

LEAF ANATOMY

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Leaves are the primary **food-producing organs** of the plant.

They are designed to efficiently **collect light** and use that light energy to **produce food**.

LEAF ANATOMY

The main sun-collecting structure on the leaf is a large broad flat surface called the **leaf blade**.

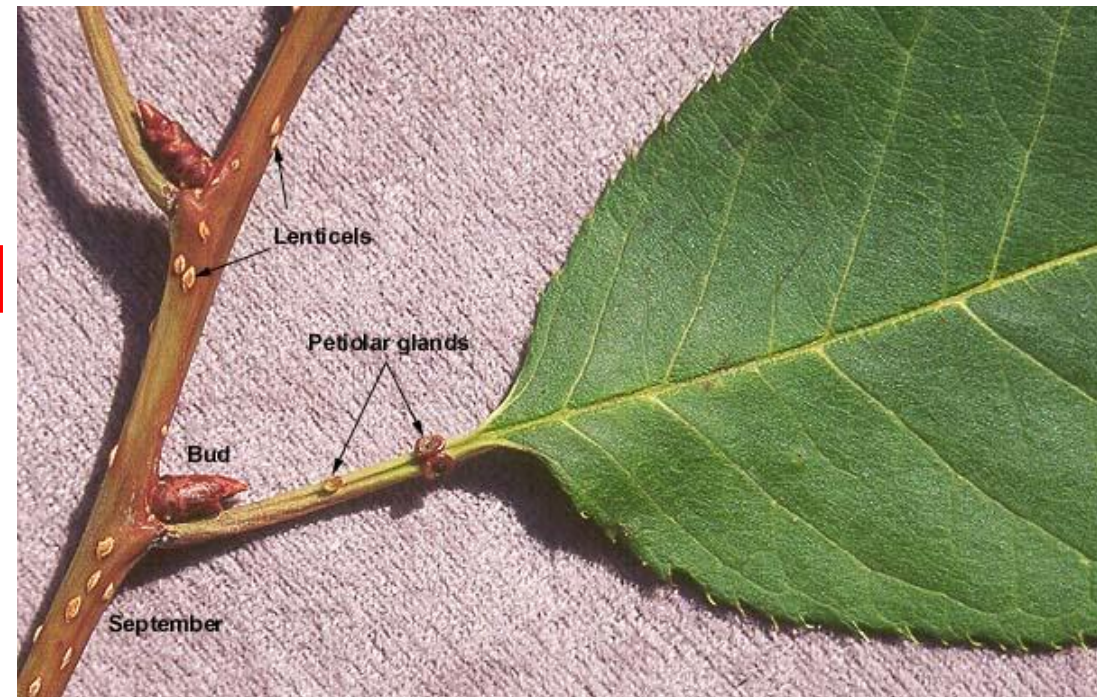
- The tip of the leaf blade is known as **the apex**.
- The edges of the leaf blade is known as the **margin**.



LEAF ANATOMY

The blade is held away from the stem and supported by a leaf stem called the **petiole**.

The petiole is not exactly like a stem, but it does have **xylem and phloem** so it can transport water and sugar.



LEAF ANATOMY

Many leaves are organized with **one main vein** running down the middle of the blade.

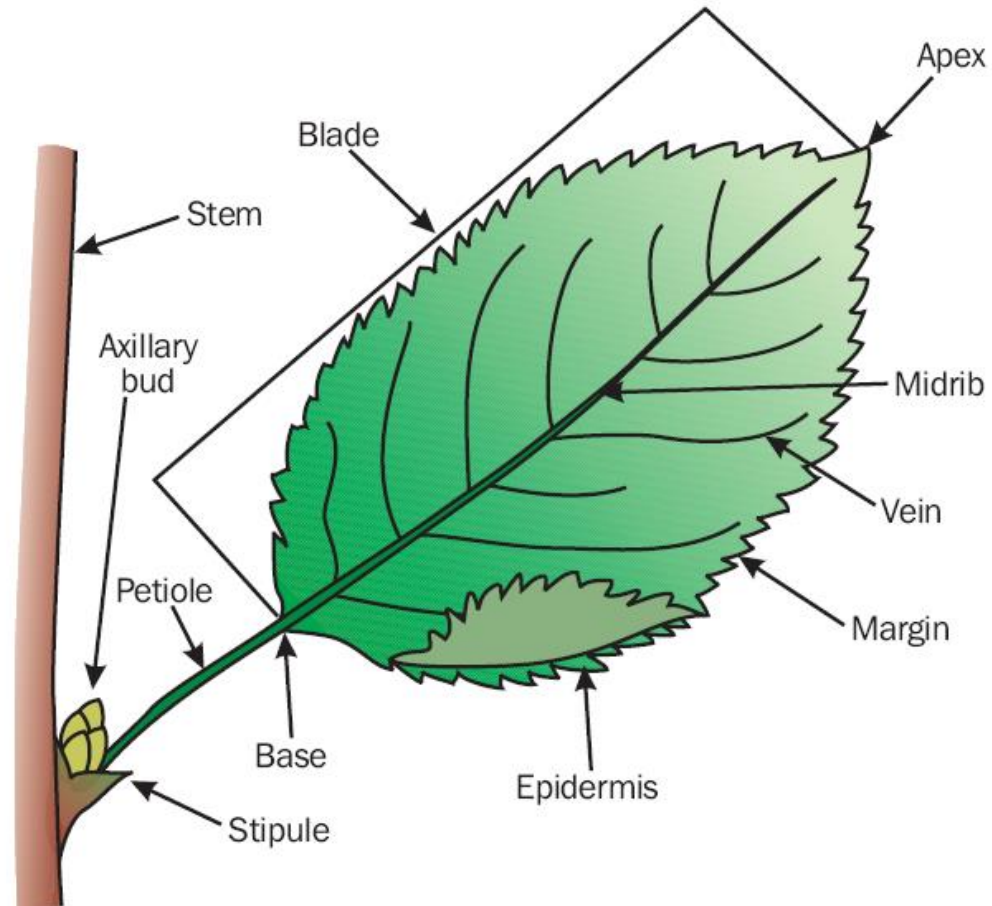
This vein is called the ***midrib***.

All of the veins, the petiole, and the midrib help position the blade in a way that it is **facing the light source**.



LEAF ANATOMY

PARTS OF A SIMPLE DICOT LEAF



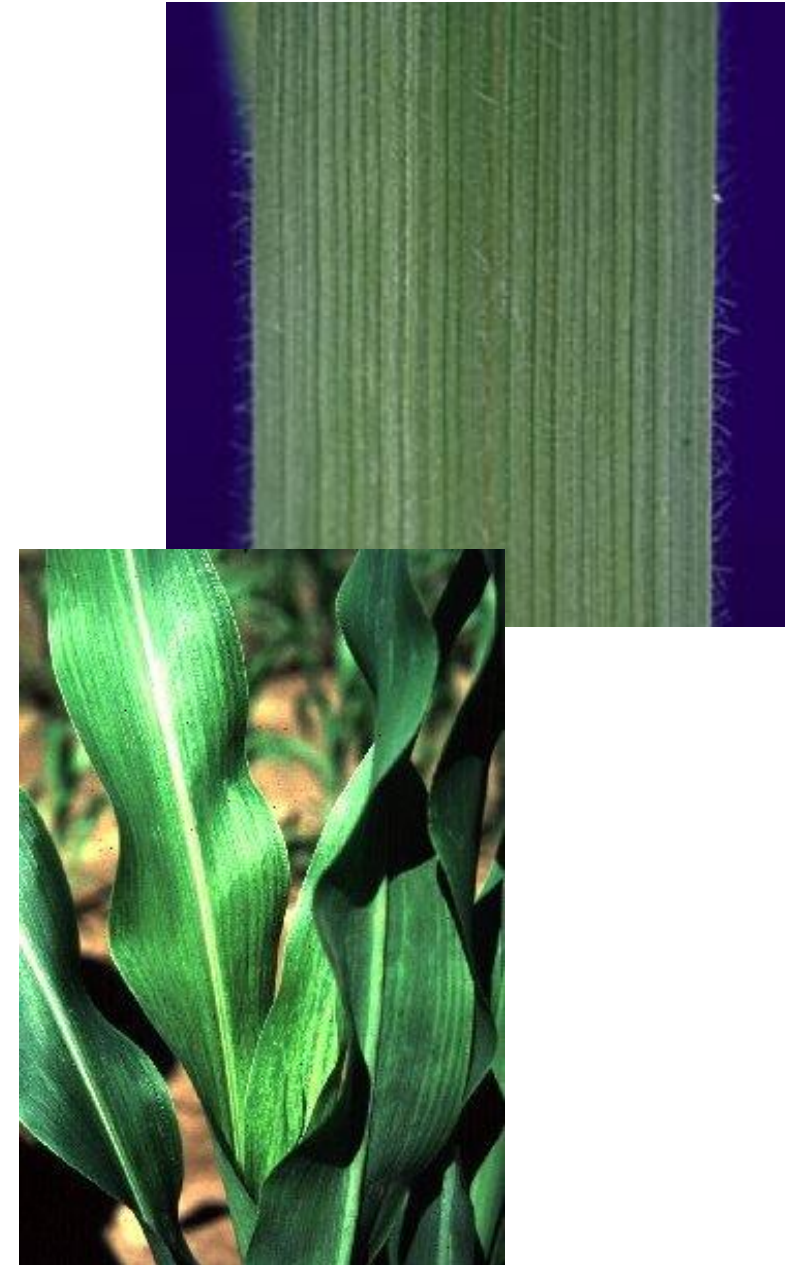
LEAF ANATOMY

Veins of flowering plants are found in **several patterns.**

Most of these patterns can be categorized into **two groups.**

LEAF ANATOMY

- Monocots have leaves with ***parallel veins***.
 - While the veins may not be parallel in a strict mathematical sense, none of the veins on the leaf **cross**.
 - It may look like they are **fused together** at the **top or bottom** of the blade.
 - Corn and grass plants are good examples of monocot leaves.



LEAF ANATOMY

- Dicots have veins that **connect and branch** from each other.
- Veins in a branching pattern are called **netted veins**.
- Some leaves with netted veins have several smaller veins branching out of a dominant midrib, which is a condition known as **pinnately netted**.



LEAF ANATOMY

- Other leaves have several dominant veins branching out from the petiole.
- This condition is known as **palmately netted**.
- A few plants have a spreading vein pattern called **dichotomous venation**; a ginkgo leaf is an example.



LEAF ANATOMY

A leaf is organized to **collect sunlight and turn it**, through photosynthesis, into food.

The leaf blade has many layers of **tissue** to allow this to happen.

On top of the leaf is a waxy non-cellular layer called the **cuticle**.

The cuticle is on the leaf to **prevent water from escaping**.

LEAF ANATOMY

The next layer on the leaf is also there for **protection**.

The **epidermis** is the skin like layer of cells found on both the top and the bottom surface of the leaf.

The epidermis may be **one or many layers** thick.

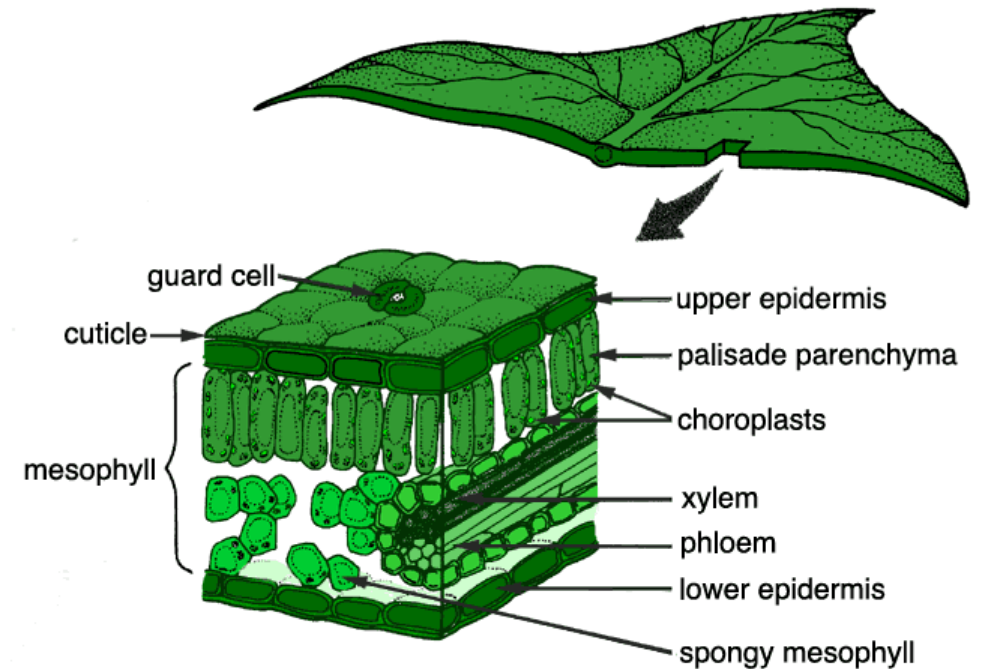
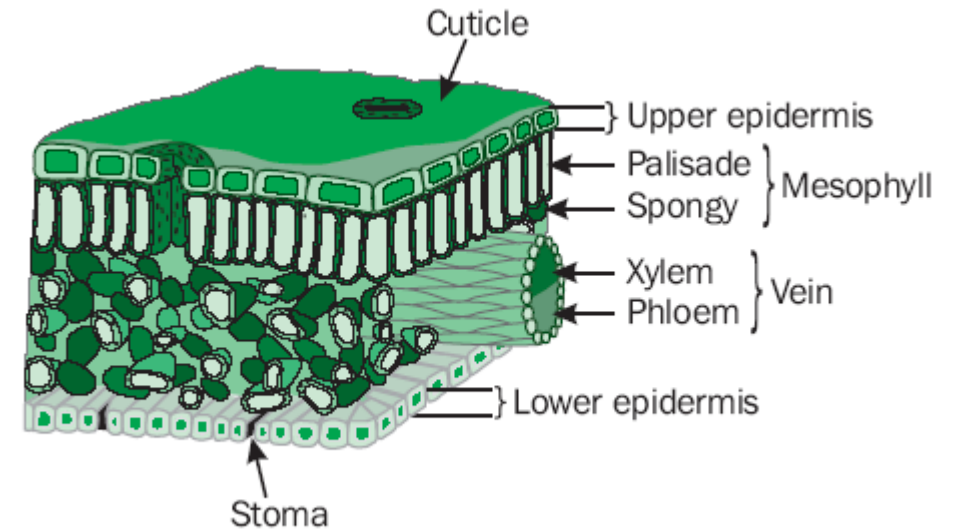


Figure 12a. Leaf cross section

LEAF ANATOMY

Directly beneath the upper epidermis is a layer of cells that are **standing on end and packed very tightly**.

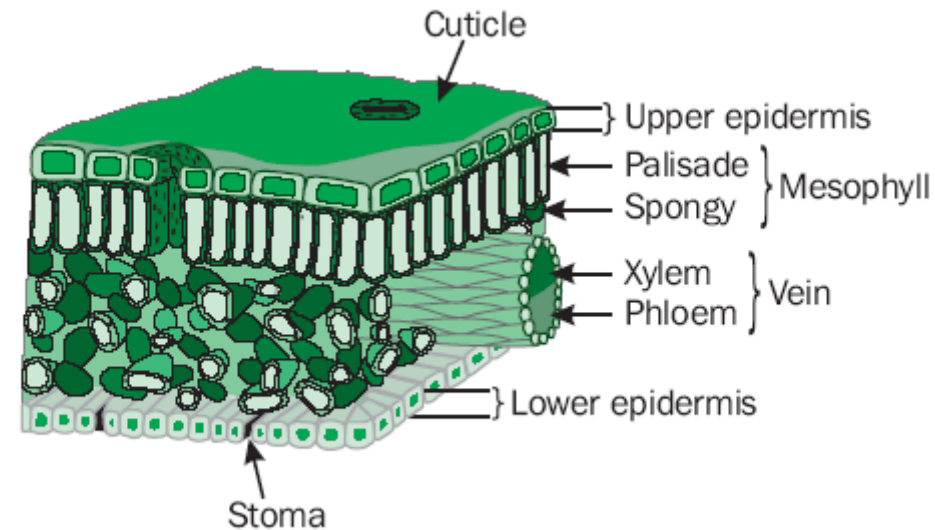
- These standing cells are responsible for most of the **photosynthesis** in the leaf and are called the ***palisade mesophyll***.



LEAF ANATOMY

Located under the palisade mesophyll are loosely packed cells called the **spongy mesophyll**.

- The **spongy mesophyll** forms air spaces that hold raw materials to be used and products of photosynthesis.

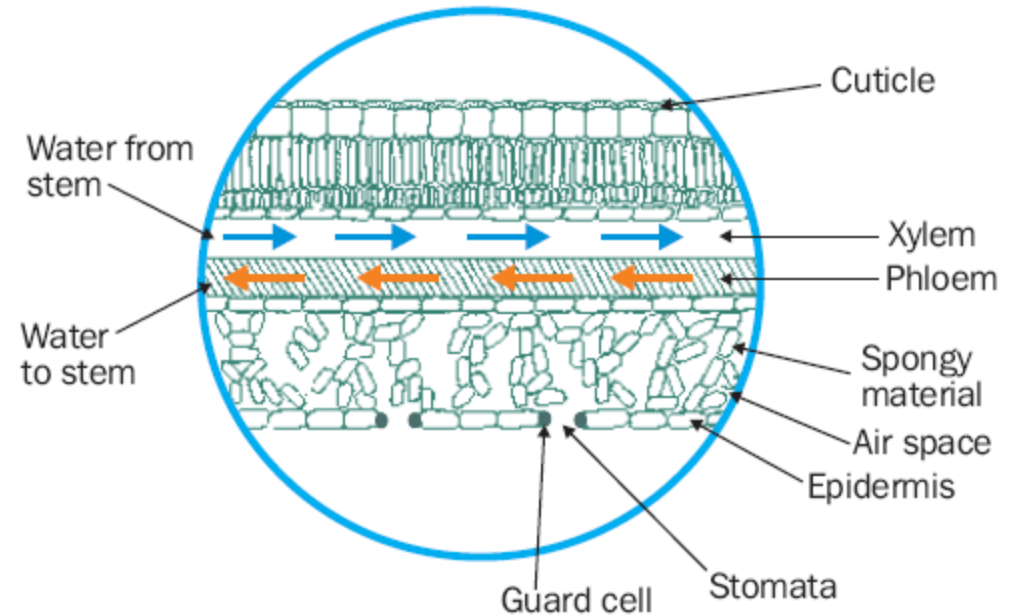


LEAF ANATOMY

The lower epidermis has **holes** in it for **gas exchange**.

The holes, **stomata**, can open and close.

The opening and closing is controlled by the **guard cells**, which surround each stoma.



TYPES OF LEAVES

Many different types of leaves exist.

Some leaves have adapted to hot, dry climates by **storing water or being smaller.**

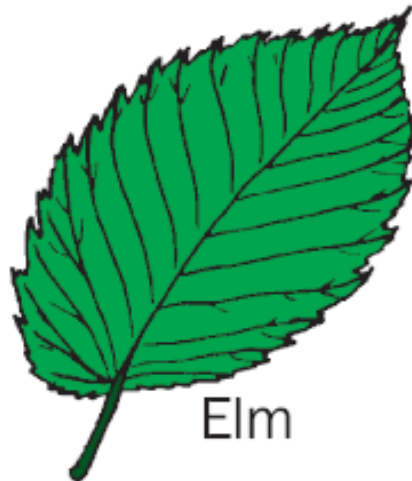
Some leaves have very large blades to **collect the maximum light in a shady location.**

TYPES OF LEAVES

In some leaves, the blade is broken into several sections.

- A leaf that has only **one blade** on its petiole is called a **simple leaf**. Most plants have simple leaves.

SIMPLE



Elm



Maple



Magnolia

TYPES OF LEAVES

- In some leaves, the blade is divided into three or more sections.
- A leaf with **multiple blades**, called **leaflets**, is said to be a **compound leaf**.

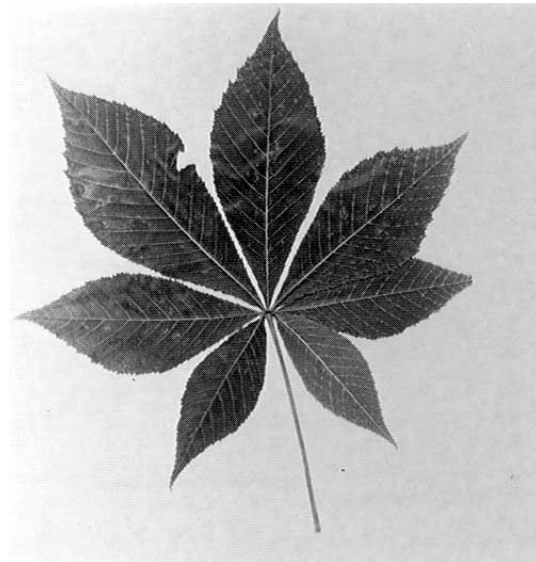
COMPOUND



TYPES OF LEAVES

There are many different kinds of compound leaves.

- A **palmately compound** leaf has all its leaflets attached to a common point.
- A **pinnately compound** leaf has multiple leaflets attached along a rachis or axis.

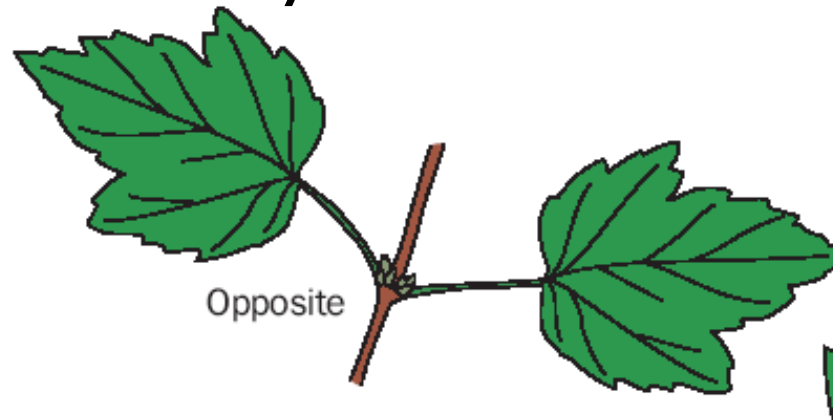


LEAF ARRANGEMENTS

The arrangement of leaves on a stem varies from one genus to another.

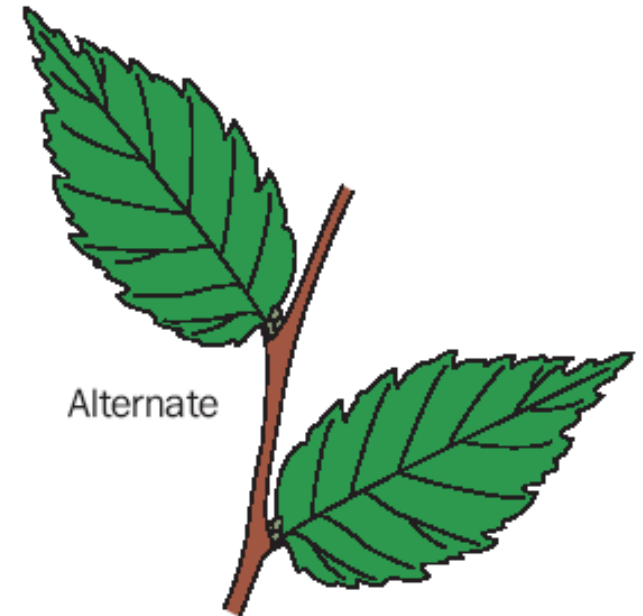
Leaves are arranged along stems in **one of four** major ways.

- When leaves and buds are arranged directly across from each other on a stem they are said to be **opposite**.



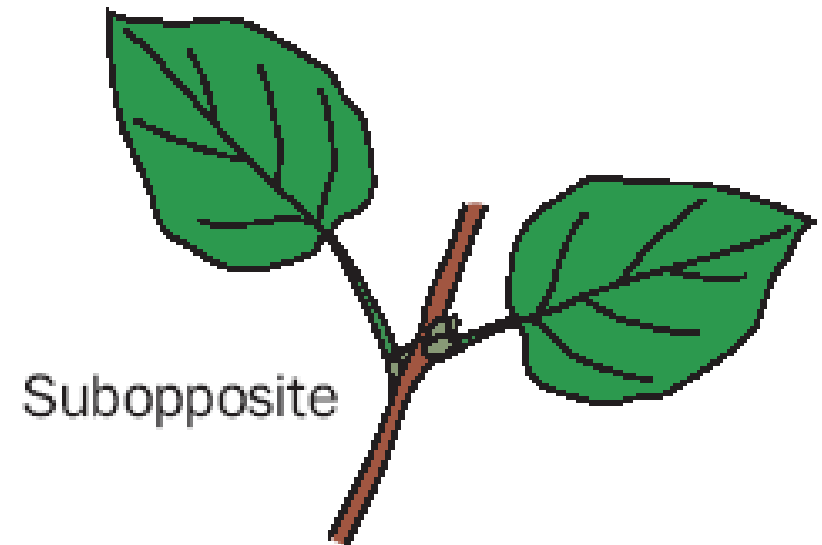
LEAF ARRANGEMENTS

Leaves and buds that are spaced along a stem in an alternating fashion are termed *alternate*.



LEAF ARRANGEMENTS

A third arrangement is *subopposite*, which refers to a condition where leaves and buds are not spaced far enough apart to be called alternate nor perfectly opposite.



LEAF ARRANGEMENTS

When three or more leaves and buds are attached at a node, the arrangement is called **whorled**.

