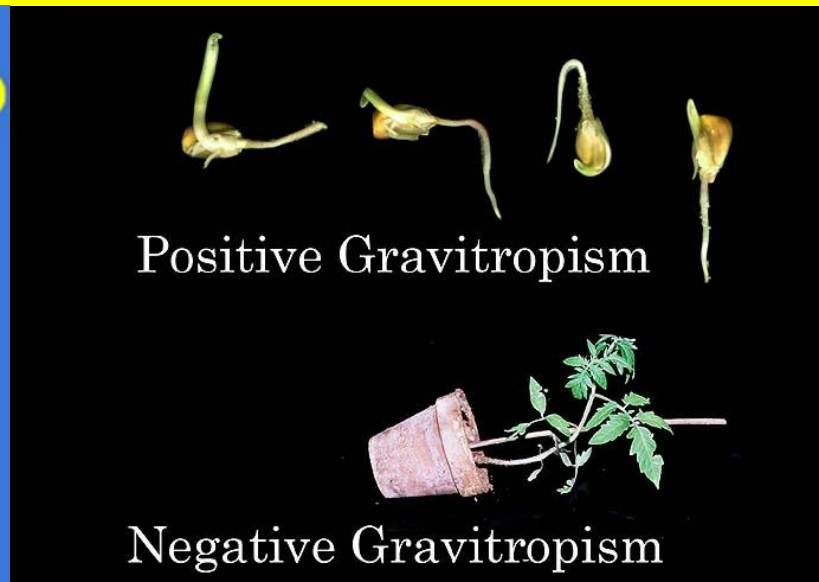
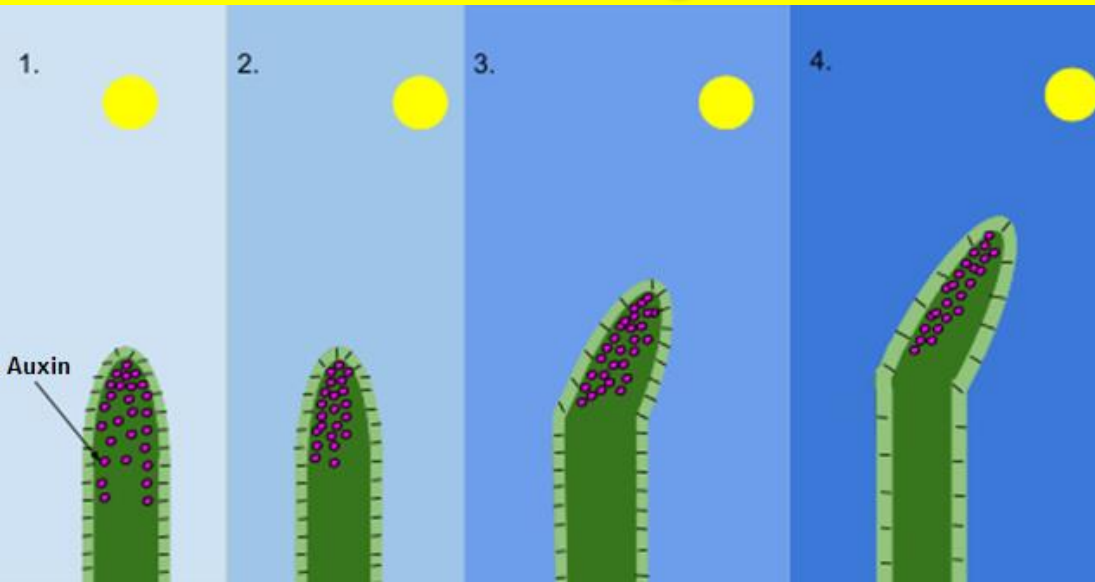


Plant System Interactions





The **root system** serves 3 main roles for the plant:

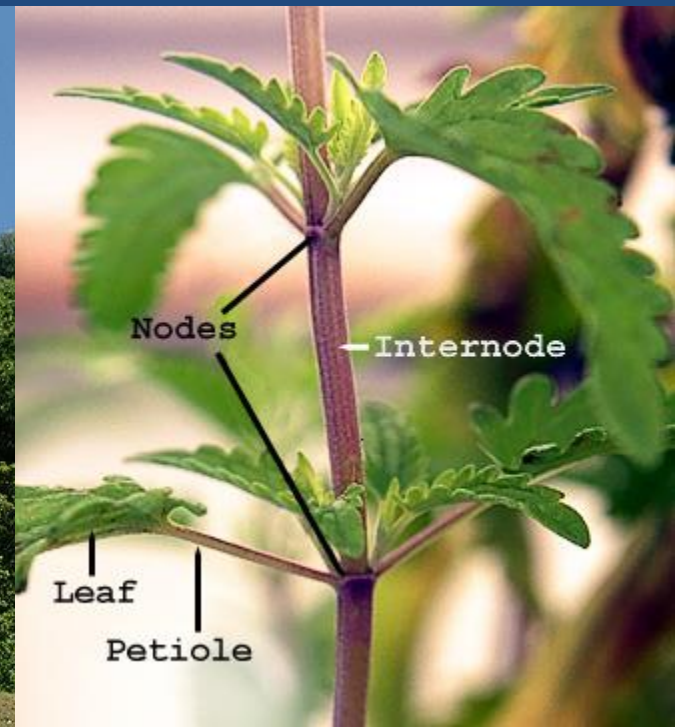
1. Absorb water and nutrients

2. Anchor the plant to the ground/surface

3. Store energy, nutrients and water

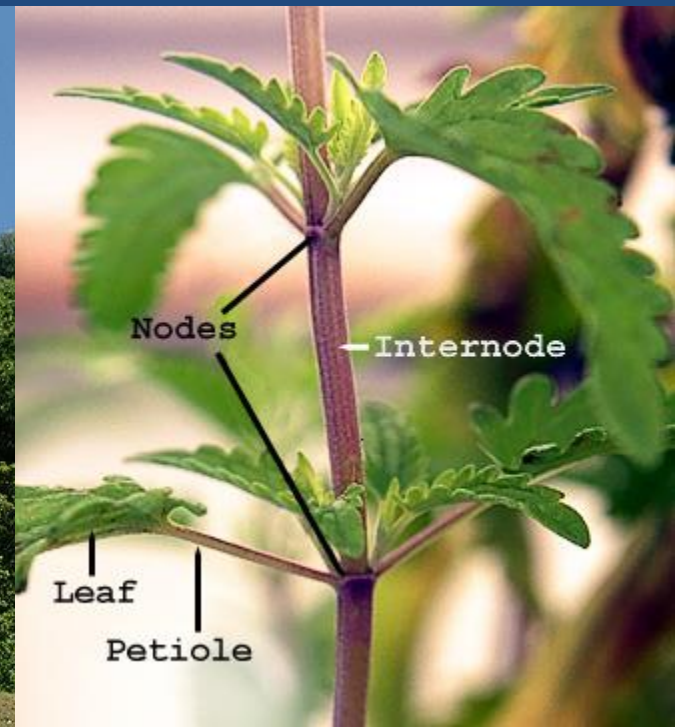
Shoot System

Everything *above the ground* is part of the **shoot system**. The shoot system contains tissues and organs responsible for many of the plant's vital functions.



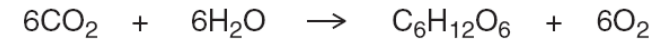
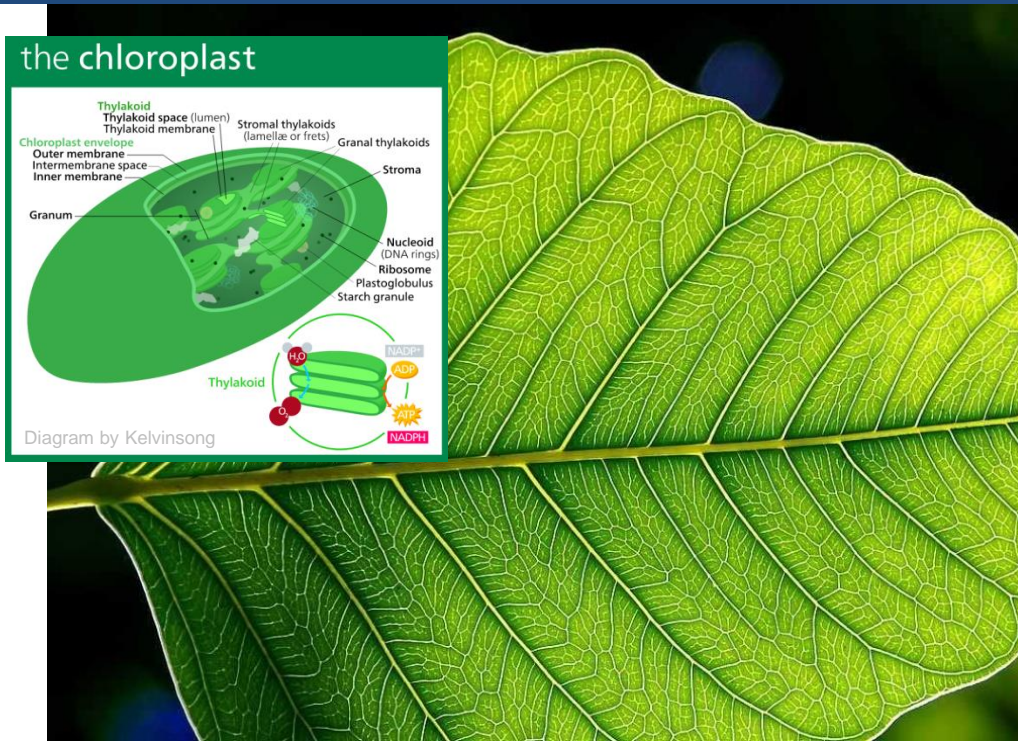
Shoot System

1. The shoot system provides **structure and support** to the plant so that it can grow.

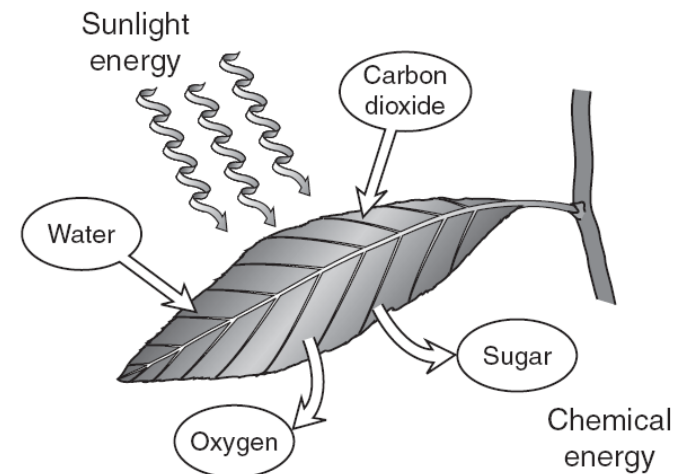


Shoot System

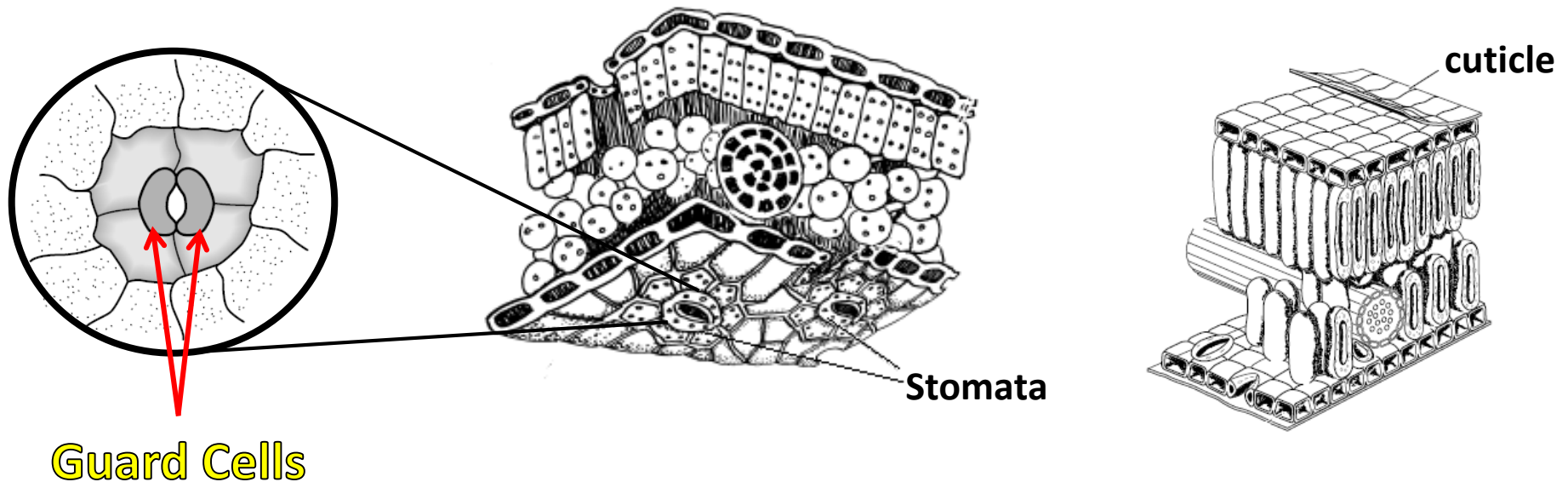
2. Leaves produce the plant's food by performing *photosynthesis*. This converts *solar energy* into useable *chemical energy*.



Sunlight energy \rightarrow Chemical energy

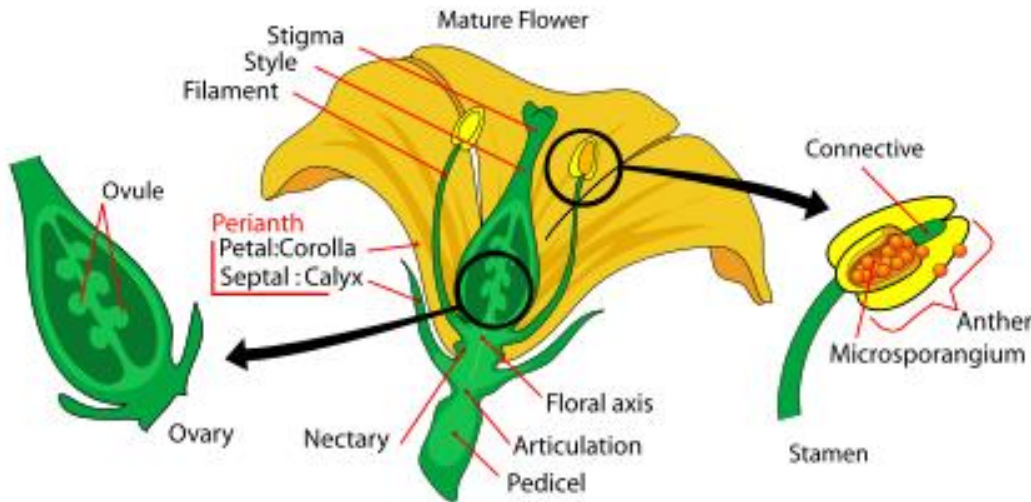


Leaves also contain tiny pores called **stomata** that allow CO_2 , O_2 , and water vapor to enter and exit. The size of a stoma is controlled by **guard cells**. Leaves also have a *waxy coating* known as a **cuticle** to prevent water loss.



Shoot System

3. **Flowers** or **cones** are the **reproductive organs** in many types of vascular plants.



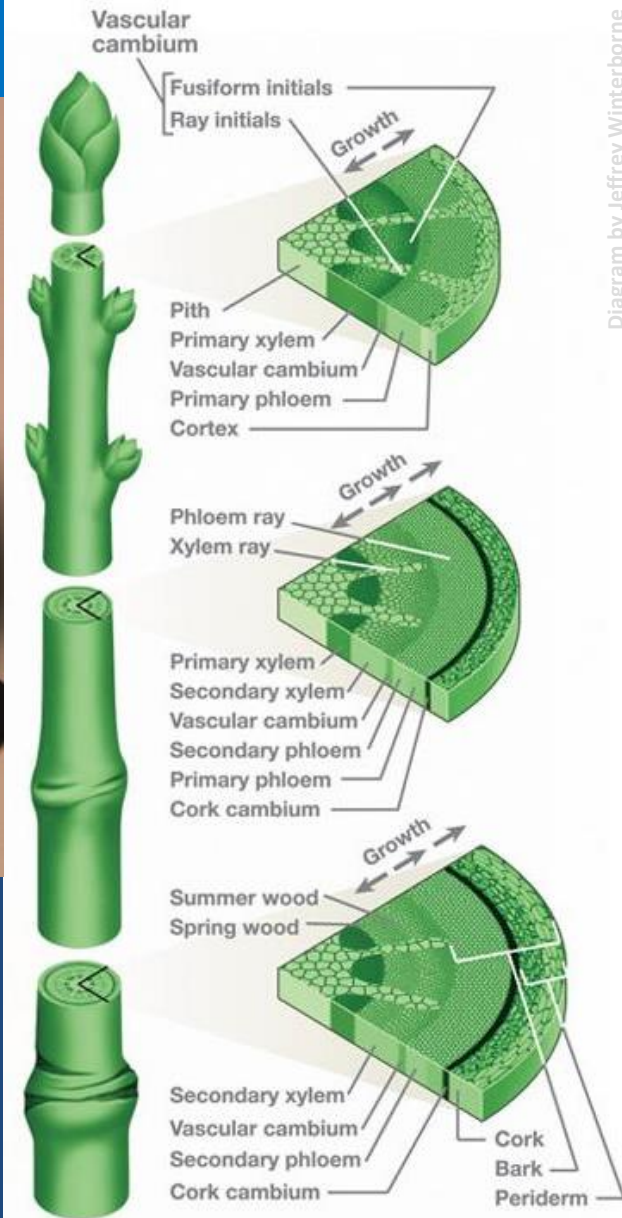
Vascular Tissue



Xylem carries water and minerals

Phloem carries *organic nutrients*, like sugars

Vascular tissue runs throughout the plant. It is responsible for *distributing water and nutrients.*



Response to Stimuli

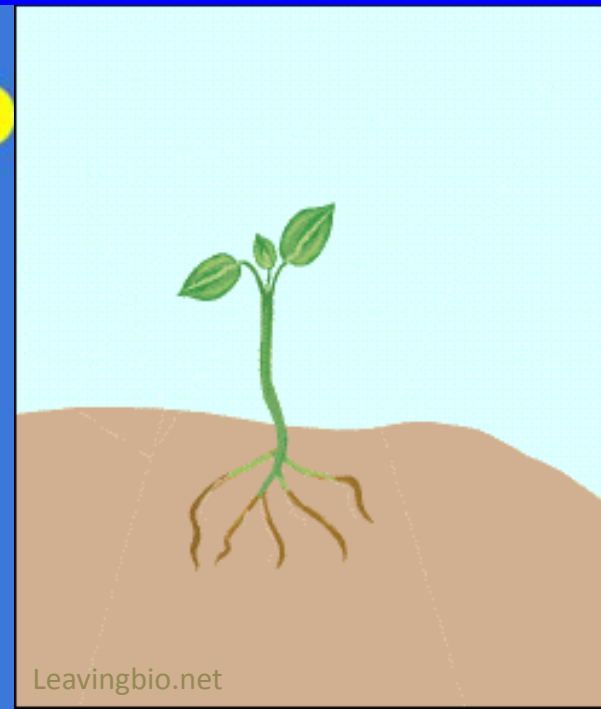
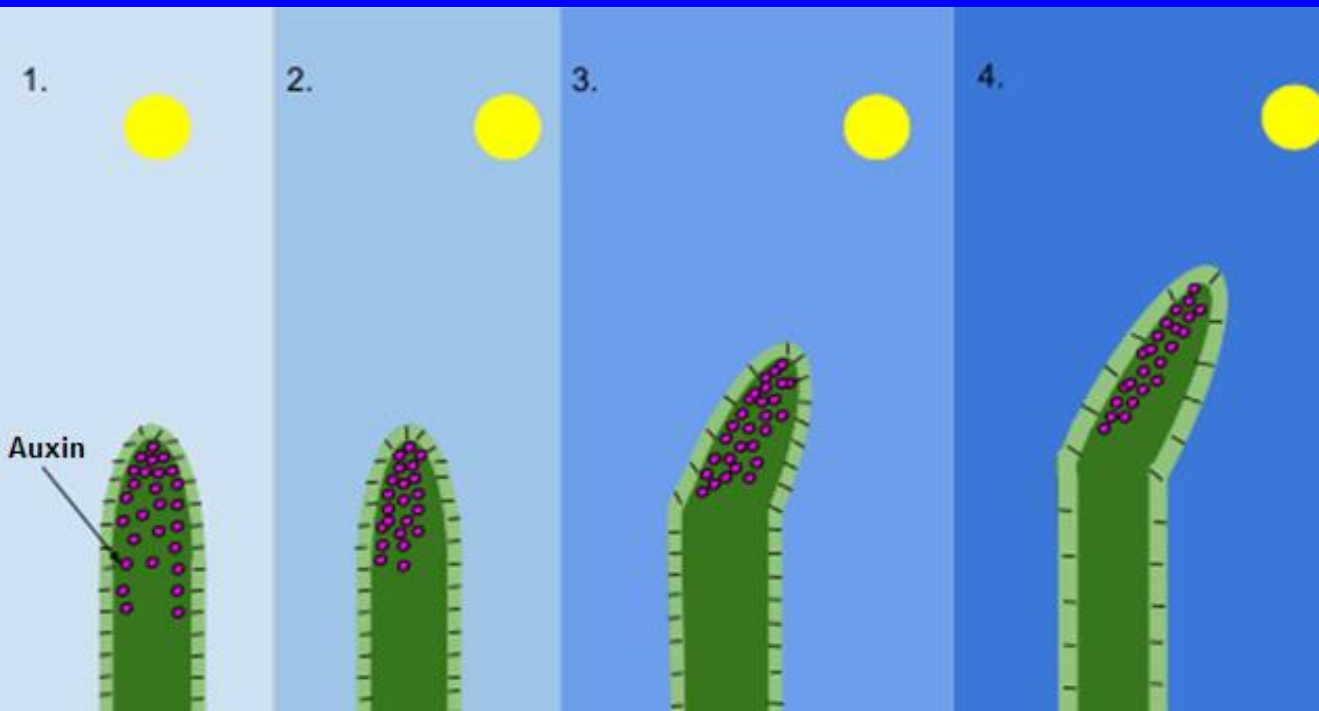
Plants grow in response to different **stimuli** like *light, gravity* or *touch*. Growth in response to these stimuli are known as **tropisms**.



Phototropism

Phototropism is when a plant grows in response to **light**. This benefits the plant by allowing it to absorb more sunlight for photosynthesis.

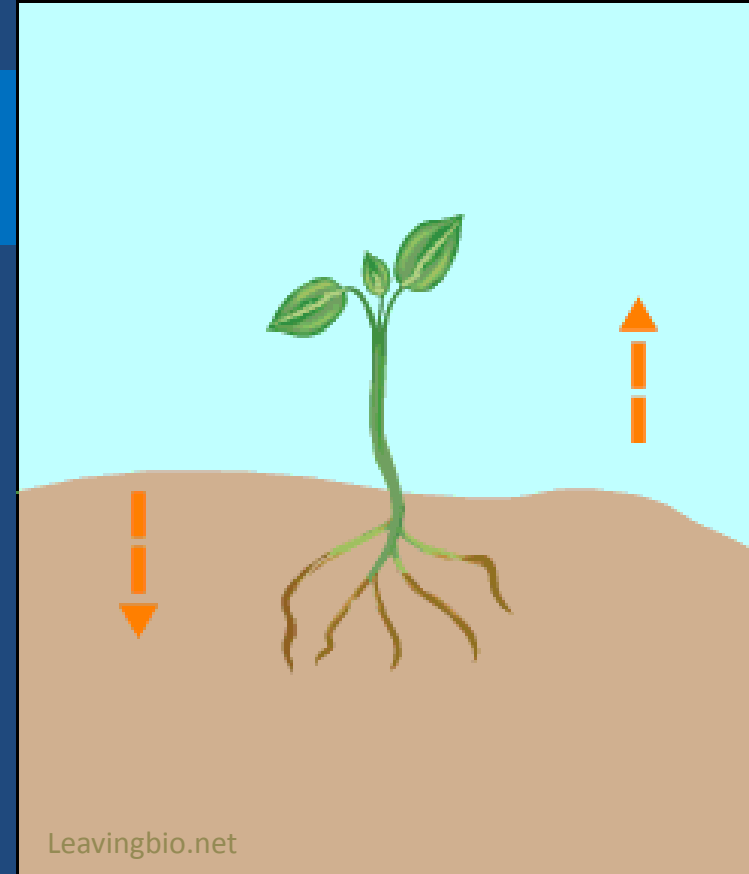
Photo- means light



Geotropism

Gravitropism (also called **geotropism**) is when a plant grows in response to **gravity**. This causes the roots to grow down and the shoots to grow up.

Geo- means **Earth/ground**



Positive Gravitropism

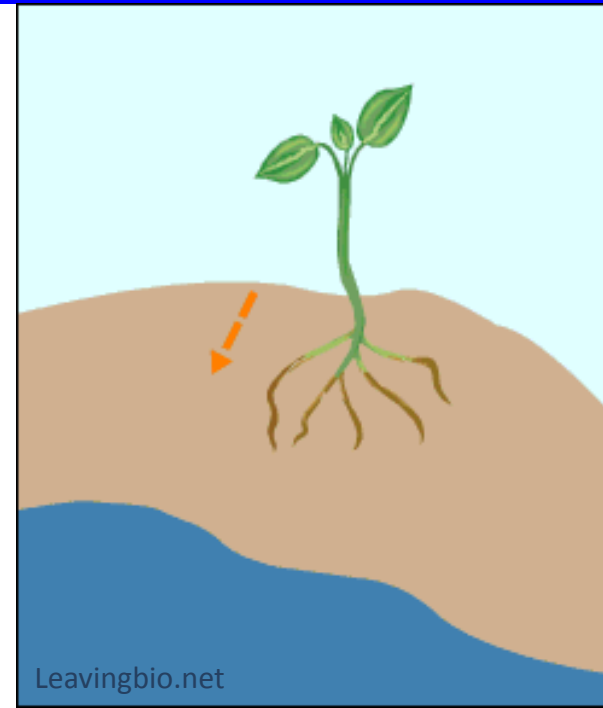
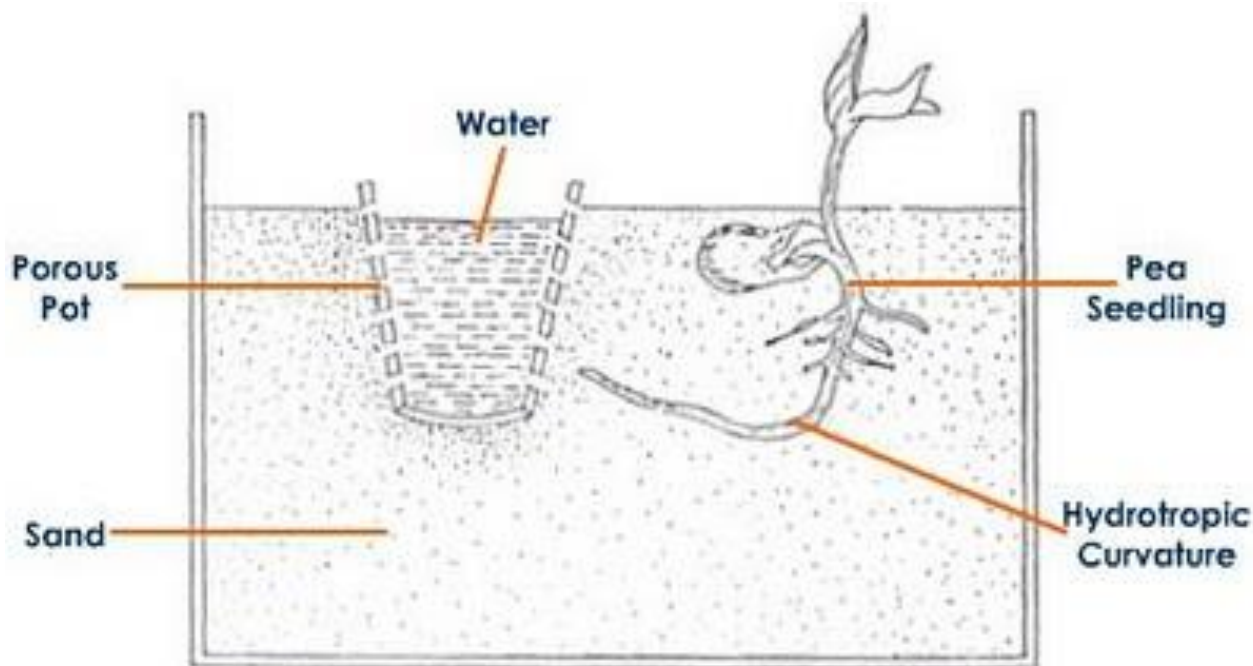


Negative Gravitropism

Hydrotropism

Hydrotropism is when a plant grows in response to water. This allows plants to respond to their environment to absorb this vital resource.

Hydro- means water



Thigmotropism

Thigmotropism is when a plant grows in response to **touch**. This is especially important for climbing plants, like vines, that grow around a surface.

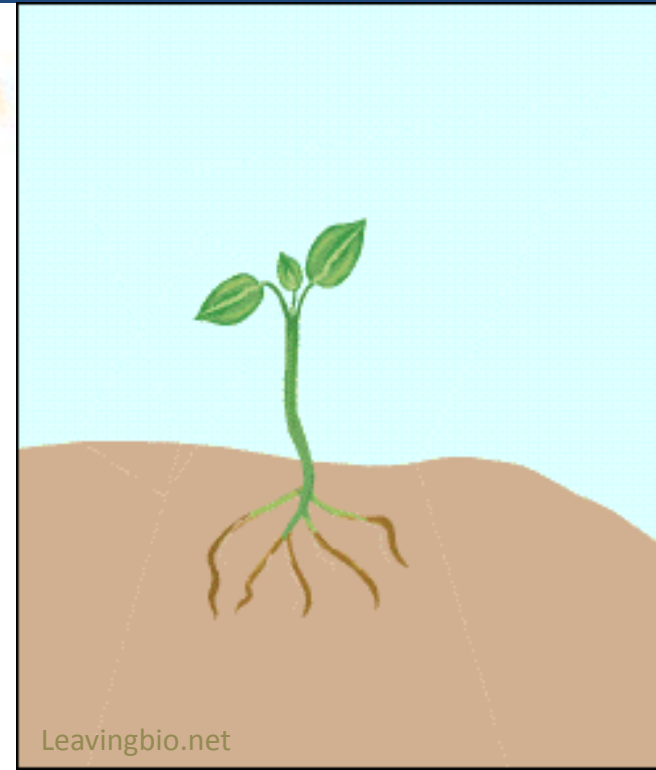
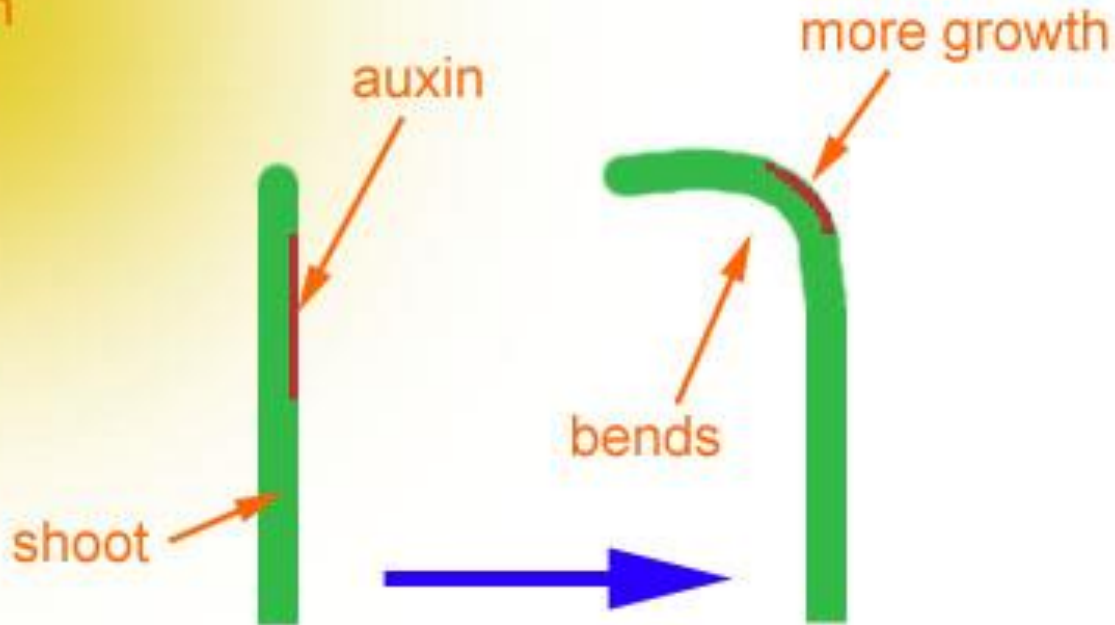
Thigmo- means touch



Plant Hormone: Auxin

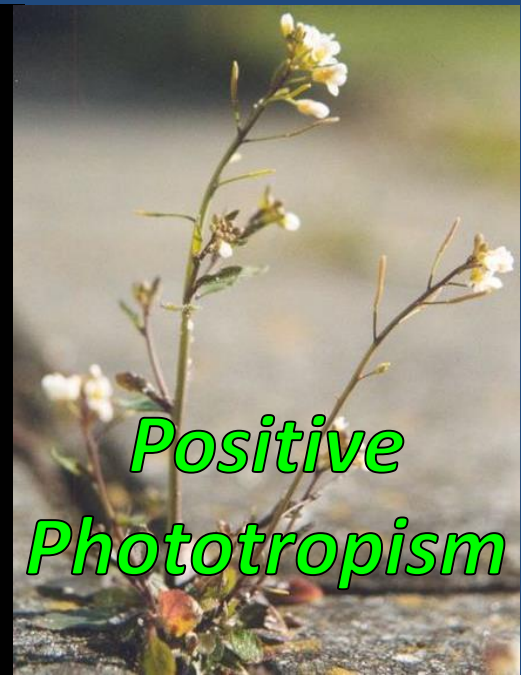
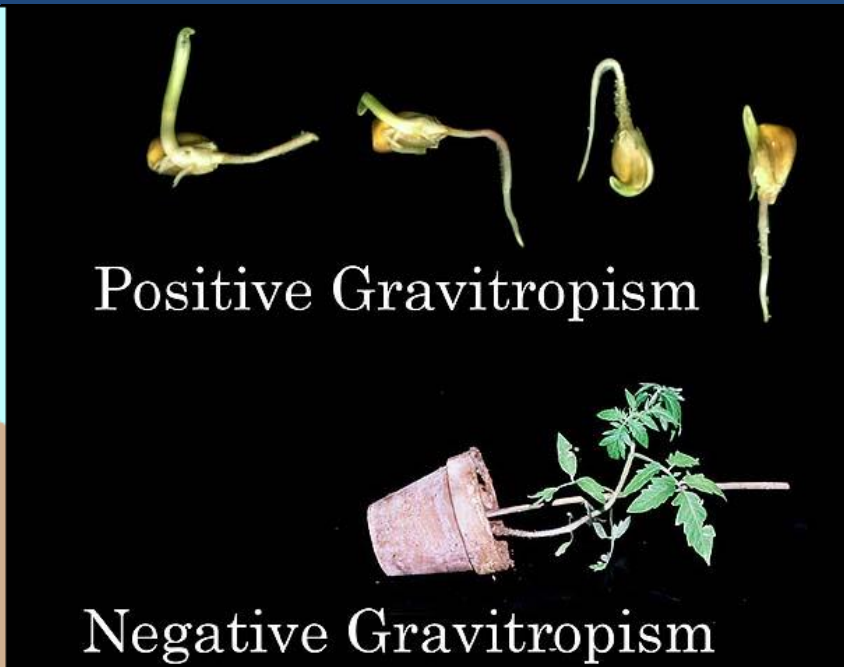
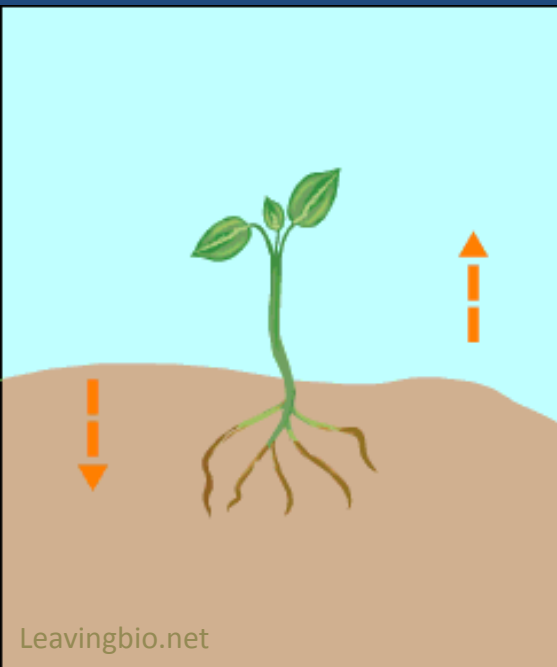
Plant hormones like **auxin** allow plants to grow in response to these stimuli. Auxins cause plant cells to **elongate** which bends the shoot.

sun



Plants show a **positive** tropism when they grow **towards** the stimuli

Plants show a **negative** tropism when they grow **away from** the stimuli



Nastic Movements

Some plants can perform **rapid movements** in response to a *stimuli* like light or touch. These are called **nastic movements**, and they are not the result of growth.



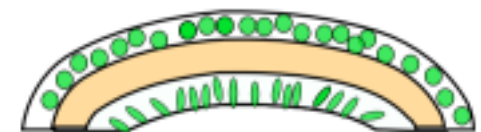
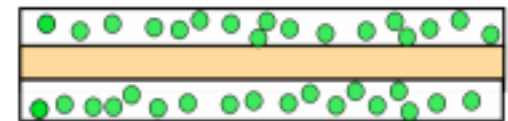
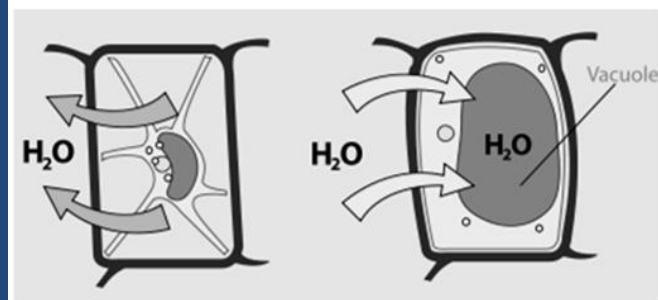
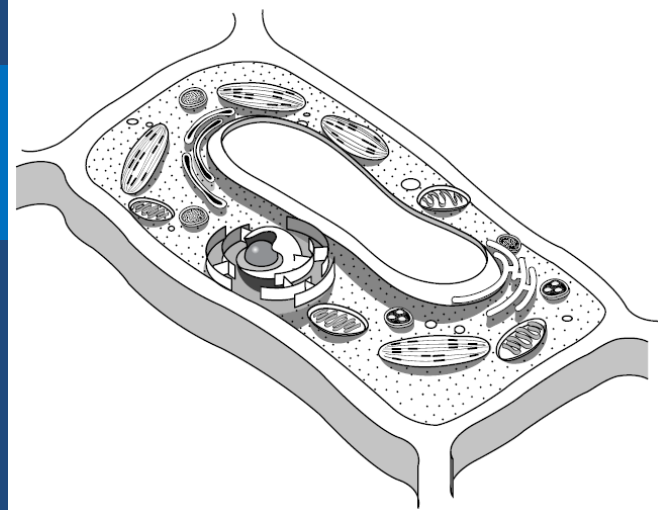
Photonasty



Thigmonasty

Nastic Movements

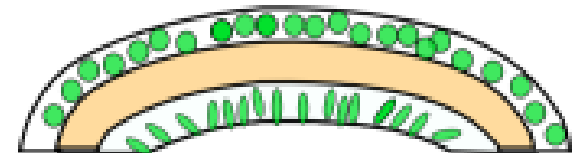
Rapid movements in plants happen because of **osmosis**. Plants release ions, like K^+ and Ca^+ , to affect the cell's *turgor pressure*. This causes **water** to rapidly leave or enter the **central vacuoles** of plant cells causing them to stiffen or droop quickly.



Photonasty

The Purple Shamrock (*Oxalis triangularis*) exhibits **photonasty** and quickly responds to **light**. When it becomes dark, the *turgor pressure* in the leaves drop and they sag.

Photo- means **light**



Photonasty

Thigmonasty

Touch-me-nots (*Mimosa pudica*) exhibit **thigmonasty** and quickly respond to **touch**. When touched, the *turgor pressure* in the leaves drop and they sag.

Thigmo- means **touch**



Thigmonasty

Thigmonasty is an important **defense mechanism** for plants. The quick movements can startle large herbivores and knock smaller herbivorous insects off the leaves.



Thigmonasty

Thigmonastic movements in carnivorous plants, like the Venus flytrap (*Dionaea muscipula*), can be used to trap insects in the modified leaves.

