

TRANSPORT SYSTEM

- **Unicellular organisms and some colonies can take material from their environment by diffusion, osmosis and active transport.**
- **But in multicellular organisms all cells can not take needed material from their environment.**
- **Therefore there is a special transport system in complex multicellular organisms.**

TRANSPORT IN PLANTS

- In Plants, transport of materials is provided by;
 - Leaves,
 - Stem and
 - Root

The Leaf

A typical leaf consist of ;

- **Leaf blade**

- **Petiole (Stalk)**

The petiole attaches the leaf to the stem.

Plants are divided into two major groups:

- **Flowering Plants**

- **Non-Flowering Plants**

FLOWERING PLANTS

- Flowering Plants are divided into two major group according to their seed leaves (Cotyledons). These are;
 - **Monocotyledons**
 - **Dicotyledons**

Differences Between

Monocots and Dicots

DICOTS

The leaf blade is
not single
structure

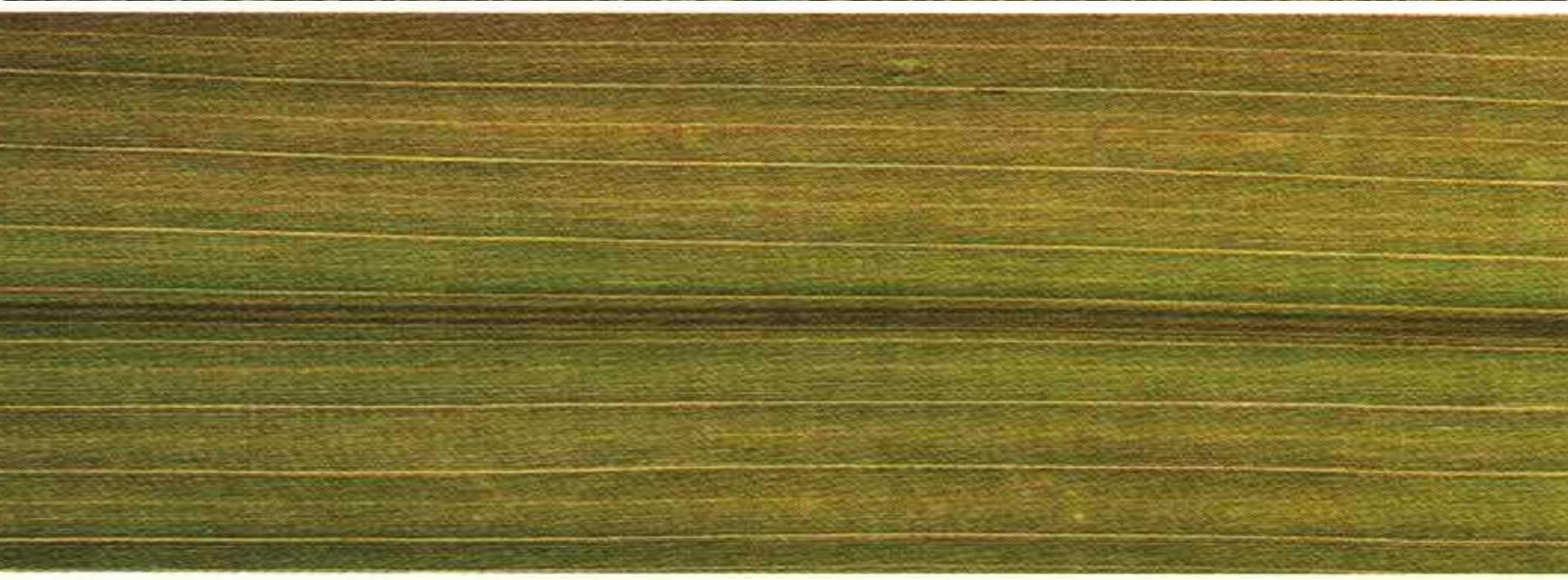
The leaves of dicots
are network veined

MONOCOTS

The leaf blade
is single
structure

The leaves of
monocots have
parallel veins.





The Anatomical Structure of the Leaf

1. The Cuticle Layer

2. Epidermal Tissue

3. The Mesophyll Layer

- **The Palisade Paranchima**

- **The Spongy Paranchima**

4. The Vascular Bundles (Veins)

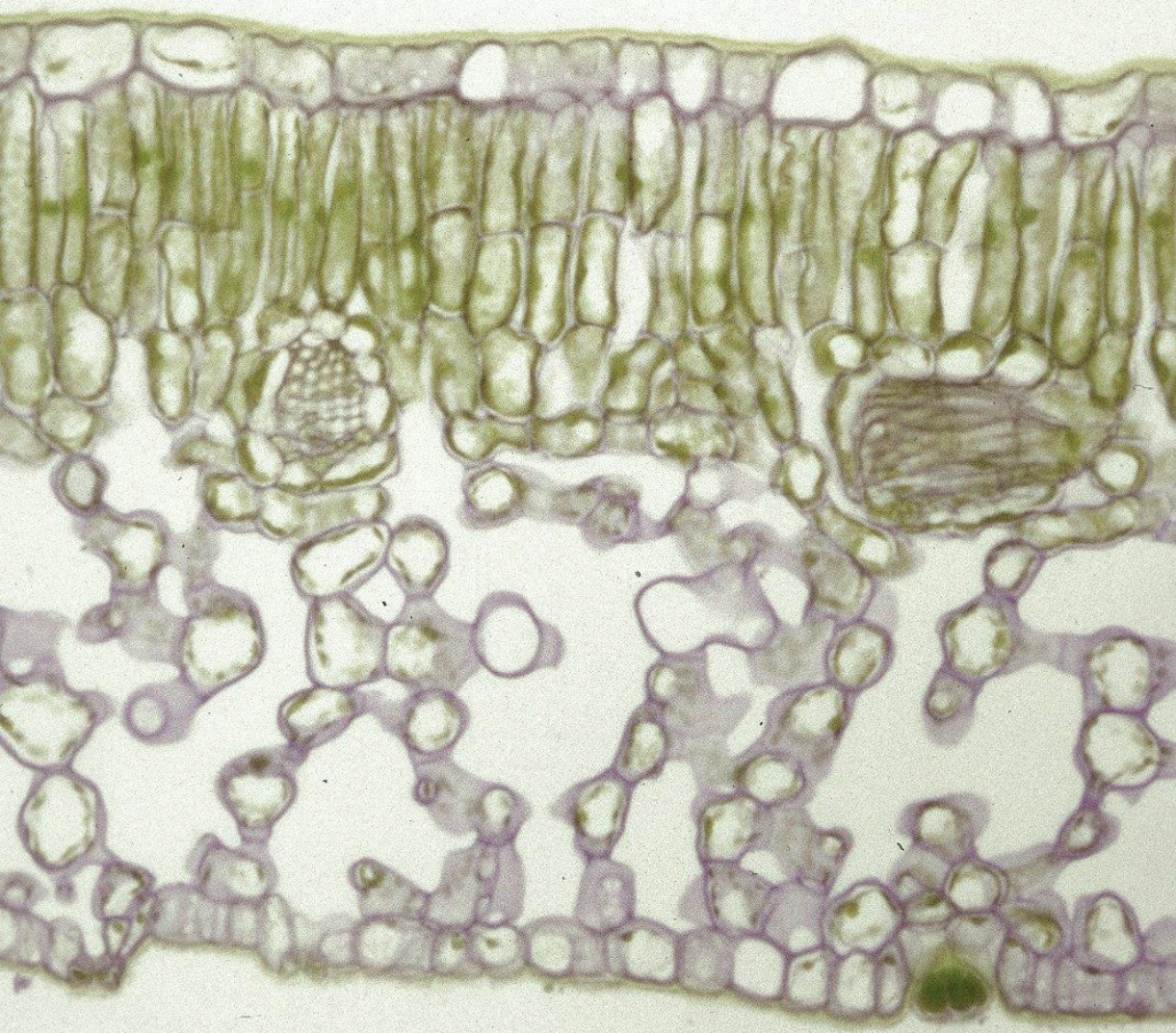
Parts of a leaf

→ **Cuticle**

- **It is a waxy layer which prevent water loss from the leaf surface**



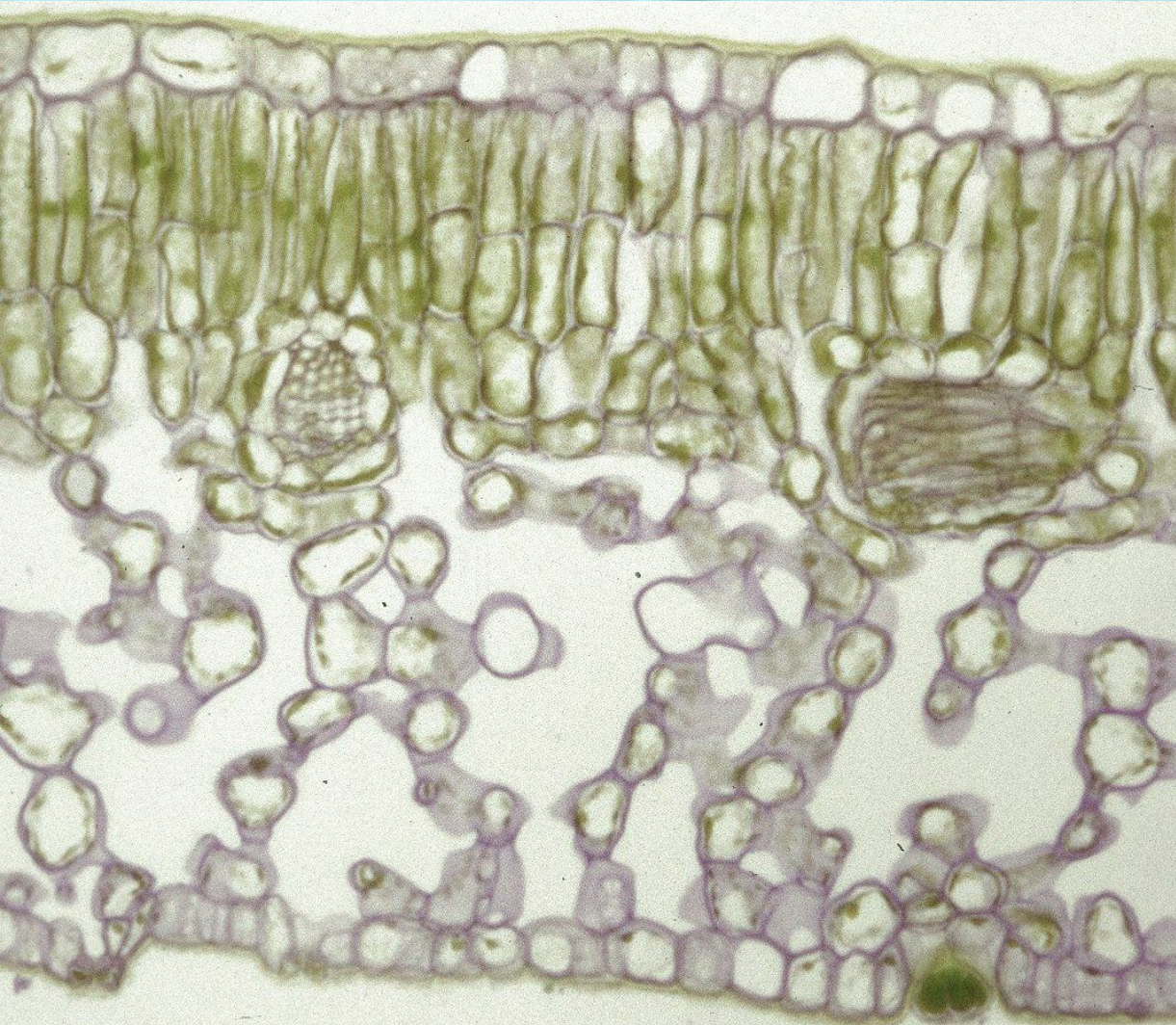
Parts of a leaf



**upper
epidermis**

**It protects
internal
tissues from
mechanical
damage and
bacterial and
fungal
invasion**

Parts of a leaf



**palisade
mesophyll**

**contains
many
chloroplasts**

Parts of a leaf



**less
chloroplasts for
photosynthesis**

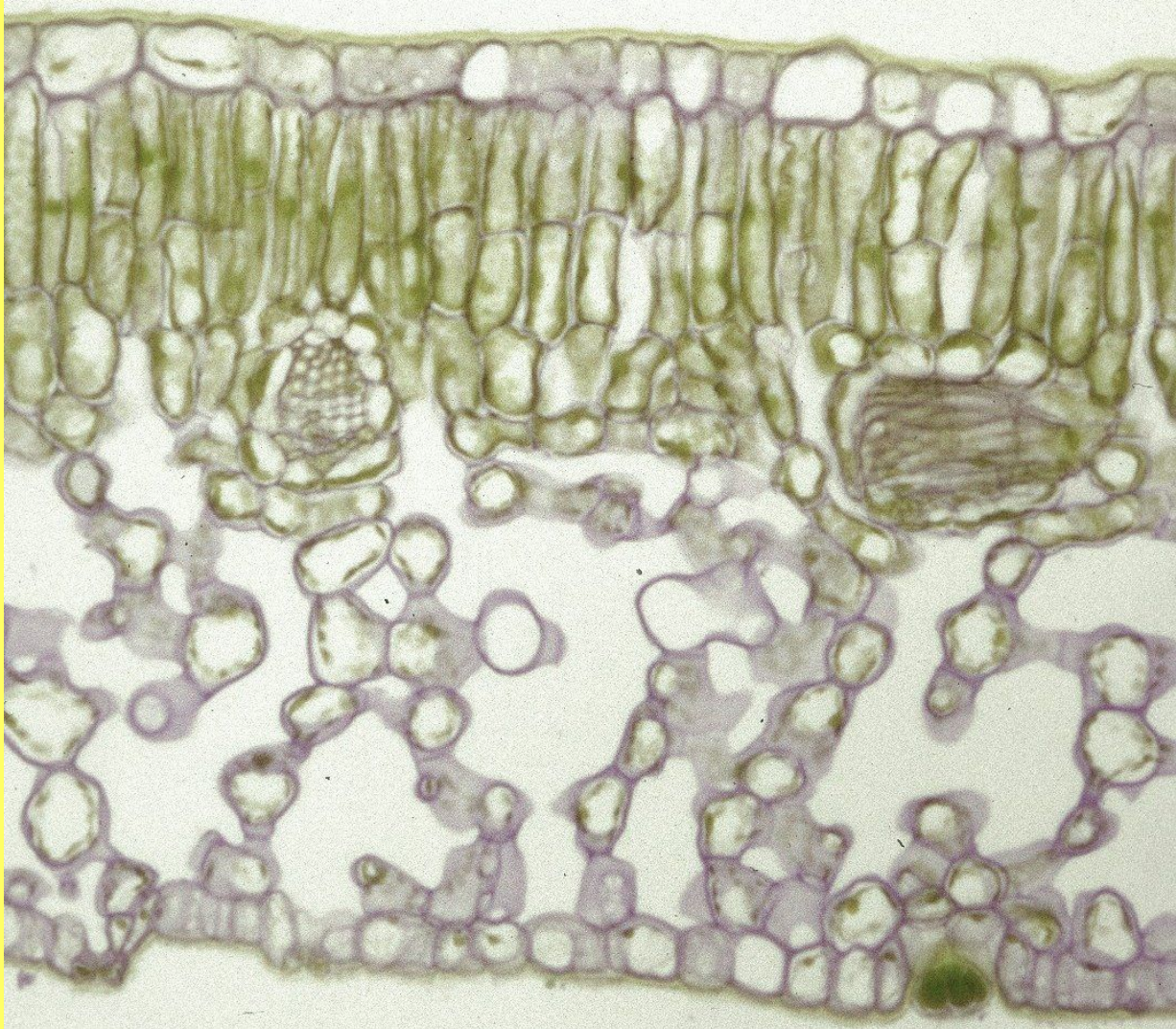
**spongy
mesophyll**

Parts of a leaf



**vascular
bundle
(vein)**

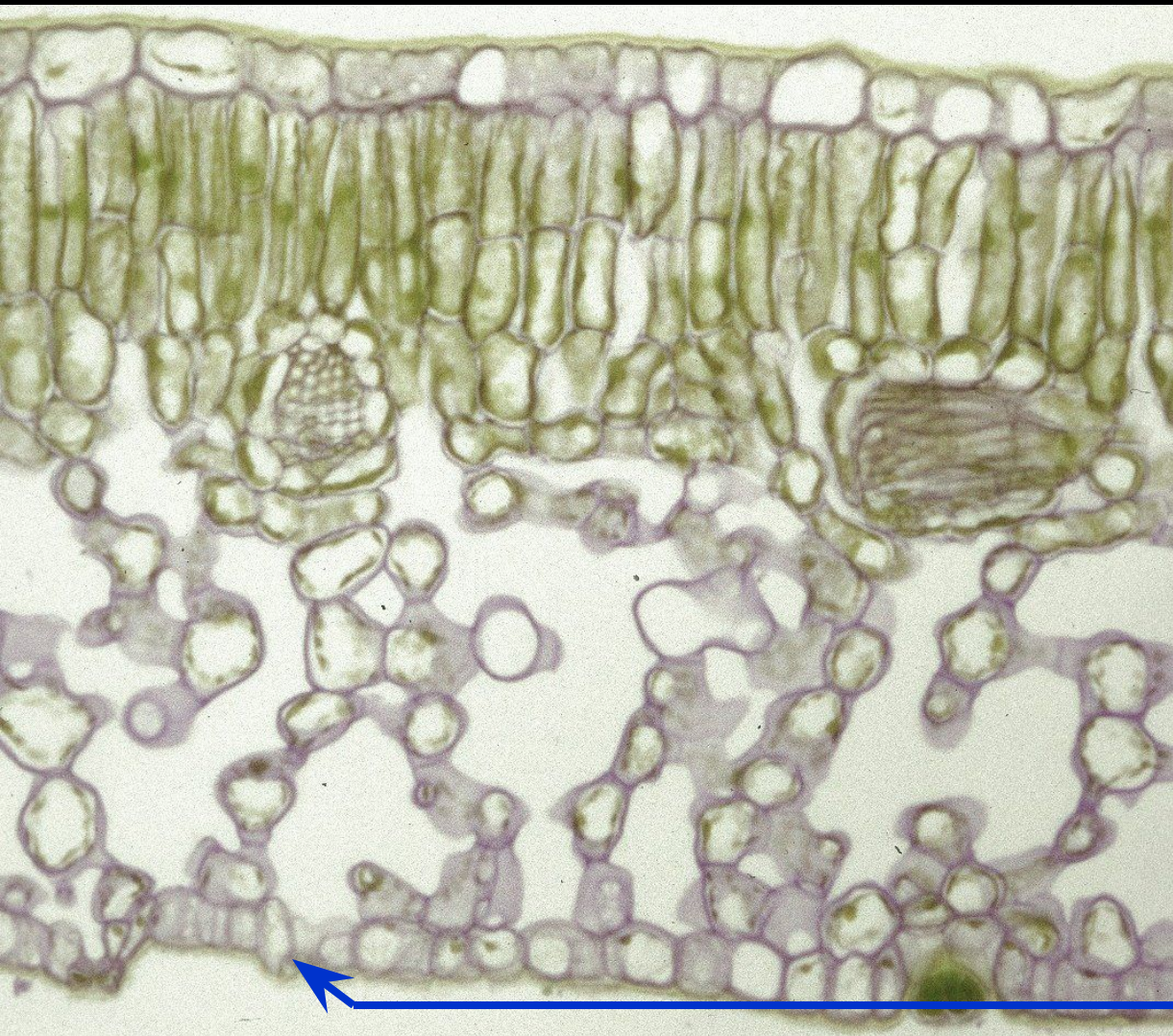
Parts of a leaf



**same as
upper
epidermis
except the
cuticle is
thinner**

**lower
epidermis**

Parts of a leaf



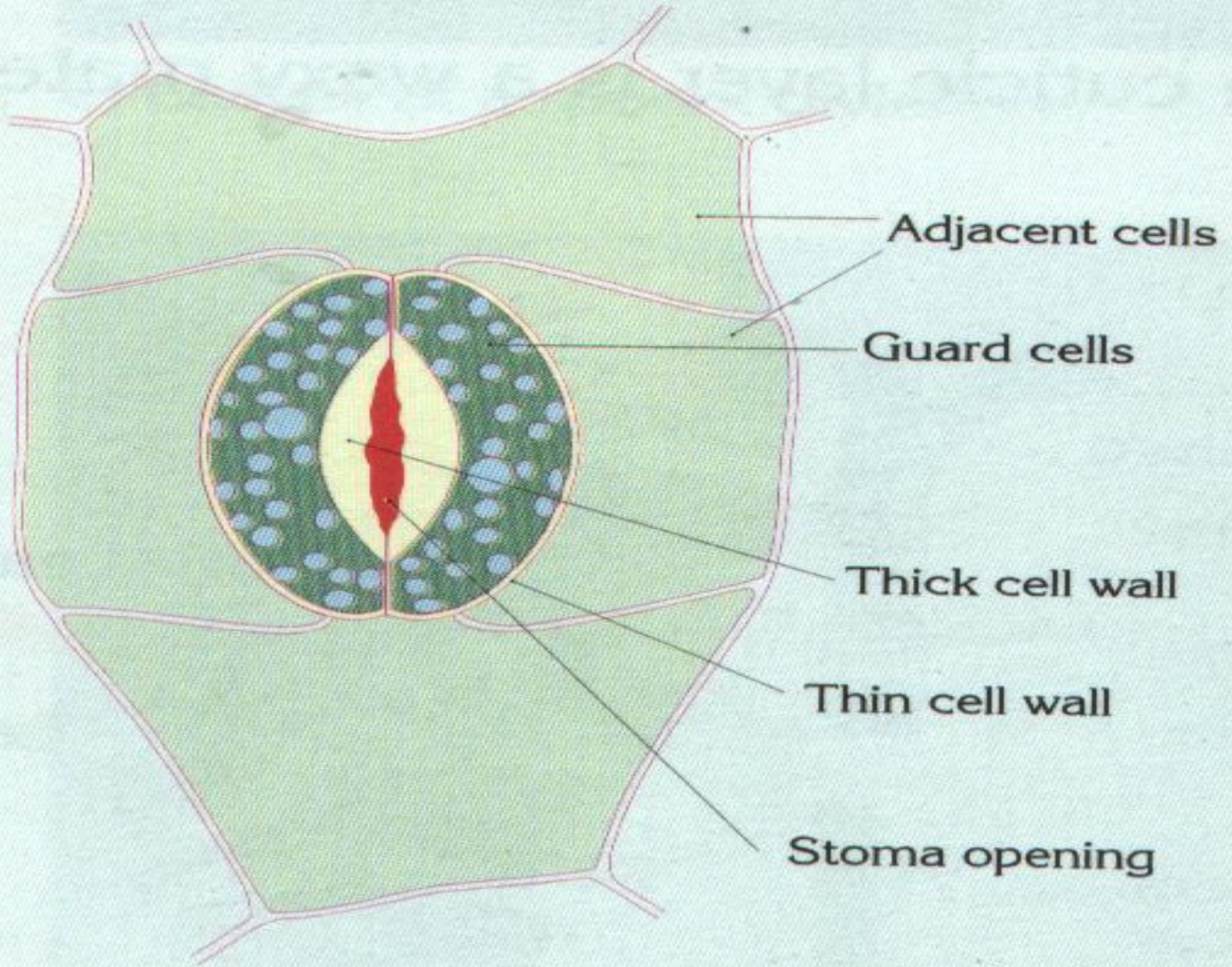
**opening
which allows
gases to pass
through it to
go into or
out of the
leaf**

stoma

STOMATA

- **There are many stomata in epidermal tissue.**
- **The stomata allow the exchange of carbon dioxide and oxygen.**
- **Water vapour also passes out of the leaf through the stomata.**
- **Stomata open during the day and close at night.**





Stomatal opening regulates
by two factors:

1. TURGOR PRESSURE

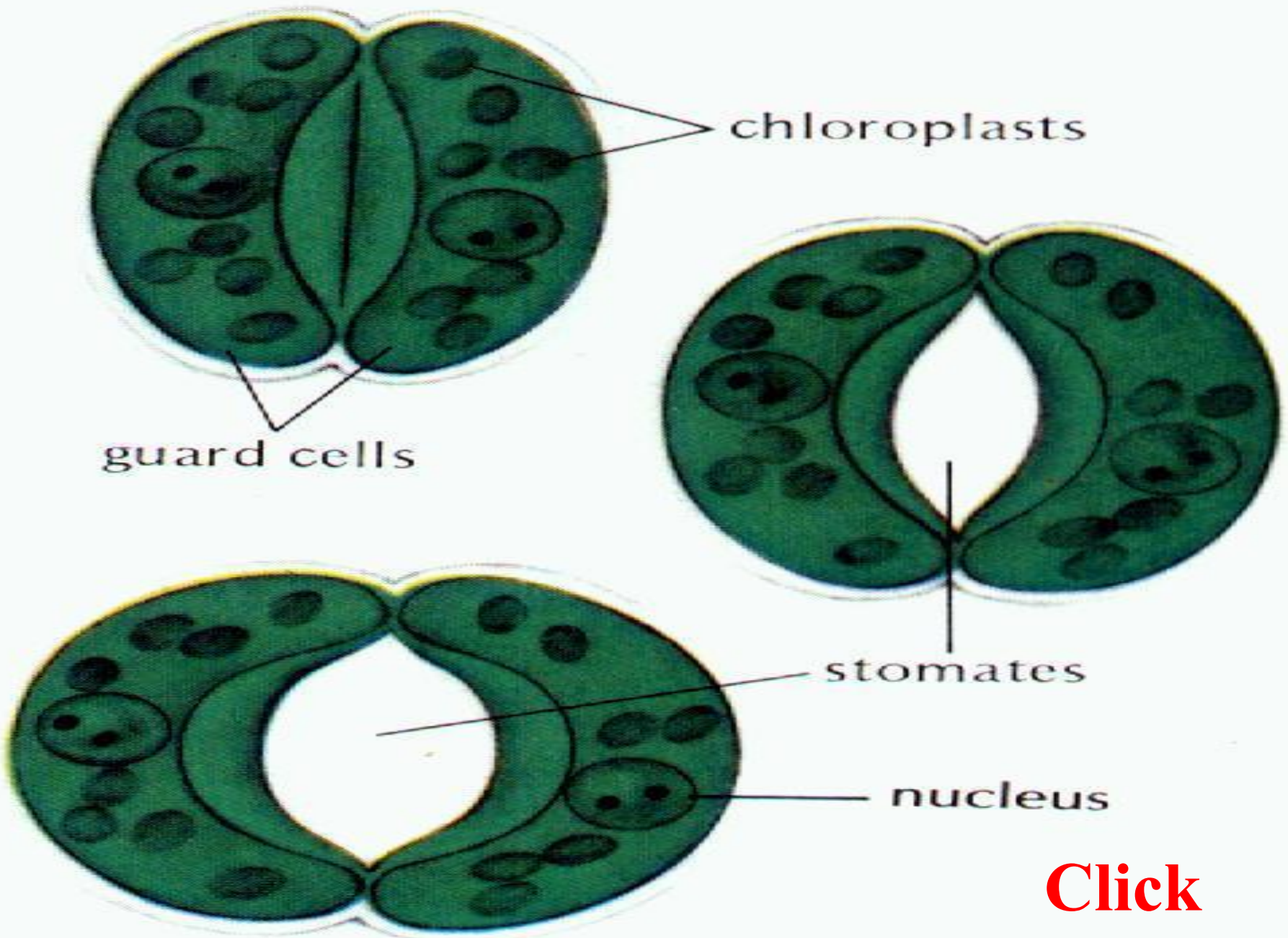
2. CO₂ CONCENTRATION

TURGOR PRESSURE

- 1. Glucose molecules are produced by photosynthesis in guard cells.**
- 2. These glucose molecules increase the osmotic pressure in this cell.**
- 3. And guard cells take water and swollen by turgor pressure.**
- 4. Stomata cells are opened by the effect of turgor pressure**

At night;

1. **Glucose concentration decreases in guard cells.**
2. **Therefore osmotic pressure decreases**
3. **Water passes from guard cells to the adjacent cells.**
4. **And stomata are closed.**



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TYPES OF STOMATA

- **In arid climates the stomata are found deep of the epidermal layer. These stomata are called lower case stomata.**
- **At the normal humidity and temperature, stomata are found at the same level as the epidermis. These stomata are called normal case stomata**
- **At the high humidity, stomata are found at the upper position than epidermal layer. These stomata are called upper case stomata.**

Functions of the leaf

- **Photosynthesis**
- **Gas exchange**
- **Transpiration**
- **Excretion**
- **Regulation of temperature**

TRANSPIRATION

- **Excess water is excreted from the stomata as water vapour. This process is called transpiration.**
- **WIND, HUMIDITY and TEMPERATURE effect the rate of transpiration.**

STEM

- **Stem holds leaves and flowers in the air.**
- **Some underground stems are specialized for food storage**

Types of stem

- **Woody Stem**

Woody stems contain thick wood. Plants with woody stems live more than 2 years

- **Herbaceous Stem**

Herbaceous stems are soft and green. Plants with herbaceous stem live either 1 or 2 years.

In dicots,

- **Vascular bundles are located at the core of the stem.**
- **The xylem and phloem vessels are separated by circular cambium layer.**
- **Xylem vessels are found near the core of the stem**
- **Phloem vessels are located in the outer portion of the stem.**

In Monocots,

- They generally have herbaceous stem
- Vascular bundles are scattered.
- Each bundle contains xylem and phloem.
- There is no cambium between xylem and phloem vessels.
- Generally stem has chloroplast

stem with no secondary growth

one season of secondary growth

vascular bundle

cork cambium

vascular cambium

cortex

cork

pith

epidermis

1° xylem

1° phloem

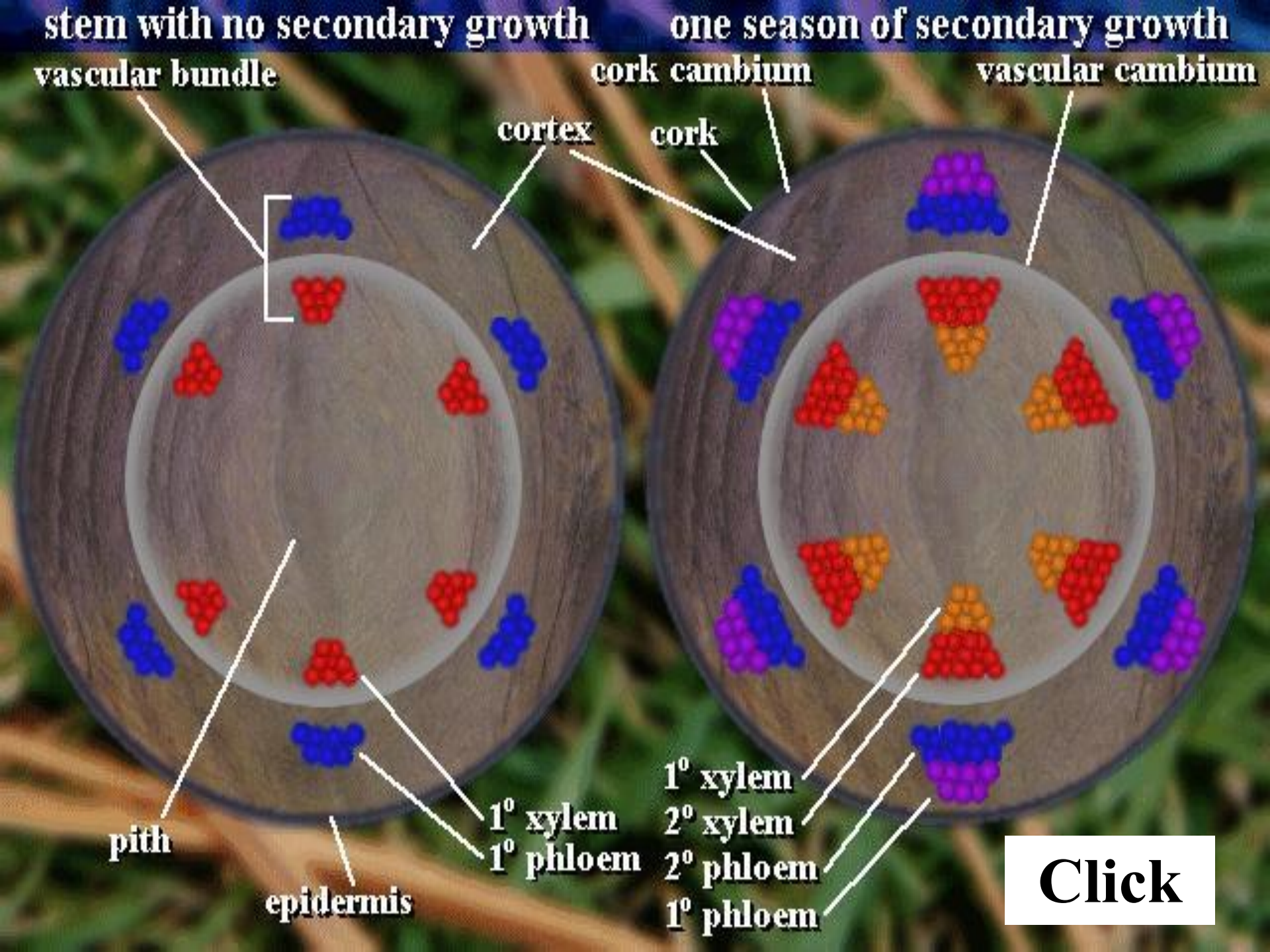
1° xylem

2° xylem

2° phloem

1° phloem

Click



ROOT

- **The roots of plants are found underground.**
- **They anchor the plant in the soil and absorb water and minerals**
- **They transport water and minerals to the stem and other parts of plant.**
- **Roots have no leaves and chloroplast.**

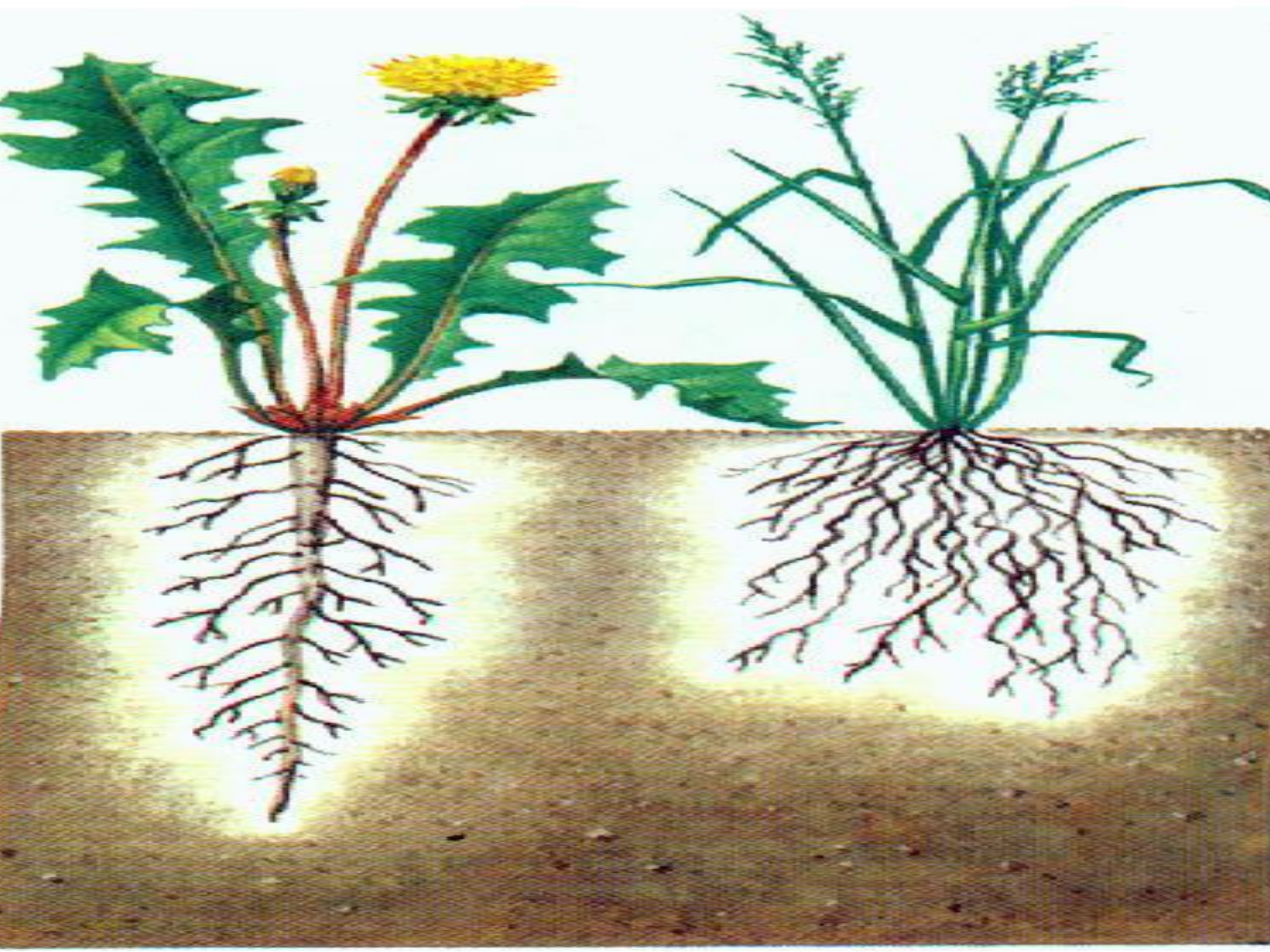
There are two types of roots:

TAP ROOT

**It is found in
dicots.**

FIBROUS ROOT

**It is found in
monocots.**



PARTS OF ROOT

- 1. Root Cap:** It protects the tip of root.
- 2. Meristematic Zone:**Root grows by this part.
- 3. Elongation Zone**
- 4. Maturation Zone:**It has root hairs.Root hairs increase surface area of root.

TRANSPORT OF
ORGANIC AND INORGANIC
MATERIALS
IN PLANTS

TRANSPORTATION PARTS IN PLANTS

In plants, transportation of materials are provided by;

- Xylem**
- Phloem**

PROPERTIES OF XYLEM

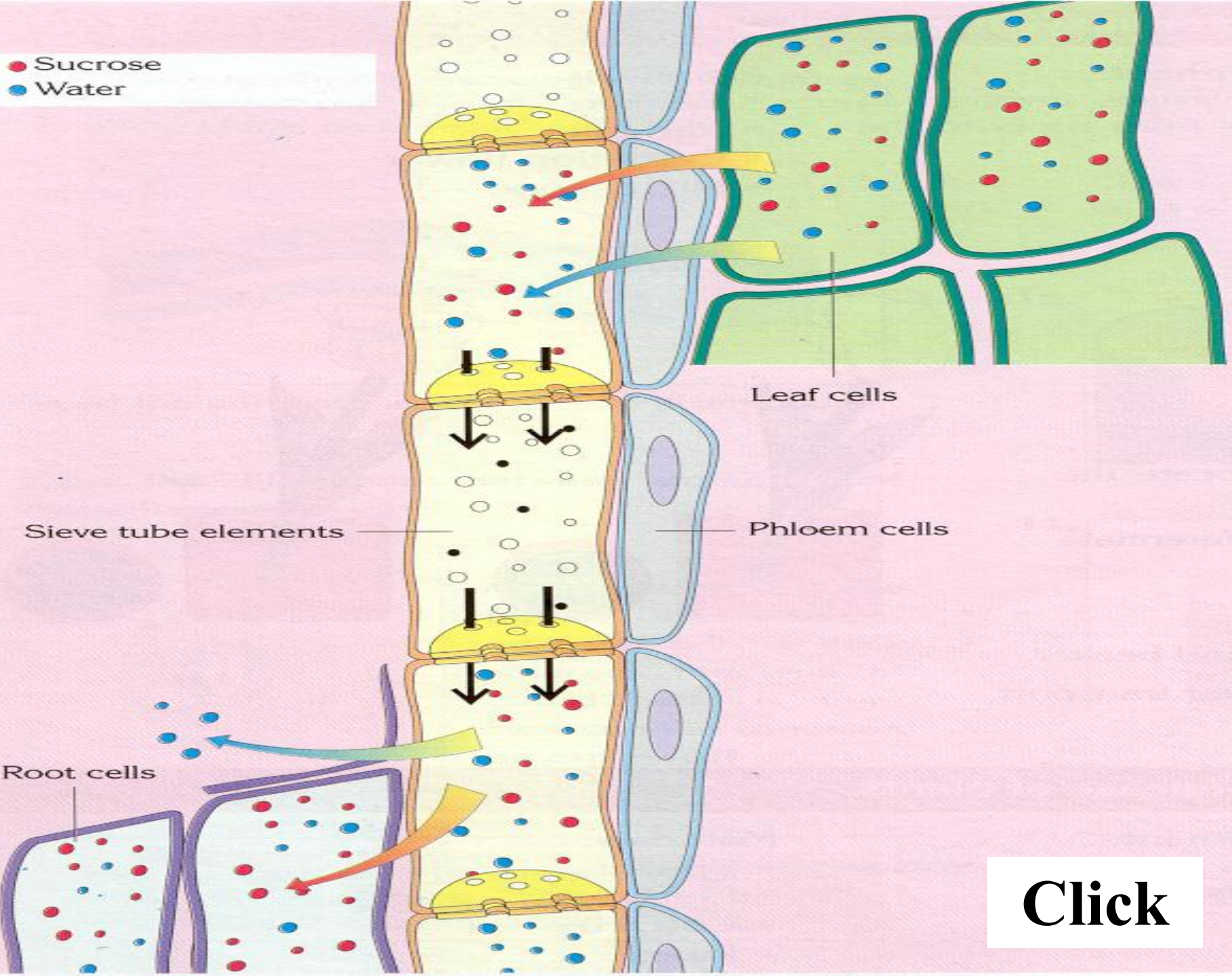
- 1. Transport of water and minerals from roots to the stem and leaves**
- 2. They are located at the core of the plant**
- 3. They are composed of trachea, tracheids, schlerenchyma and parenchyma.**
- 4. Their cells are non-living cells**
- 5. There is no cell wall among of tracheids.**
- 6. The rate of transportation is rapid in xylem.**

PROPERTIES OF PHLOEM

- 1. Transport of glucose and other organic compounds from leaves to the stem and root**
- 2. Transport of nitrogenous compound from root to the stem and leaves.**
- 3. The rate of transportation is slower than the xylem.**
- 4. Their cells are living.**
- 5. Phloes is composed of two types of cells: Sieve and Companion cells.**

- 6. Sieve cells contain cytoplasm but don't have nucleus at maturity.**
- 7. The walls of sieve cells have many small openings.**
- 8. Companion cells which contain both a nucleus and cytoplasm.**
- 9. In sieve tube materials are carried by diffusion.**

● Sucrose
● Water



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CAMBIUM

- **Phloem and xylem cells are produced by cambium layer.**
- **It increases diameter of stem.**
- **Cambium layer is found in dicot plants**

WATER AND MINERAL TRANSPORT

- Terrestrial plants absorb water and minerals from the soil by means of their roots.
- In the root hair, inorganic and organic molecules are present at higher concentration.
- Water moves from the soil to the root by osmosis than it is transported by the xylem vessels.

Factors Effecting The Water Transport

1. Capillarity

2. Root Pressure

3. Transpiration-Cohesion Theory

CAPILLARITY

- **Capillarity is the upward movement of liquid in a tube of narrow diameter.**
- **Xylem cells in plants form a system of tubes of very small diameters.**
- **Xylem capillarity can rise water only one meter above the ground.**

ROOT PRESSURE

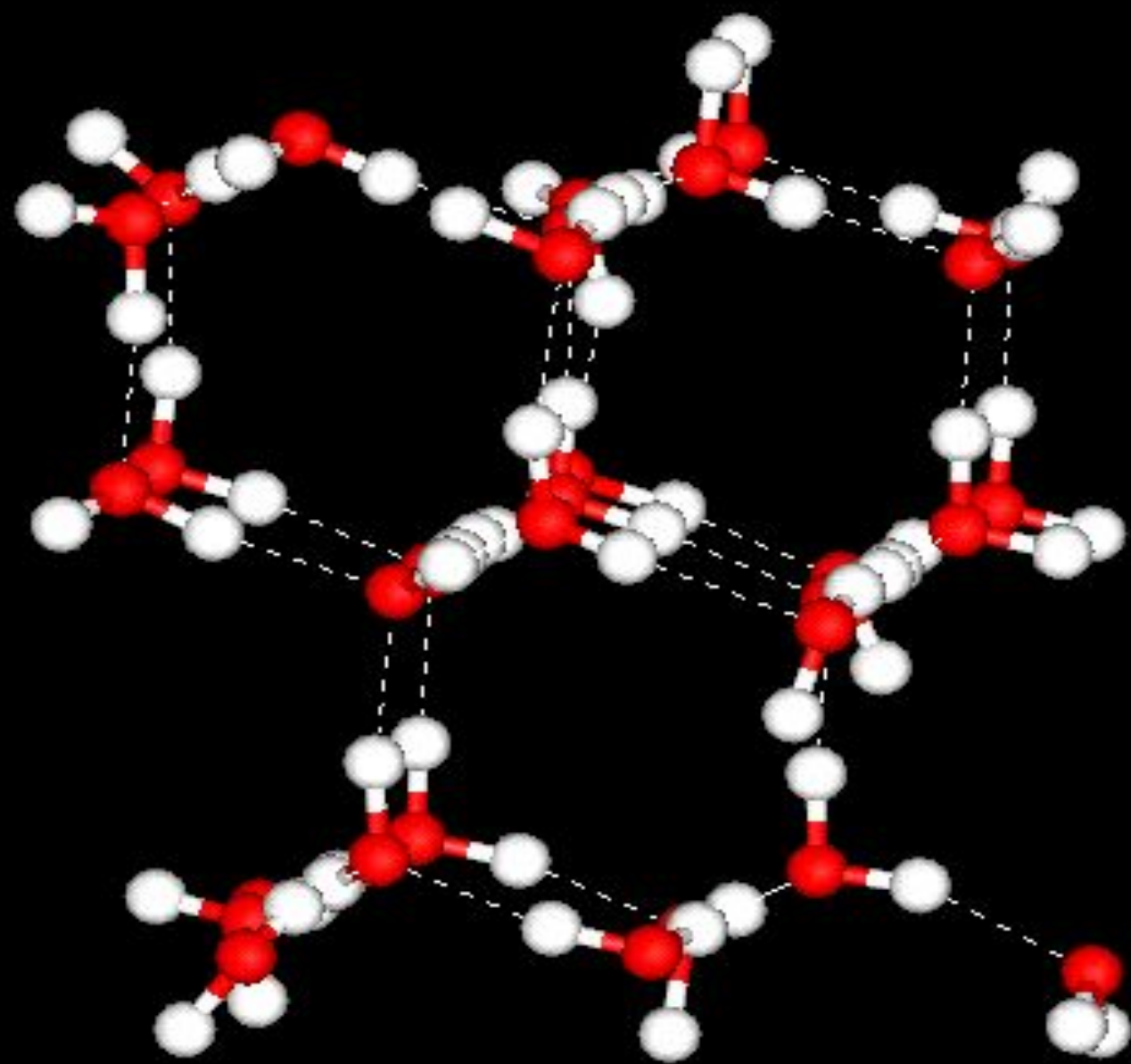
- **Cytoplasm of the root cells has a higher concentration than the water in soil.**
- **This cause a high osmotic pressure in the root.**
- **This pressure drives the water into and up the xylem.**

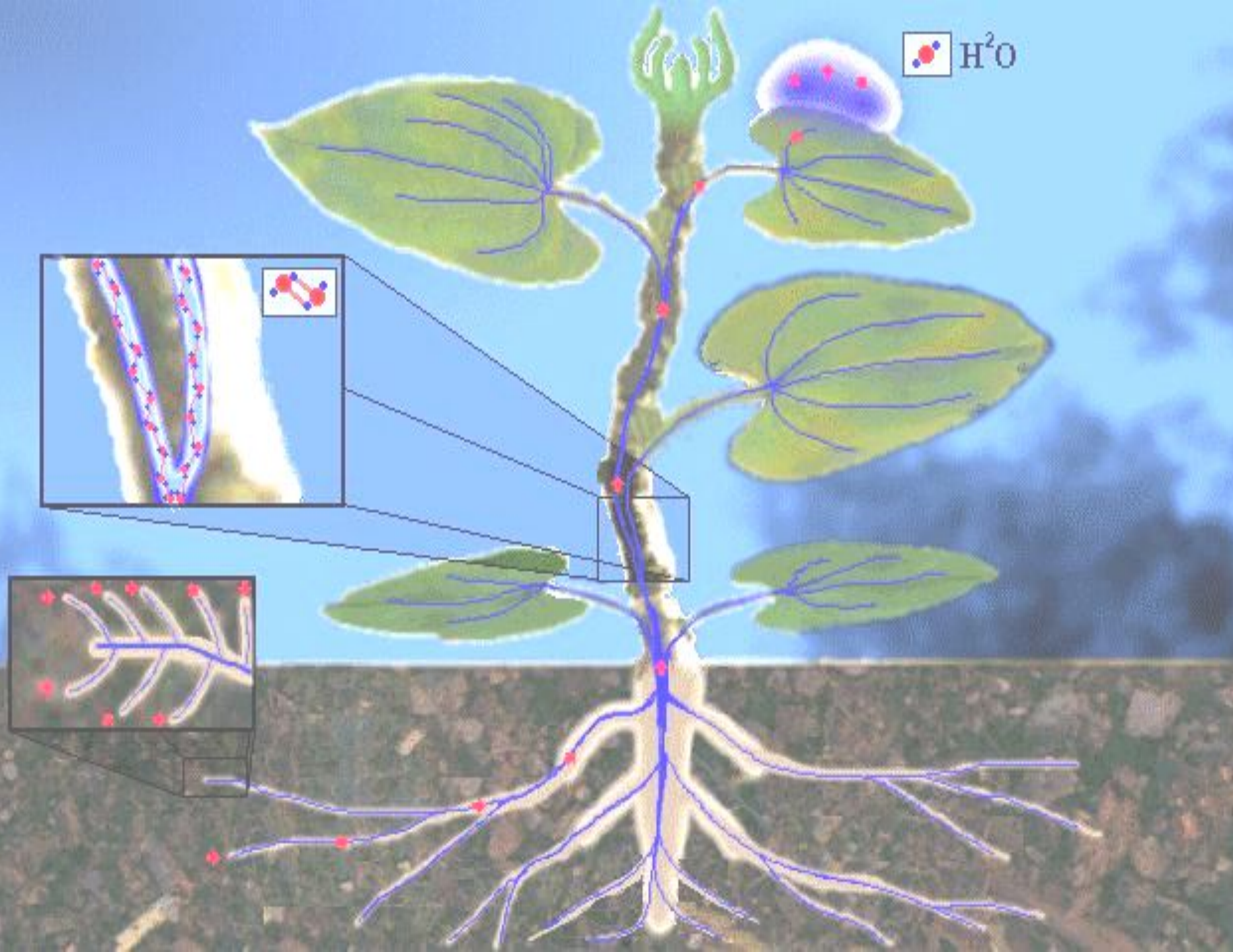
TRANSPIRATION-COHESION THEORY

- According to the theory, the column of water is not broken because of the cohesion of the water molecules.
- There is a tendency for water to flow in to the leaves to replace the transpired water.
- Water will flow from the leaf veins into the leaf mesophyll.
- Water flows up the stem from the root.

COHESION

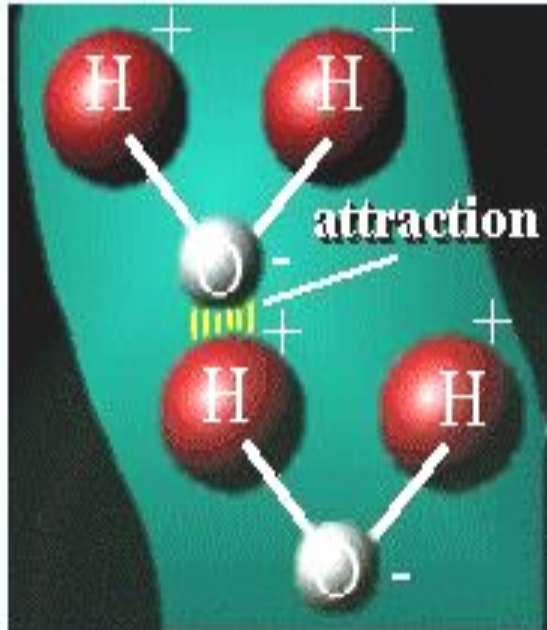
- **Cohesion is an attractive force between identical or similar molecules.**
- **Water is carried to the tops of the tallest trees by means of transpiration-cohesion force.**





transpiration

water used
for plant
functions



[Click](#)

Click 1

Click 2