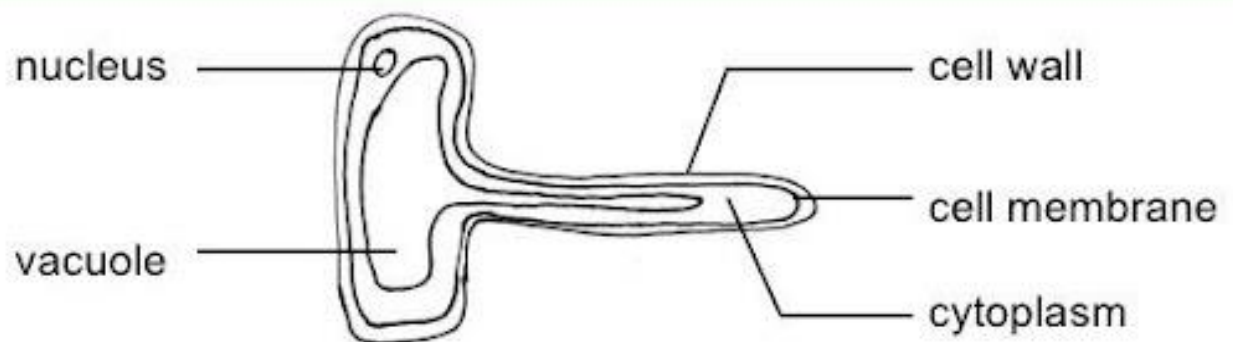


# CHAPTER 10

# TRANSPORT IN

# PLANTS

## Root Hair Cell



Function: absorbs water and mineral salts from the surrounding

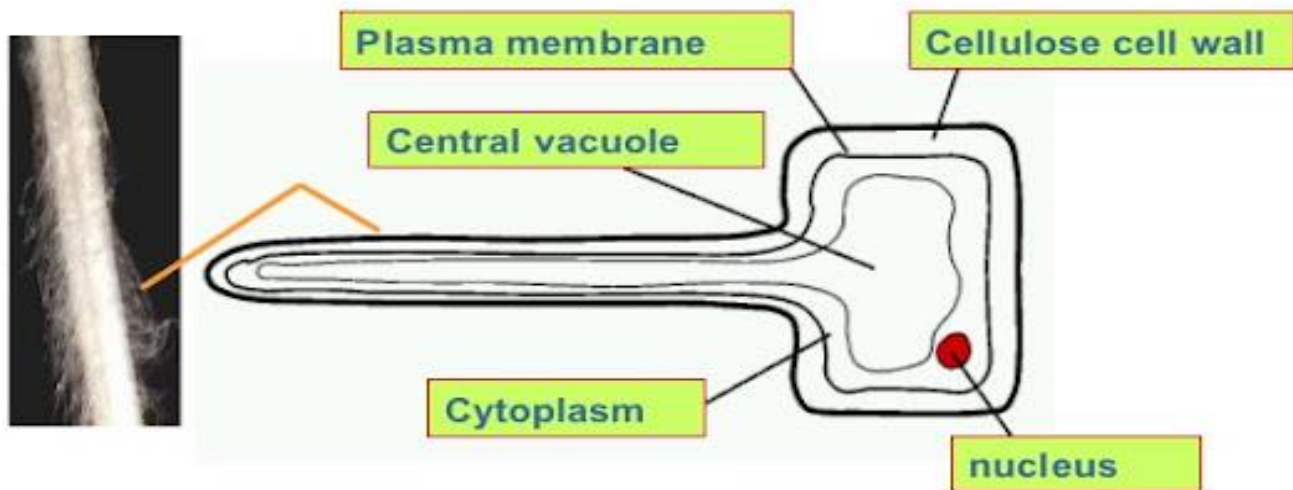
Modifications:

- elongated: **increases surface area to volume ratio** for faster absorption of water and mineral salts
- presence of sap vacuole: lowers its water potential so that water can be absorbed by **osmosis**
- large vacuole: stores as much water as possible

# Root hair

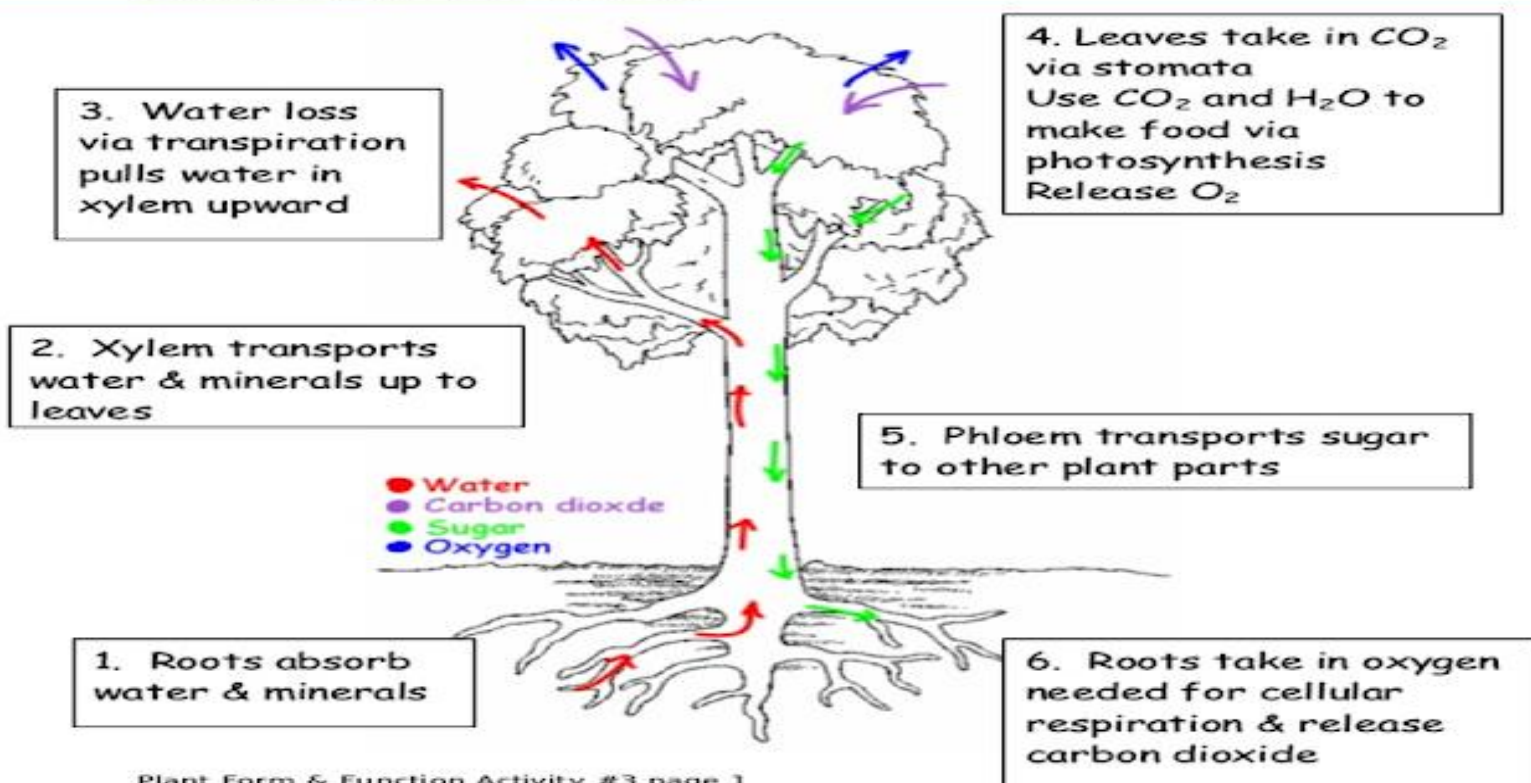
## Functions

- Adapted for the absorption of water and mineral salts from the soil.
- Anchor the plant firmly to the ground.



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# FUNCTION OF XYLEM



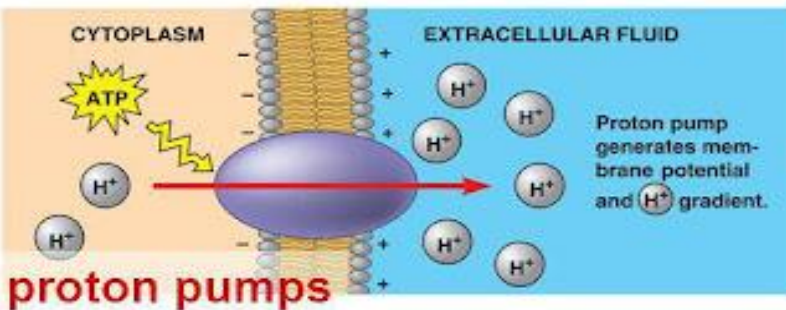
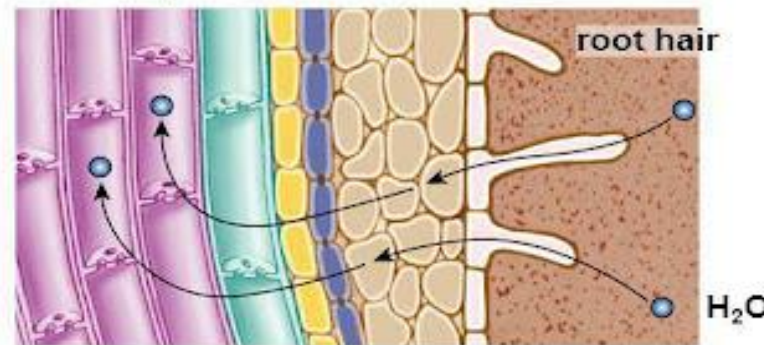
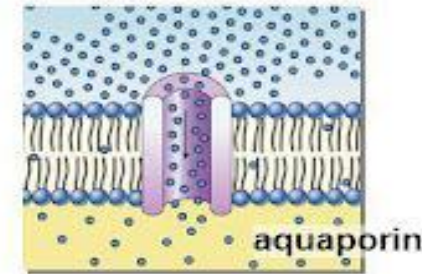
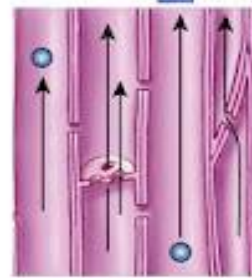
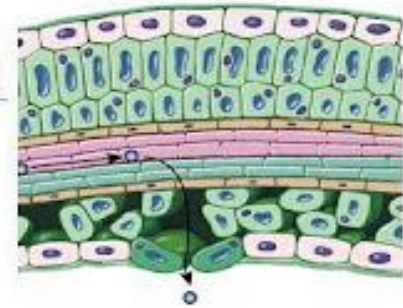
# Water & mineral absorption

## Water absorption from soil

- ◆ osmosis
- ◆ aquaporins

## Mineral absorption

- ◆ active transport
- ◆ proton pumps
  - active transport of  $H^+$



## Mineral Uptake

- Minerals are absorbed by the plant via **active transport**
  - Minerals include potassium, phosphate, nitrates and other ions
  - The concentration of ions is higher inside the root cell than in the surrounding soil
  - Move against the concentration gradient
  - Allows for selective absorption of minerals by plants
- Cortex cells absorb mineral ions that are dissolved in water
- From cortex, minerals dissolved in water travel through the endodermis and into the vascular cylinder.

# Differences & Comparision

## PHLOEM

- ❑ Transports food and nutrients like sugar and amino acids.
- ❑ Bidirectional (Moves up or down the plant's stem from source to sink).
- ❑ Present in roots, stem and leaves.
- ❑ Living tissue with little cytoplasm but no nucleus.
- ❑ Phloem is not star shaped

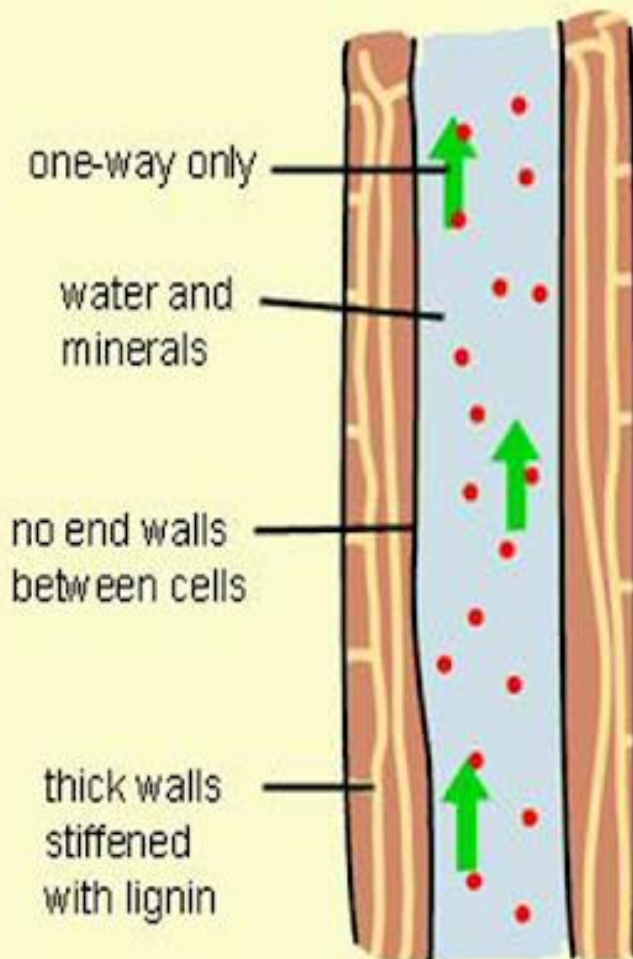
## XYLEM

- ❑ Transports water and minerals from roots to aerial parts of plant.
- ❑ Unidirectional (Moves up the plant's stem)

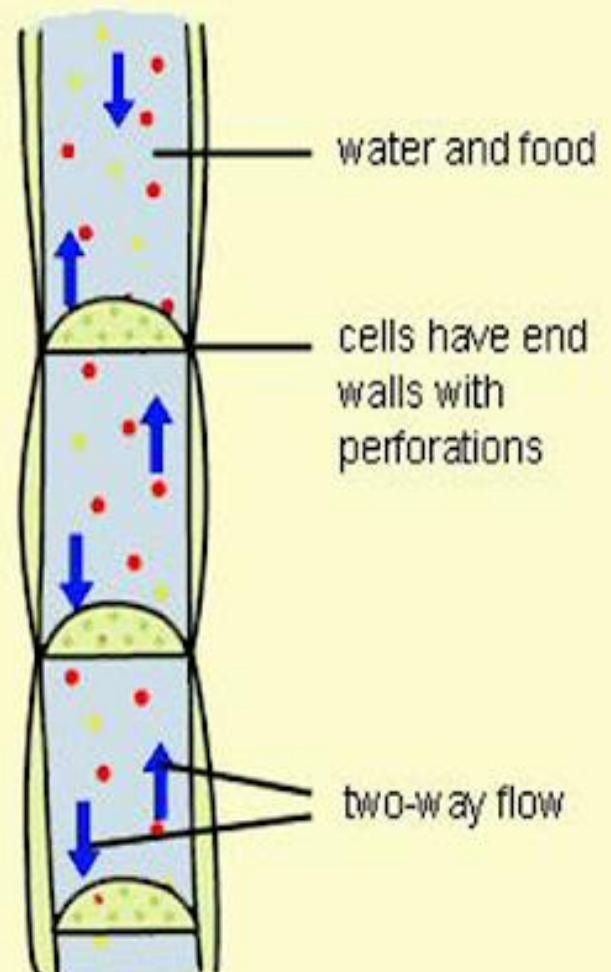
Present in roots, stems and leaves.

Dead tissue at maturity so it is hallow with no cell contents.

Xylem. is star shape



**xylem vessel**



**phloem vessel**

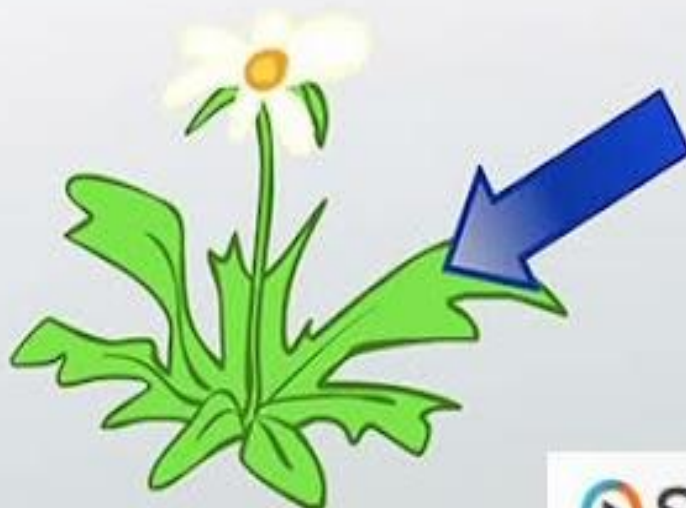
# QUIZ

- Q1. What is the function of xylem?**  
**Q2. Differentiate between xylem and phloem vessels?**

WHAT IS TRANSPIRATION?

## Transpiration

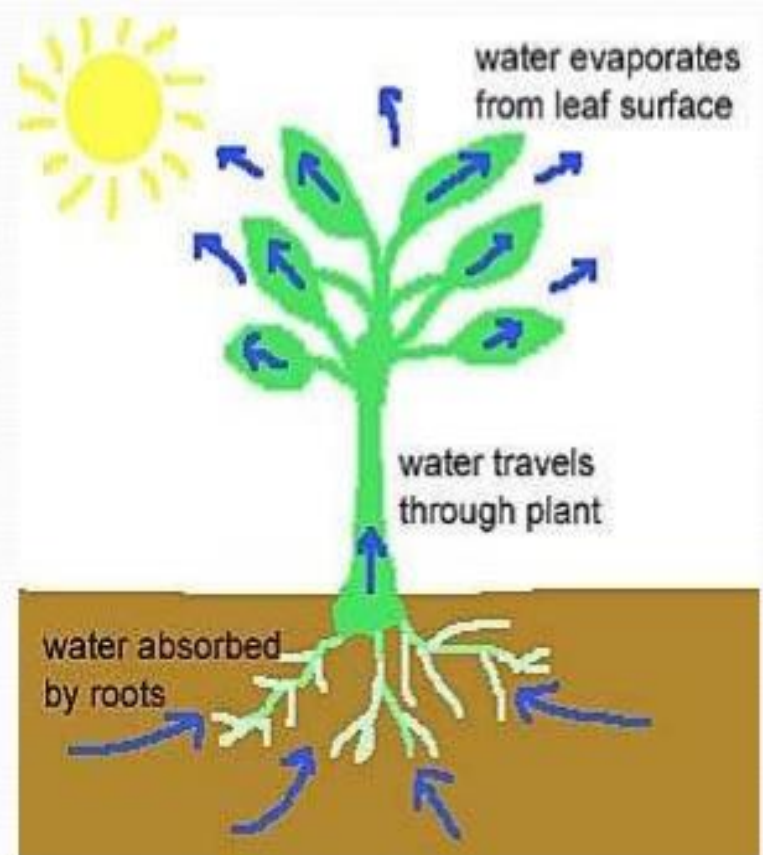
*loss of a plant's water to its environment through evaporation*



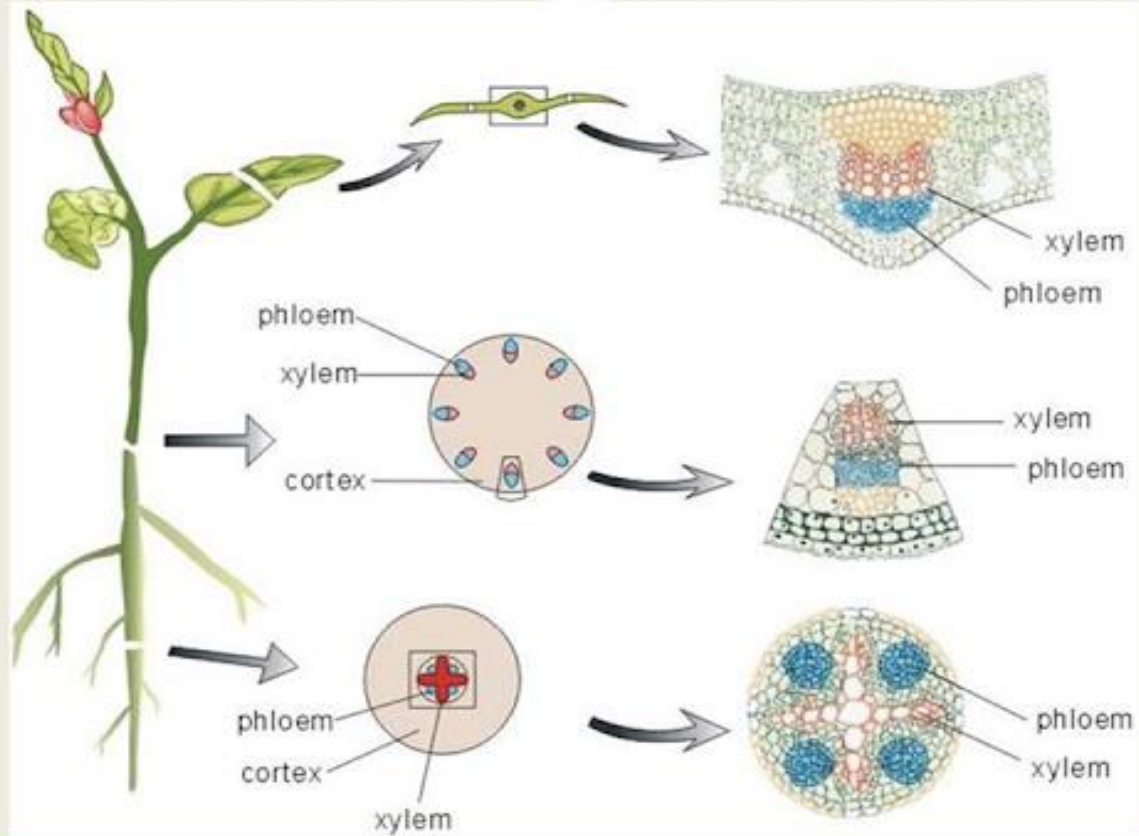
Factor	Effect on transpiration rate
Temperature (increases transpiration)	Increasing temperature increases the <u>kinetic energy</u> of molecules. This makes diffusion, osmosis and evaporation happen faster
Humidity (decreases transpiration)	When the air is humid then there is more water vapour in it. Humid air is less able to accept more water molecules by evaporation.
Wind (increases transpiration)	Wind blows water vapour away from the stoma, keeping the concentration gradient high.
Light intensity (increases transpiration)	Light causes stoma to open. Wider stoma can allow faster diffusion of water vapour out of the leaf.

## Transport of Water and Mineral Salts (Xylem)

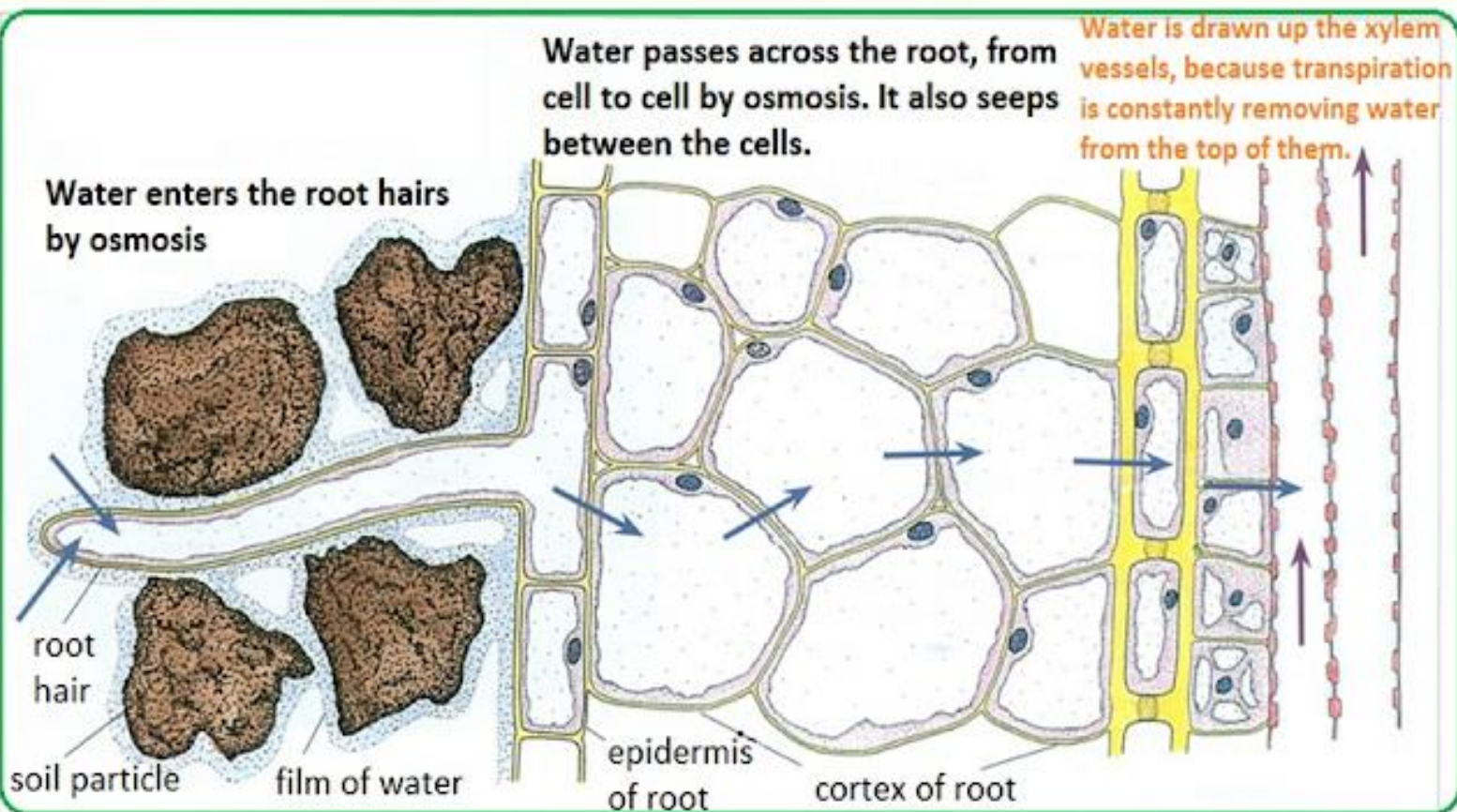
- Water and mineral salts move up the plant mainly by **transpiration pull** and in some plants, by root pressure.
- Transpiration pull
  - This pulling force is produced when water **evaporates** from the leaves through the stomata.
  - This force is similar to someone sucking up liquid through a straw.



# Positions of xylem and phloem in dicotyledonous roots, stems and leaves.

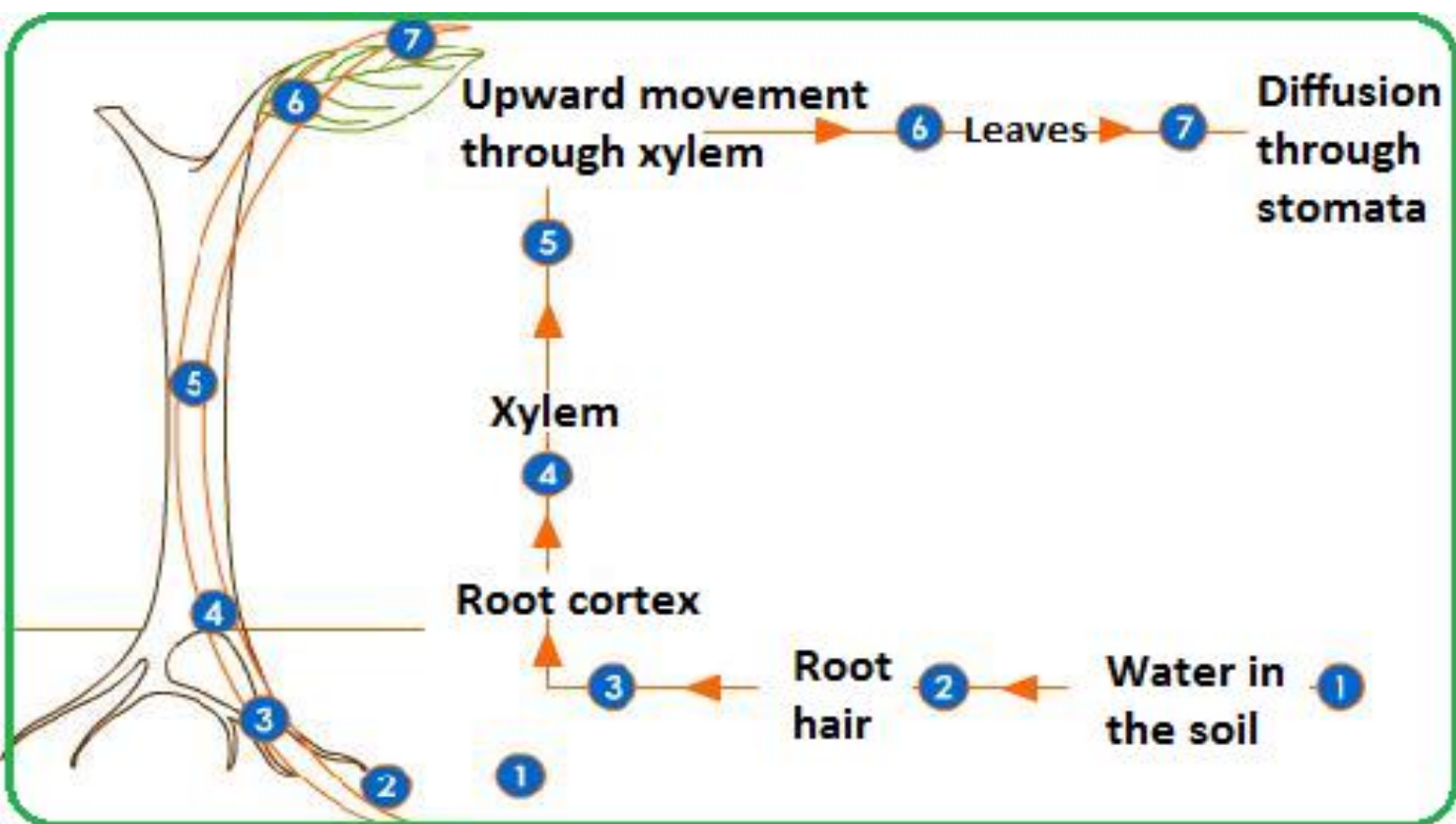


## ROOT HAIR CELLS UNDER MICROSCOPE



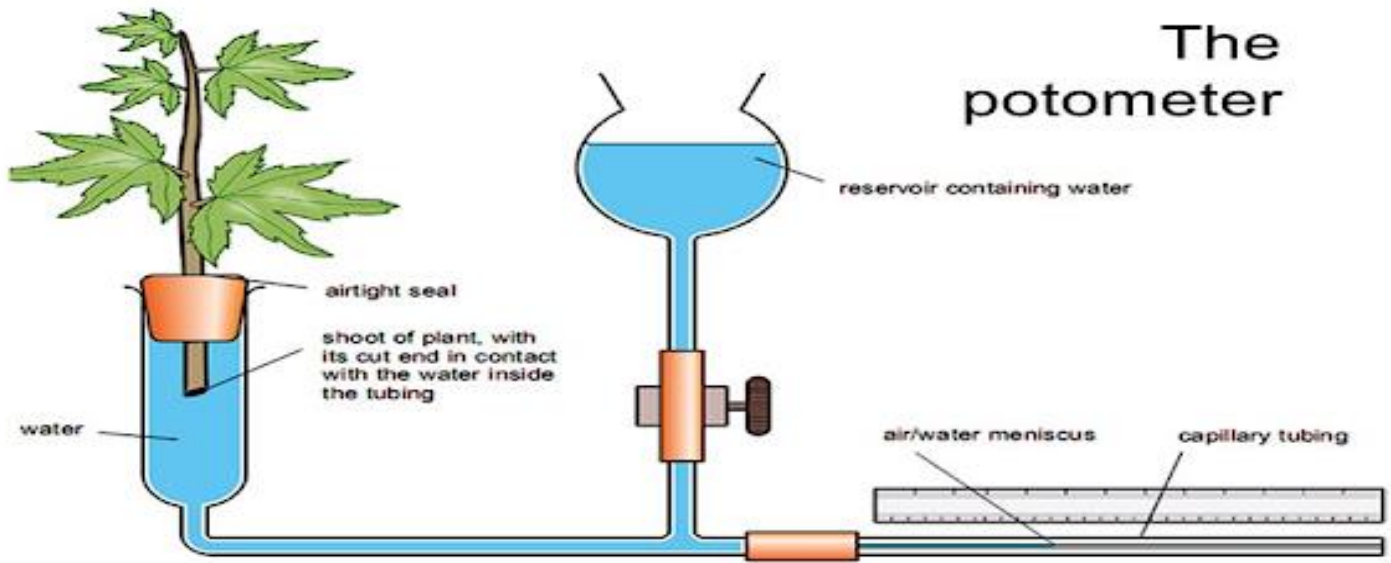
# QUIZ

- Q1. Identify the position of xylem and phloem tissues in dicot root, stem and leaves.**
- Q2. Describe root hair cell and its function.**
- Q3. State the adaptations of root hair cells for its function.**



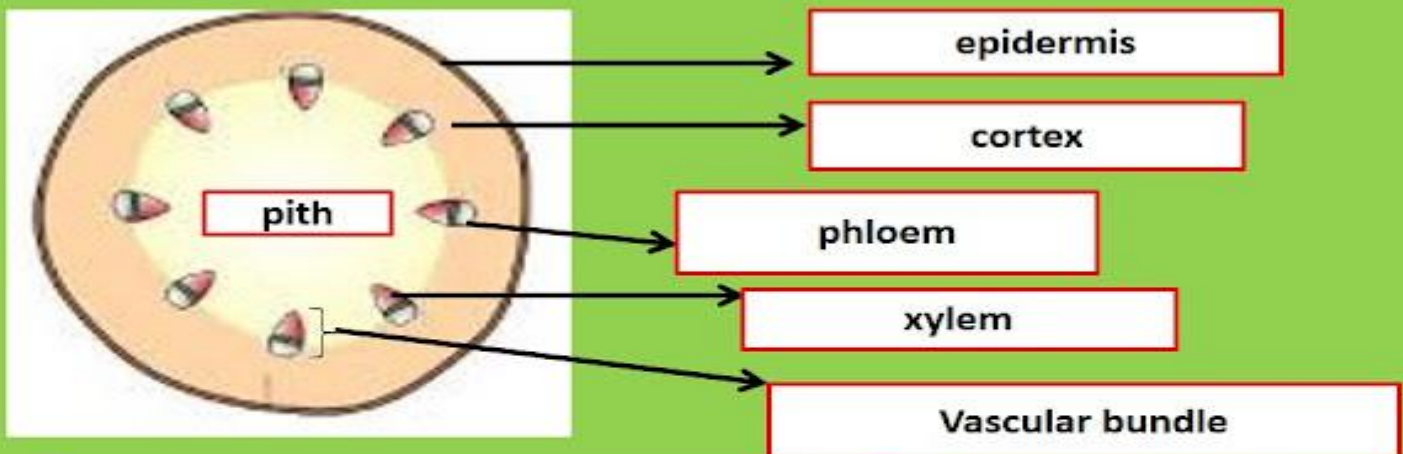


# RATE OF UPTAKE OF WATER

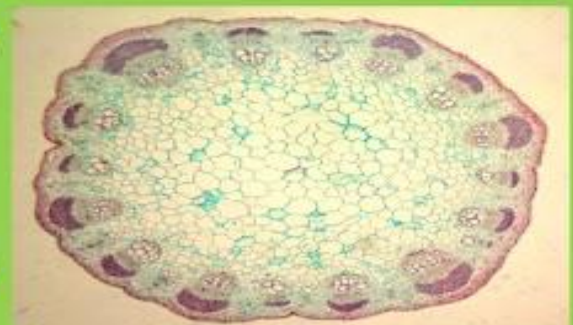


As water evaporates from the leaves, more water is drawn into the xylem vessels that are exposed at the cut end of the stem.

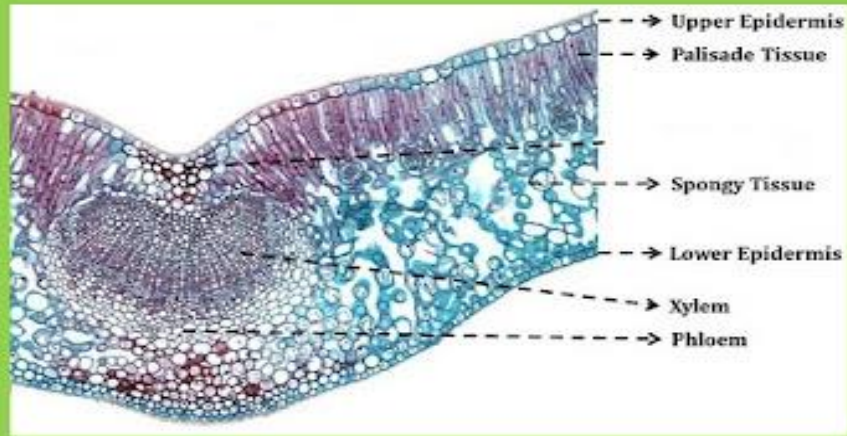
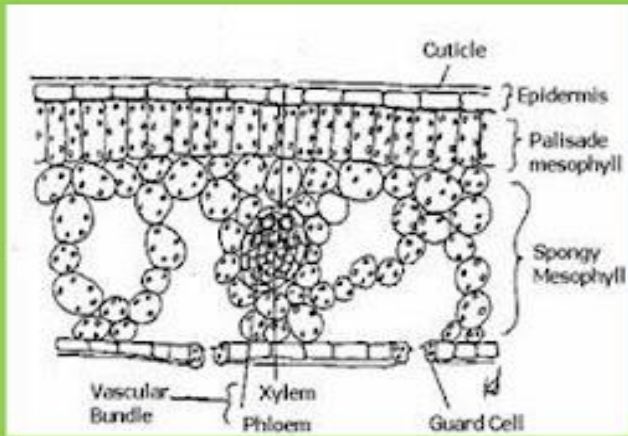
## THE STEM



- Support the leaves during sunlight
- Transport organic materials, ions and water between root and leaves
- Vascular bundles are found below epidermis between cortex and pith

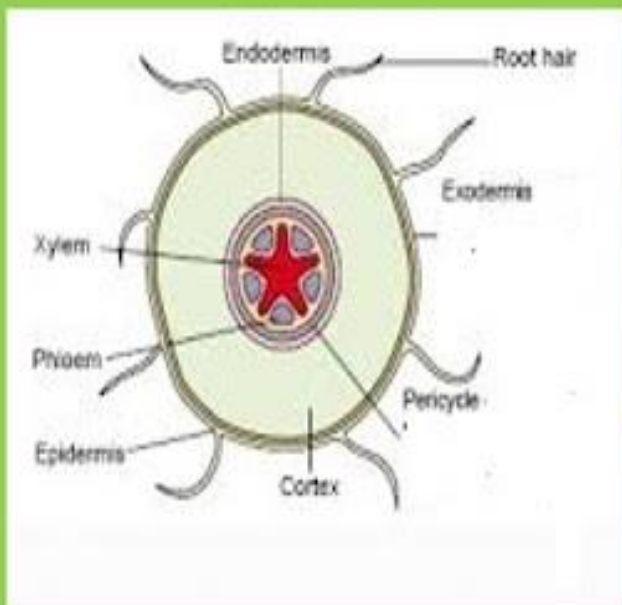


# THE LEAVES

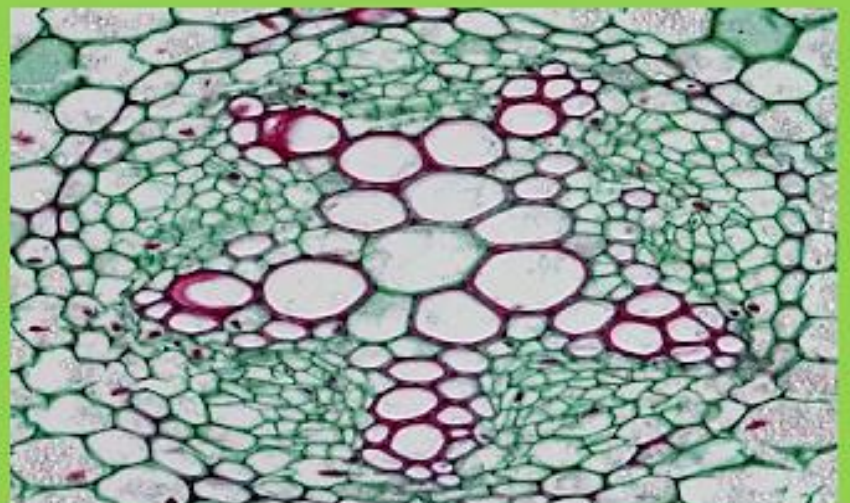


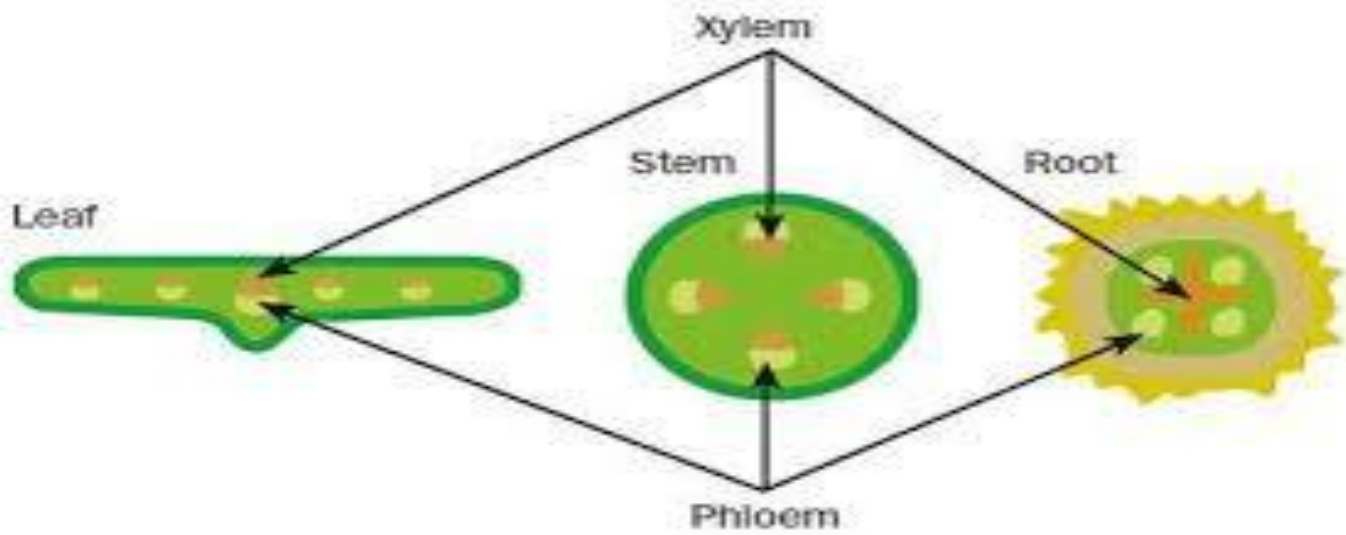
- **Site of photosynthesis**
- **Outer tough , transparent & single layered epidermis**
- **External waxy cuticle reduce water loss**
- **Stomata are pores on epidermis that help in gas exchange**
- **Mesophyll helps in photosynthesis & gas exchange**
- **Vascular bundle provide mechanical support**

# THE ROOT



- **Anchors plant to ground, absorbs water & ions from soil**
- **Vascular tissue surrounded by endodermis (casparian strip) occurs as stele**
- **Below endodermis is pericycle**





**Root:**

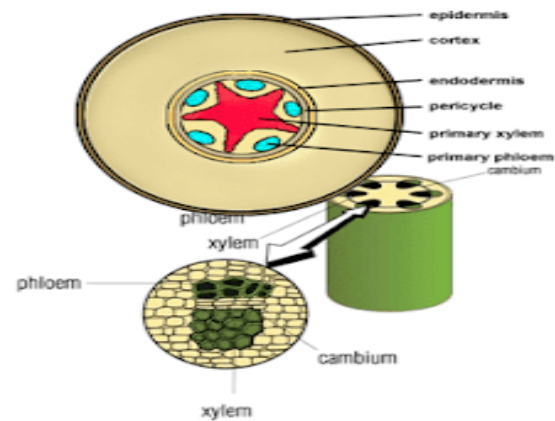
- Vascular bundle found in the **centre**
- **Large central core of xylem -X shaped**
- **Phloem between arms of xylem**

**Stem:**

- Vascular bundles found near the **outer edge**
- **Xylem** found towards the **inside** of each vascular bundles
- **Phloem** found towards the **outside** of each vascular bundles
- **Cambium** found **in between** xylem and phloem

**Leaf:**

- Vascular bundle forms the **midrib** and veins of a leaf - found in the **centre**
- **Xylem** found closer to the **flatter edge**
- **Phloem** found closer to the **bump**



Xylem tissue contains long hollow xylem cells that form long tubes through the plant. They carry water and dissolved mineral ions which have entered the plant through the roots. The thick cell walls help to support the plant. Phloem cells are living cells that are linked together to form phloem tissue. Dissolved food materials such as sucrose and amino acid that have been formed in the leaf, are transported all over the plant from the leaves.

In roots the xylem and phloem vessels are usually grouped together separately, but in the stem and leaves they are found together as vascular bundles



**Q1. State the pathway of water through root stem and leaf.**

**Q2. How can we measure the rate of uptake of water using potometer?**