR) TISSUES
IN NON-WOODY DICOTYLEDONOUS PLANTS

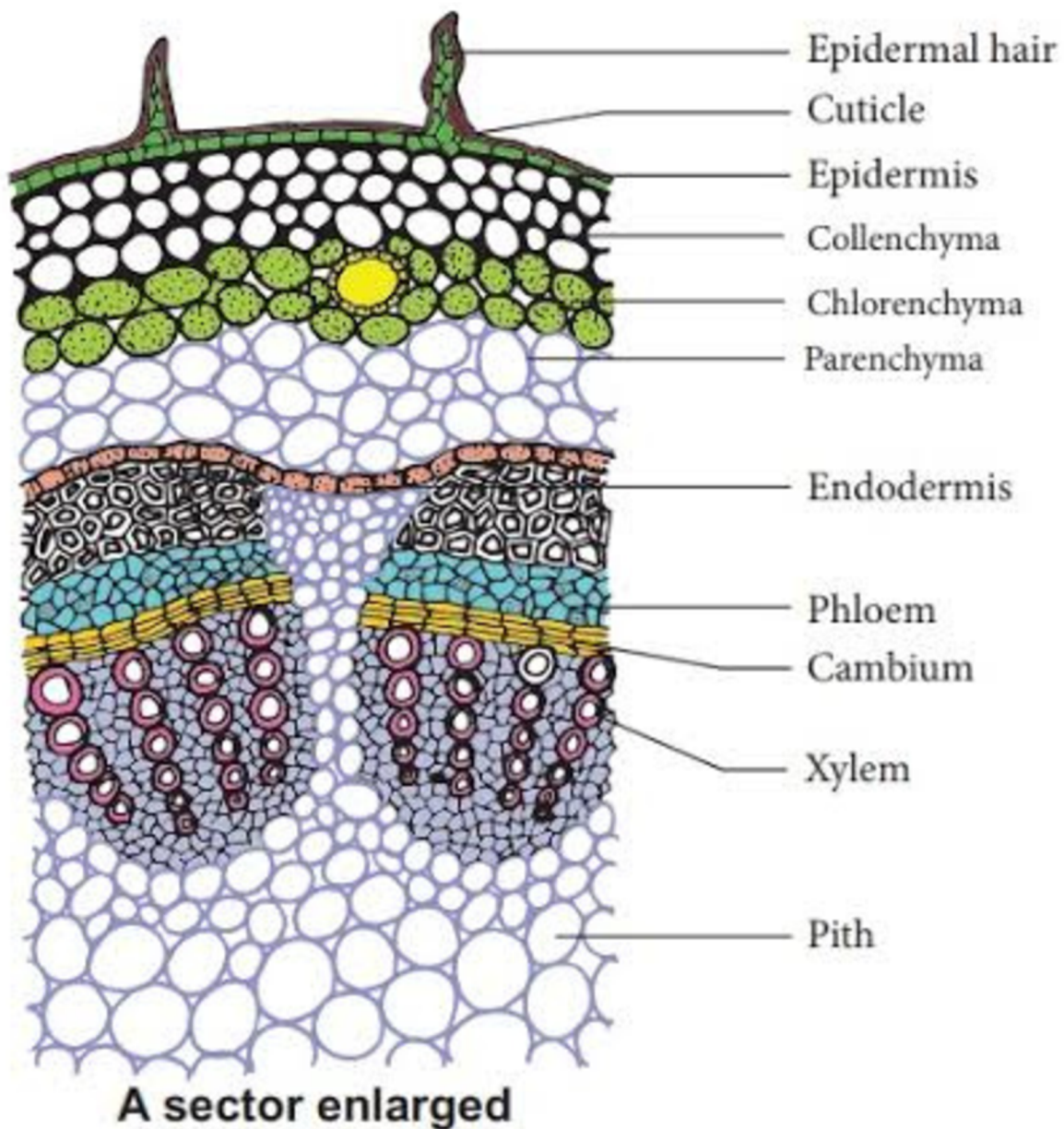


Plant organs

Organ: a group of similar tissues performing for a common function .



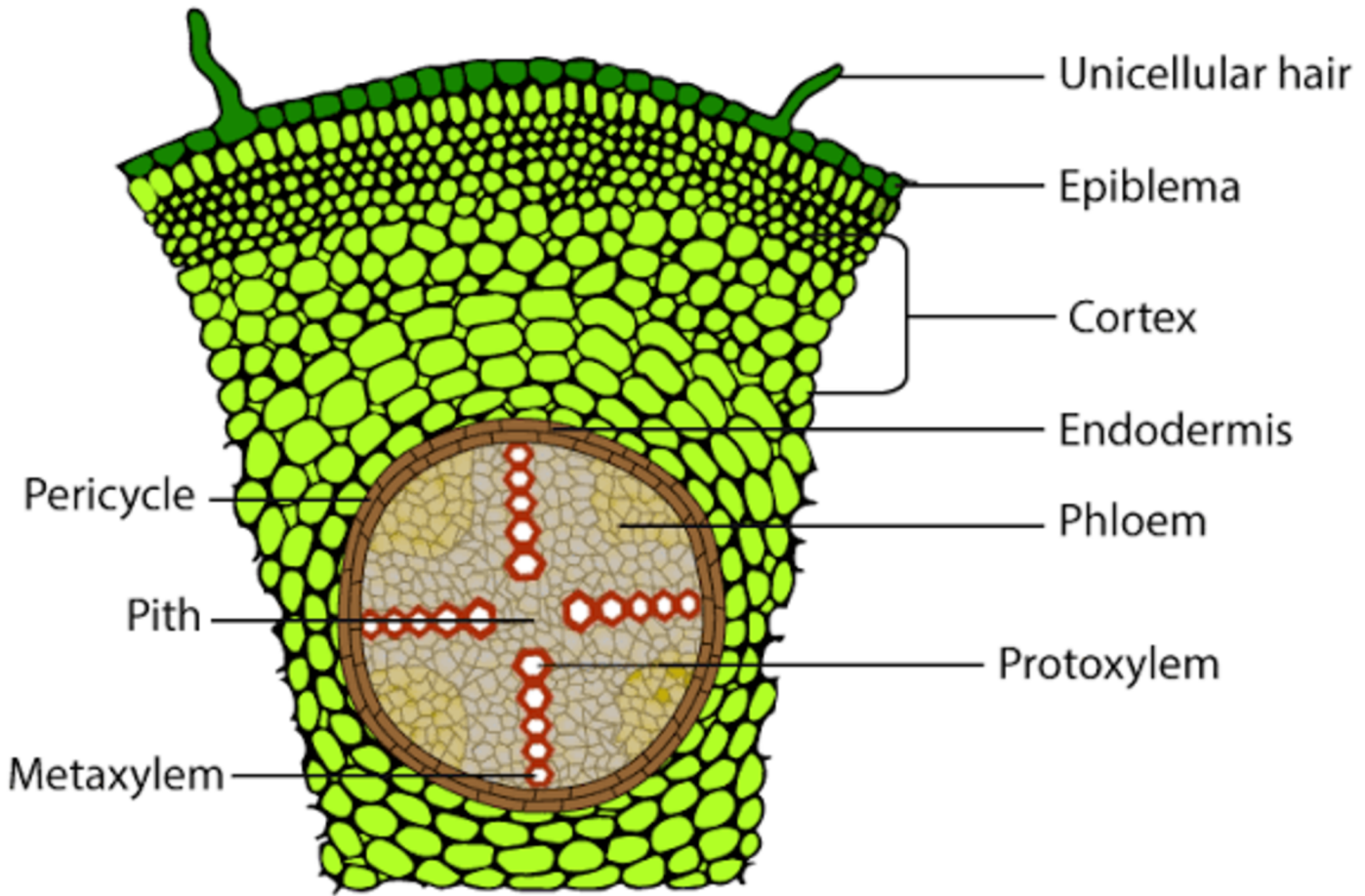
Anatomy of a dicot plant *Stem*



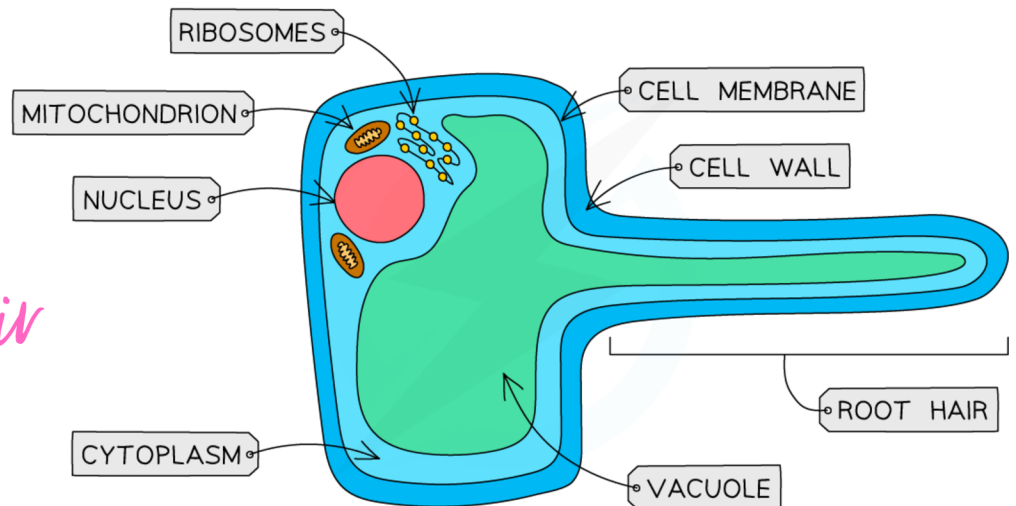
The main functions of the stem is to:

- Transport of water and mineral salts from the root to the leaf
- Transport organic substances from the leaf to the rest of the plant

Anatomy of a dicot plant *Root*



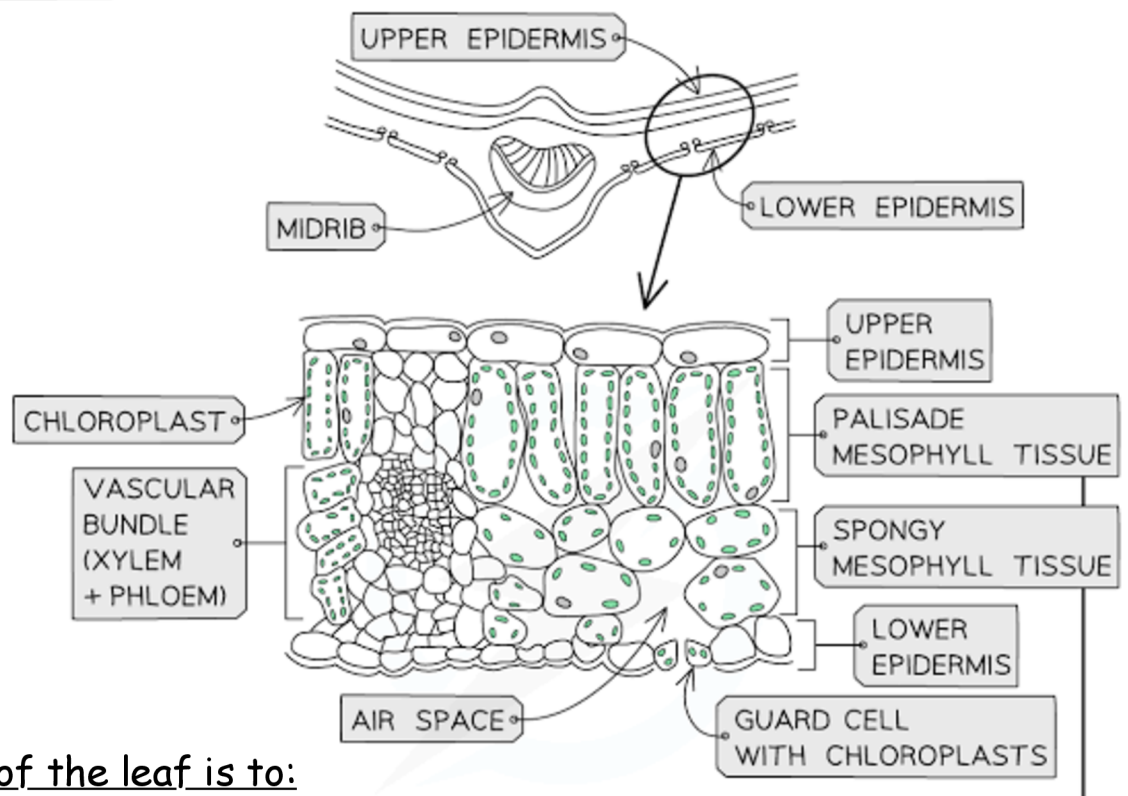
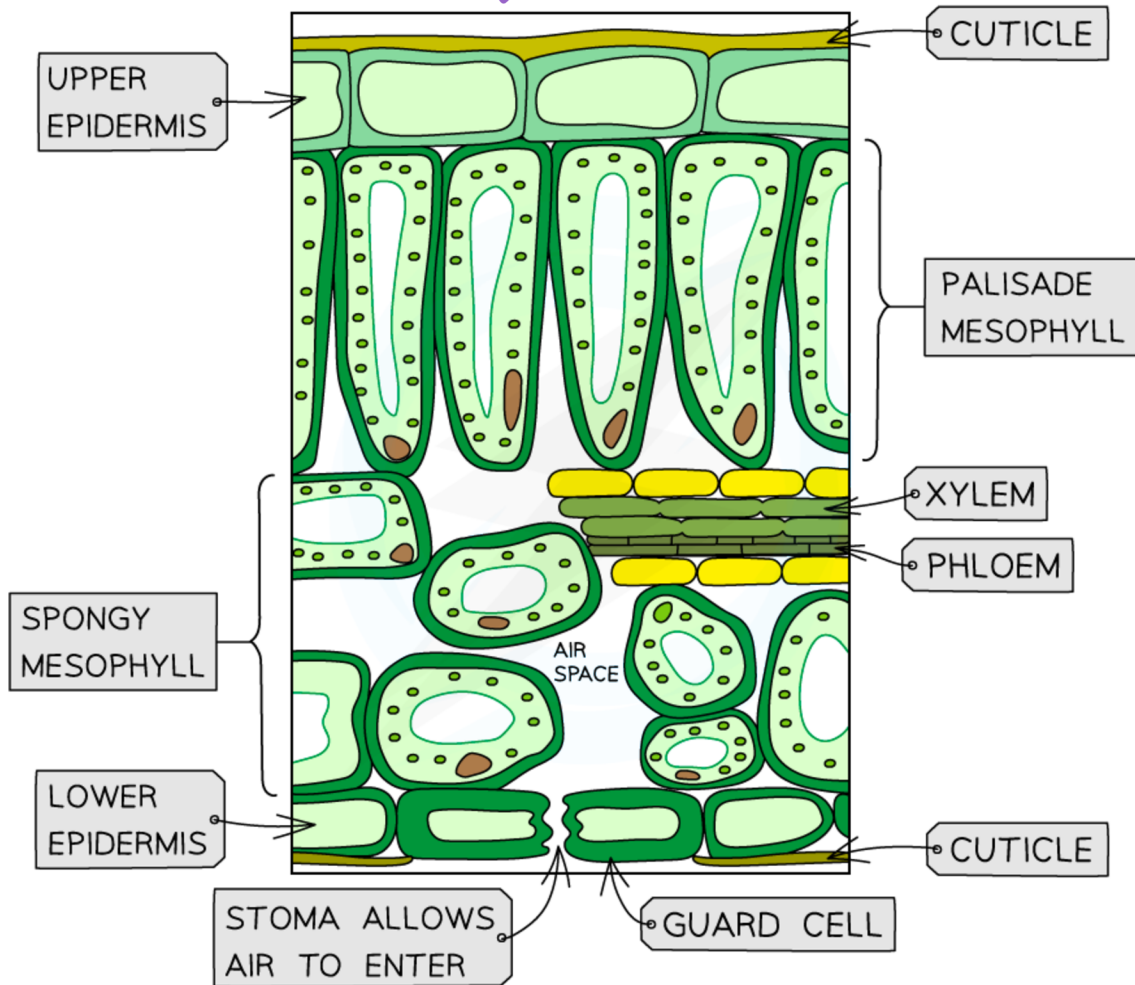
Root hair



The main functions of the root is to:

- Anchor the plant into the ground
- Absorb water and mineral salts from the soil

Anatomy of a dicot plant *leaf*



The main functions of the leaf is to:

- allow for photosynthesis to take place
- allow for gaseous exchange to take place
- Transport (diffusion & osmosis)
- Transpiration

Plant tissues

Terminology

Biological term	Description
Apical meristem	Type of tissue located at the tip of a root or shoot
Chlorenchyma	Collenchyma tissue with chloroplast
Cambium	Actively dividing tissue responsible for secondary growth
Differentiate	Take on a particular function
Guard cell	Specialised epidermal cells that control stomata size
Lateral meristem	Type of tissue located on the side of a root or shoot
Meristematic tissue	Actively dividing tissues
Perforated	To have tiny pores
Pericycle	Layer surrounding vascular bundle, plays a role in transporting substances
Permanent tissue	Already differentiated tissue
Stomata	Opening in a leaf
Tissue	a specific region within the enzyme where the substrate binds
Vascular bundle	Collective name for xylem and phloem