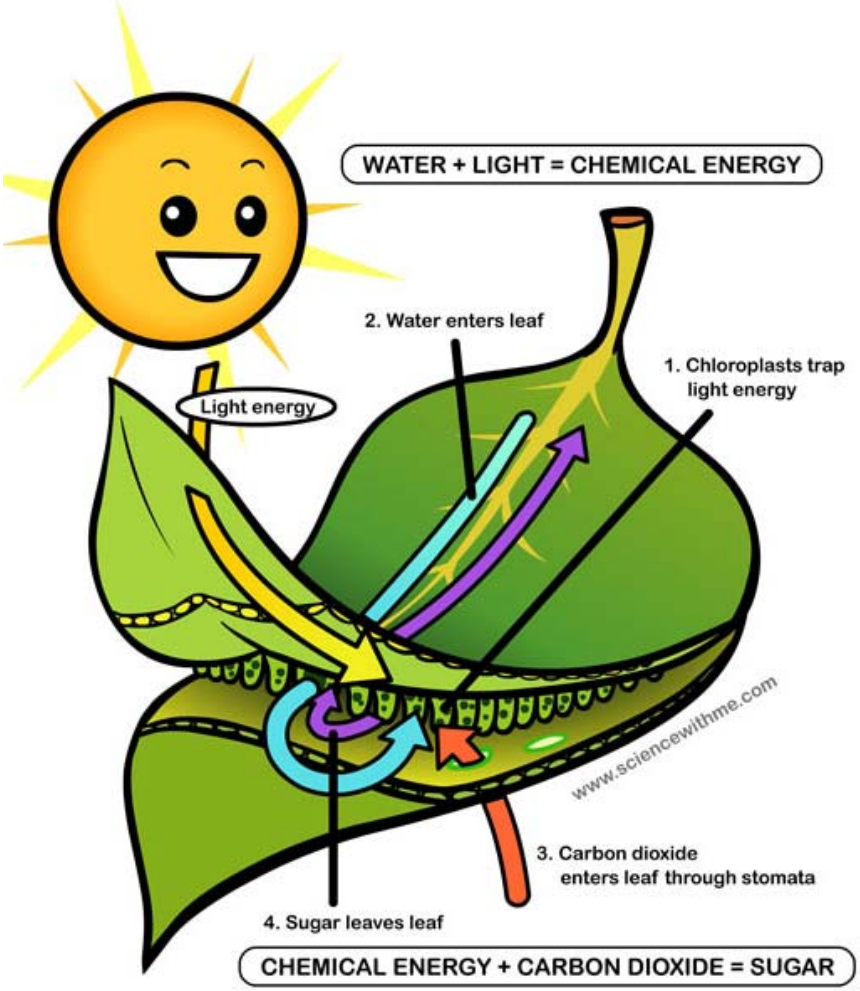
Plant

What are plants ?

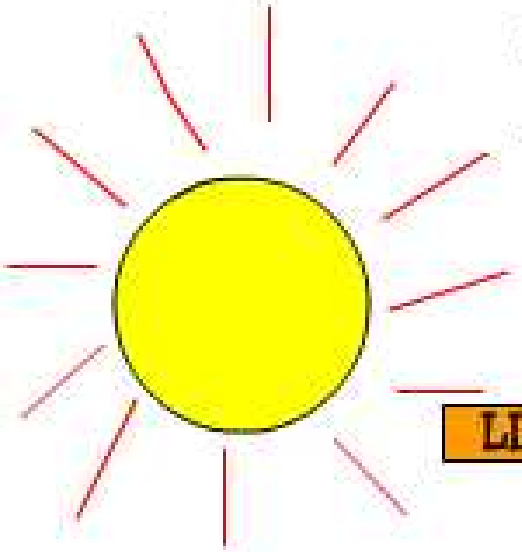
- Producer
- Convert inorganic to organic
- Provide food
- Produce O_2
- CO_2 fixation

Photosynthesis

Photosynthesis is the process in which green plants absorb solar energy to make food from carbon dioxide and water.



Photosynthesis



LIGHT

oxygen

sugar

- given off into air

converted

STARCH

- stored food in other parts of the plant.
- turns iodine dark blue

Chlorophyll

- traps light energy to make food.

water

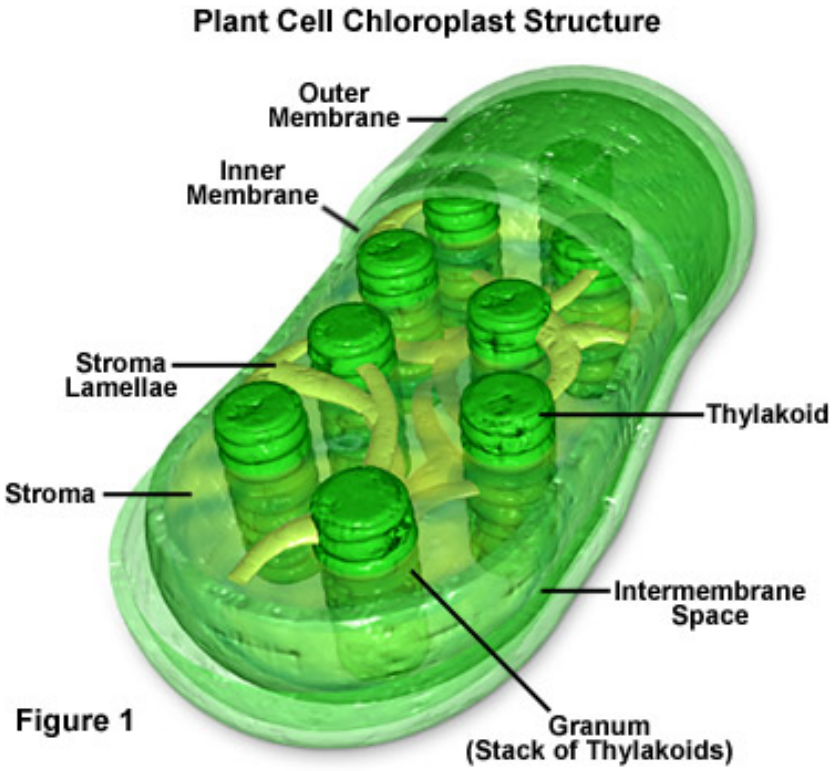
- absorbed from the roots

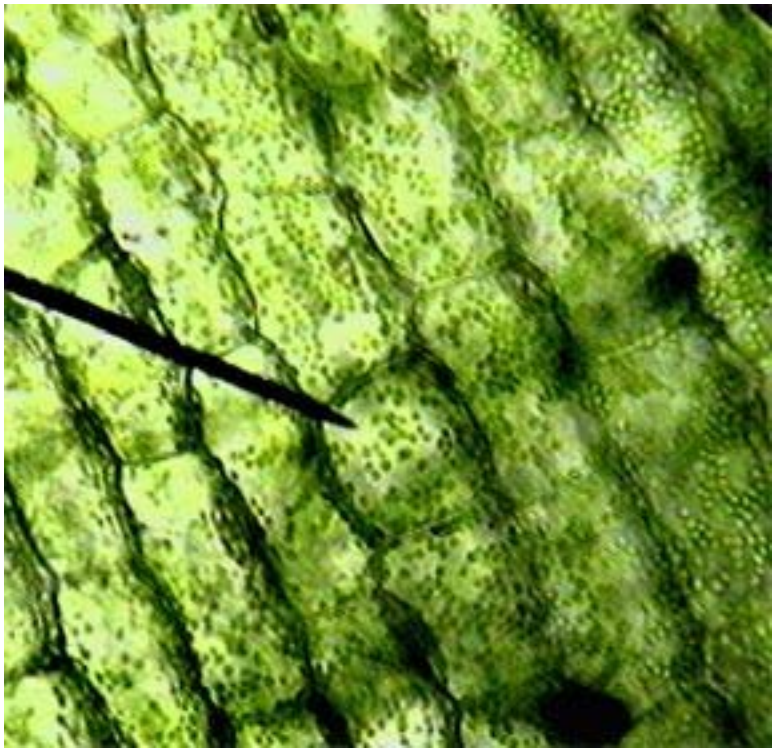
Carbon dioxide

- enters through the stomataof the leaves.

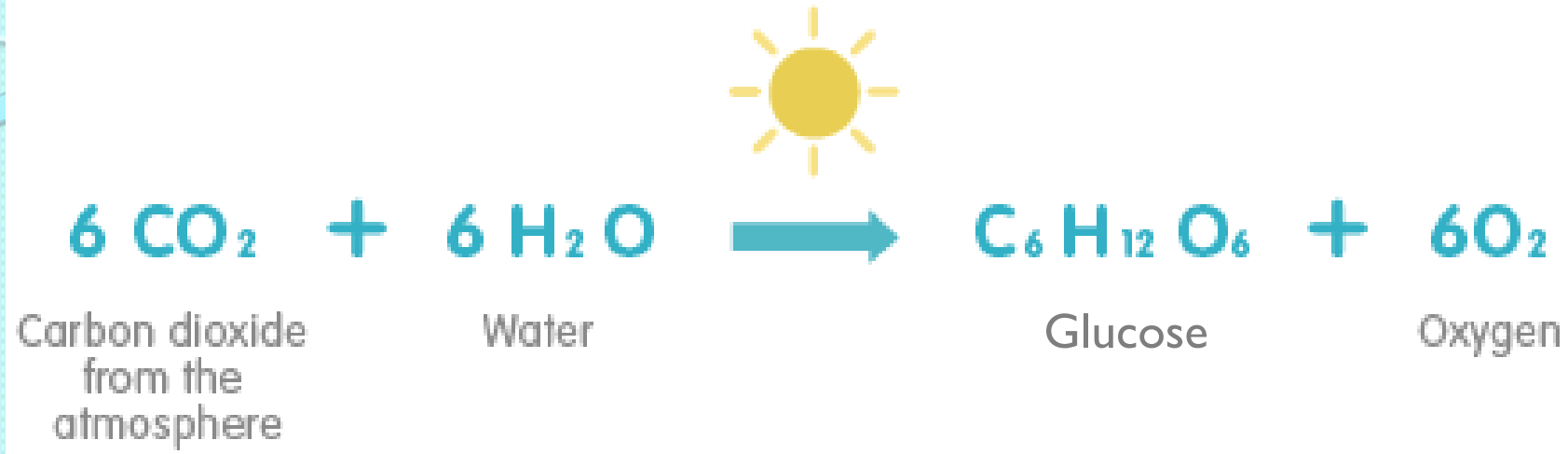
Chlorophyll

Chlorophyll is the green pigment can absorb sunlight.





Photosynthesis



Glucose converted into starch

Where is the starch stored in plant ?

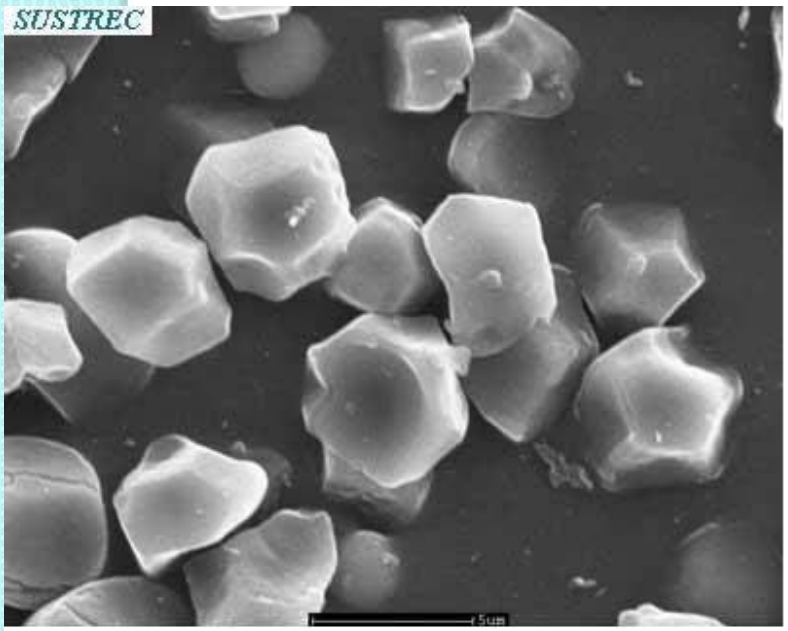
stem

fruit

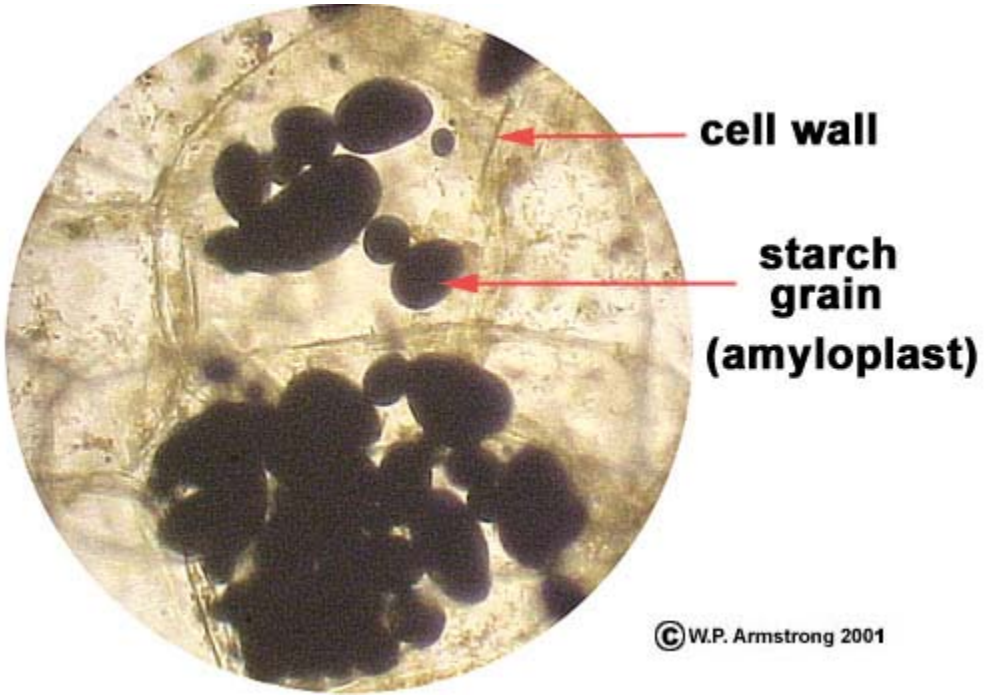
leaves

root

Starch stored in plant cell

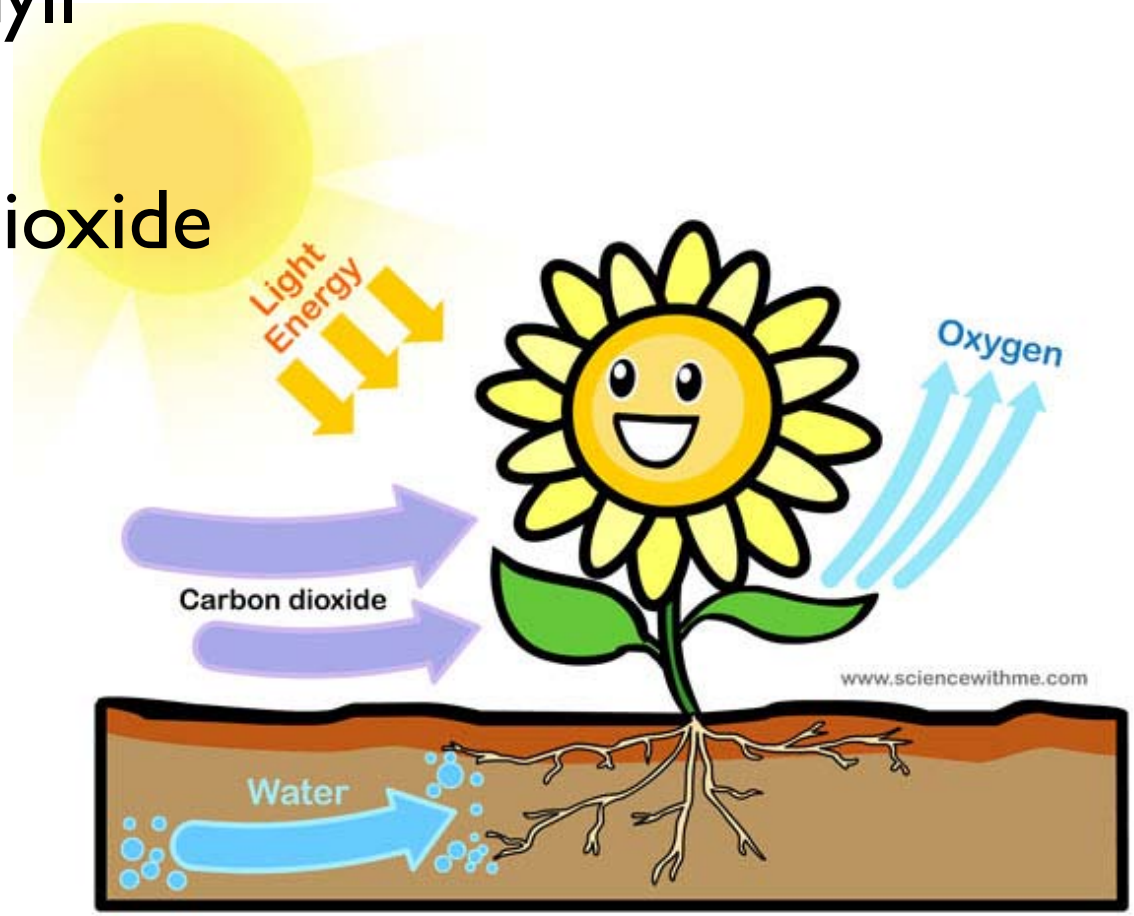


Silpakorn University, Thailand

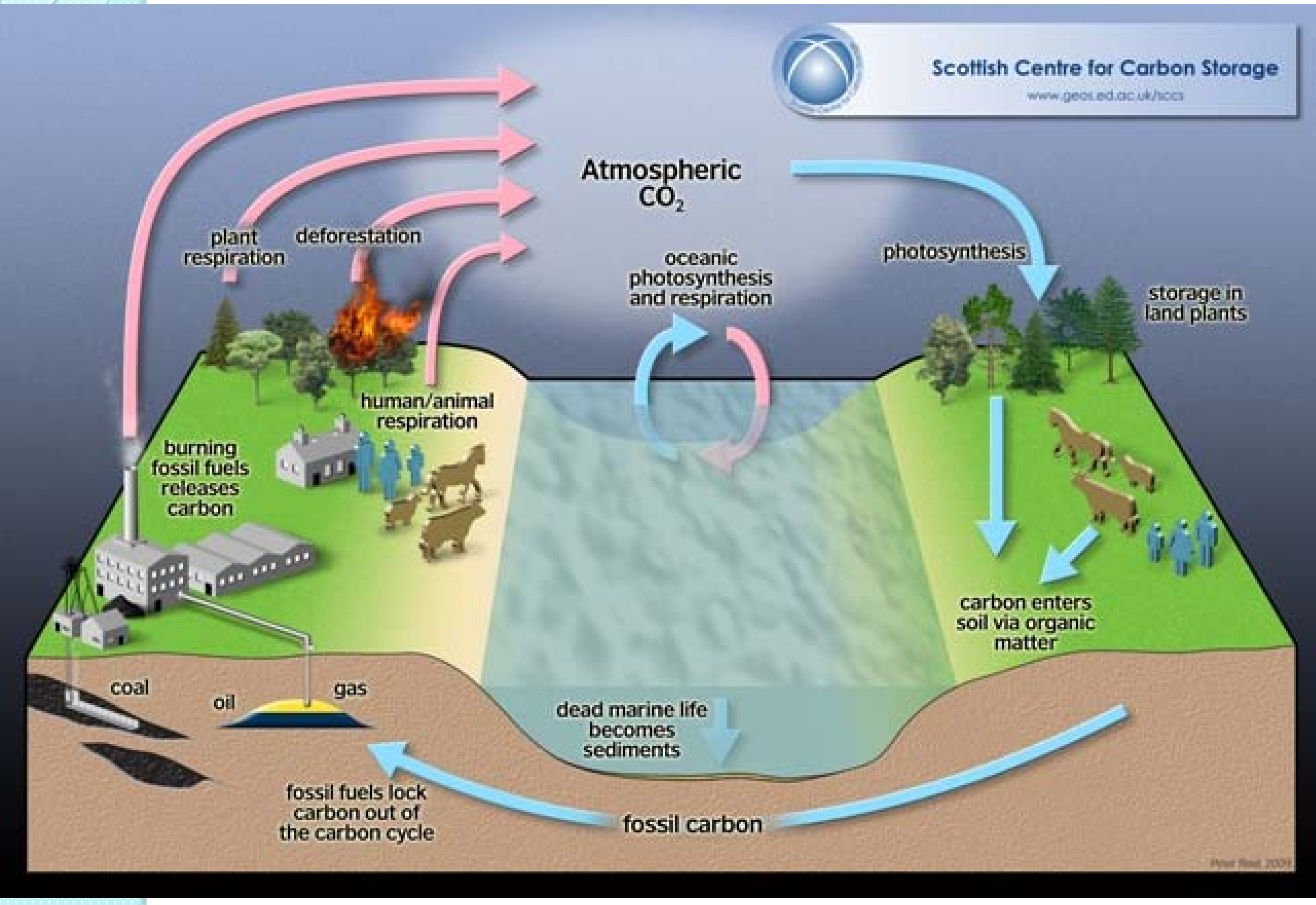


Requirements of photosynthesis

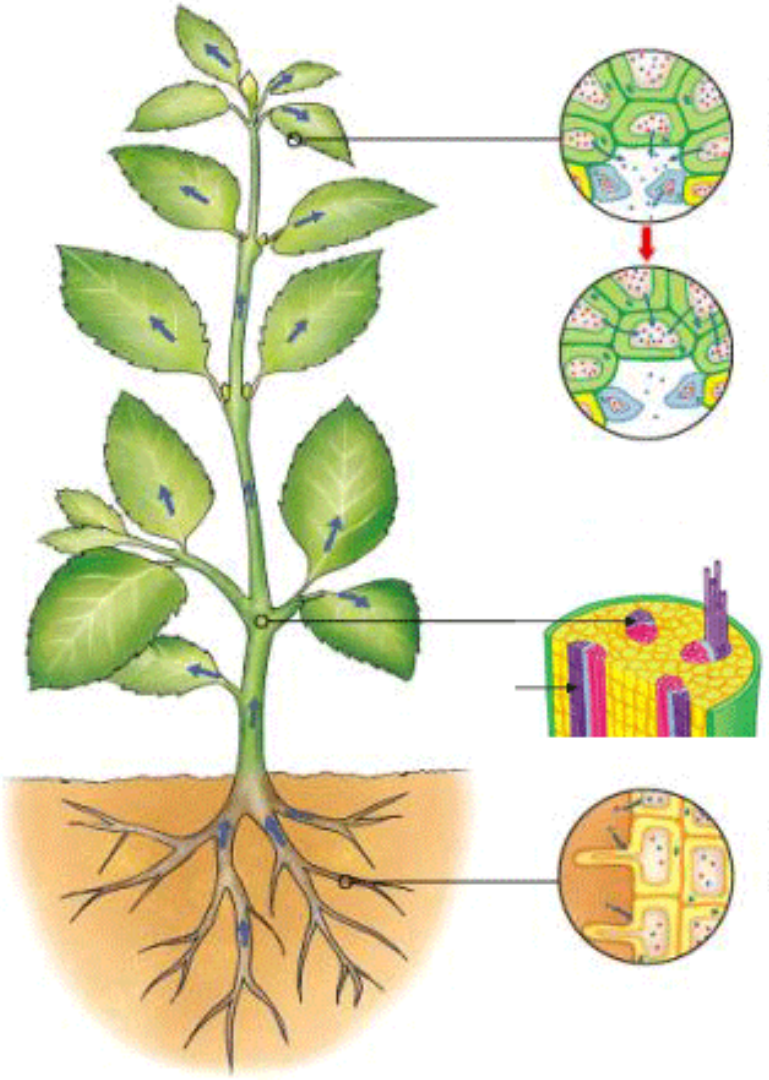
- Sunlight
- Chlorophyll
- Water
- Carbon dioxide



Importance of photosynthesis


Scottish Centre for Carbon Storage
www.geos.ed.ac.uk/sccs
Atmospheric CO_2
plant respiration
deforestation
oceanic photosynthesis and respiration
photosynthesis
storage in land plants
human/animal respiration
burning fossil fuels releases carbon
carbon enters soil via organic matter
coal
oil
gas
dead marine life becomes sediments
fossil fuels lock carbon out of the carbon cycle
fossil carbon

Transport system in plant



Wilting

: water loss through the aerial parts of the plant exceeds water absorption by roots.

Transpiration

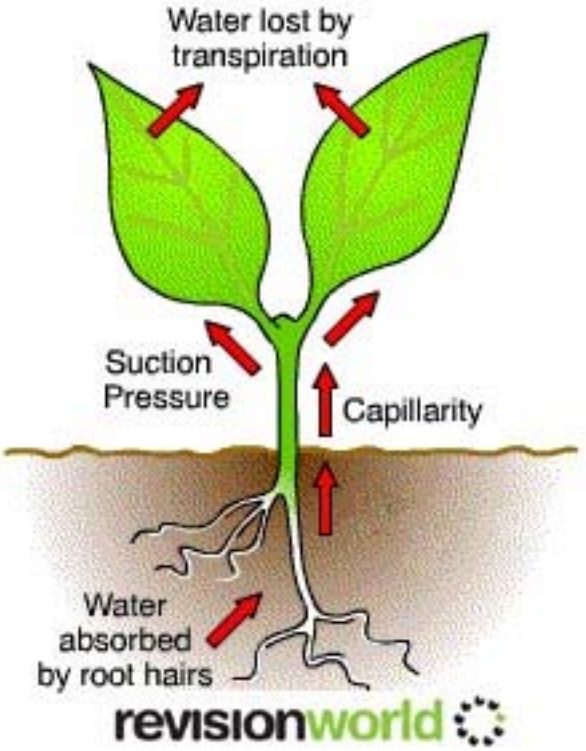
Transpiration is the evaporation of water from the aerial part of plant.

Water loss in plant

90% by stomata

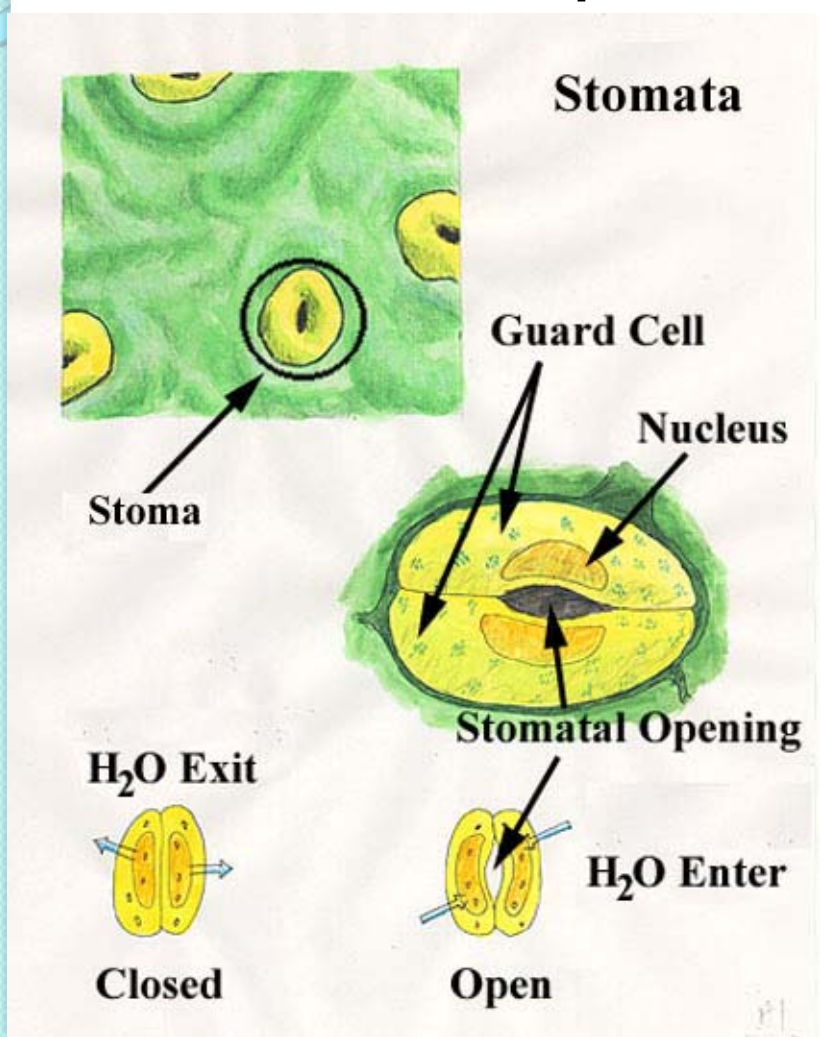
9% by cuticle

1% by photosynthesis



Stomata

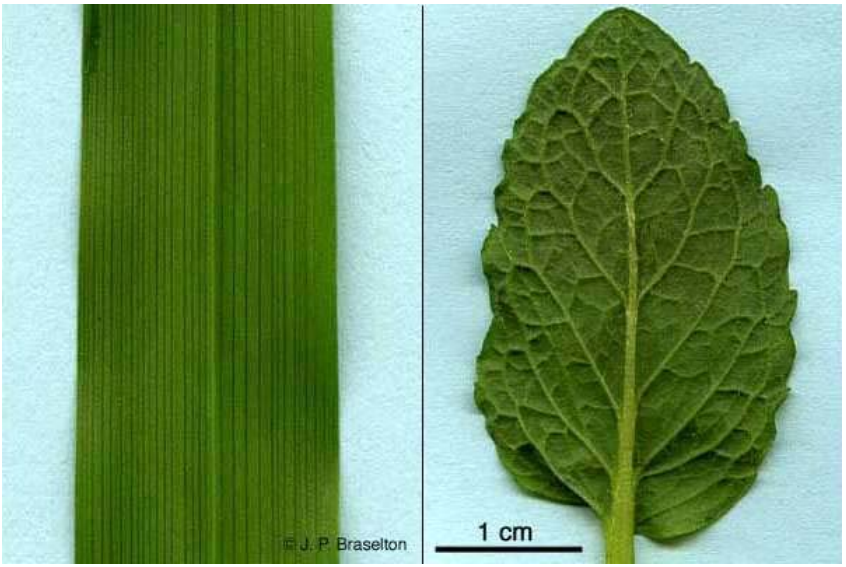
Stomata are pore in the leaves and stem.



Stomata

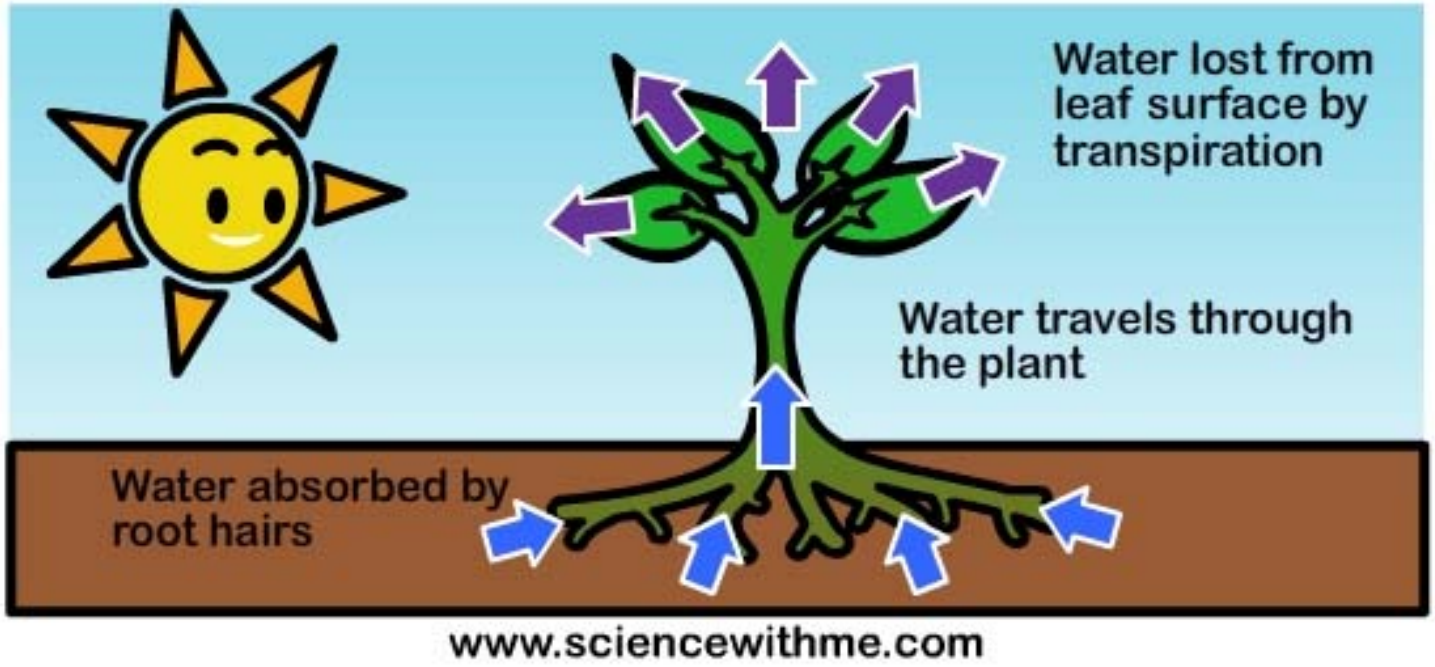
Monocotyledons : found on both sides of leaves

Dicotyledons : found in lower sides of leaves



The main function of Stomata

- To allow gases to diffuse in and out of the leave.

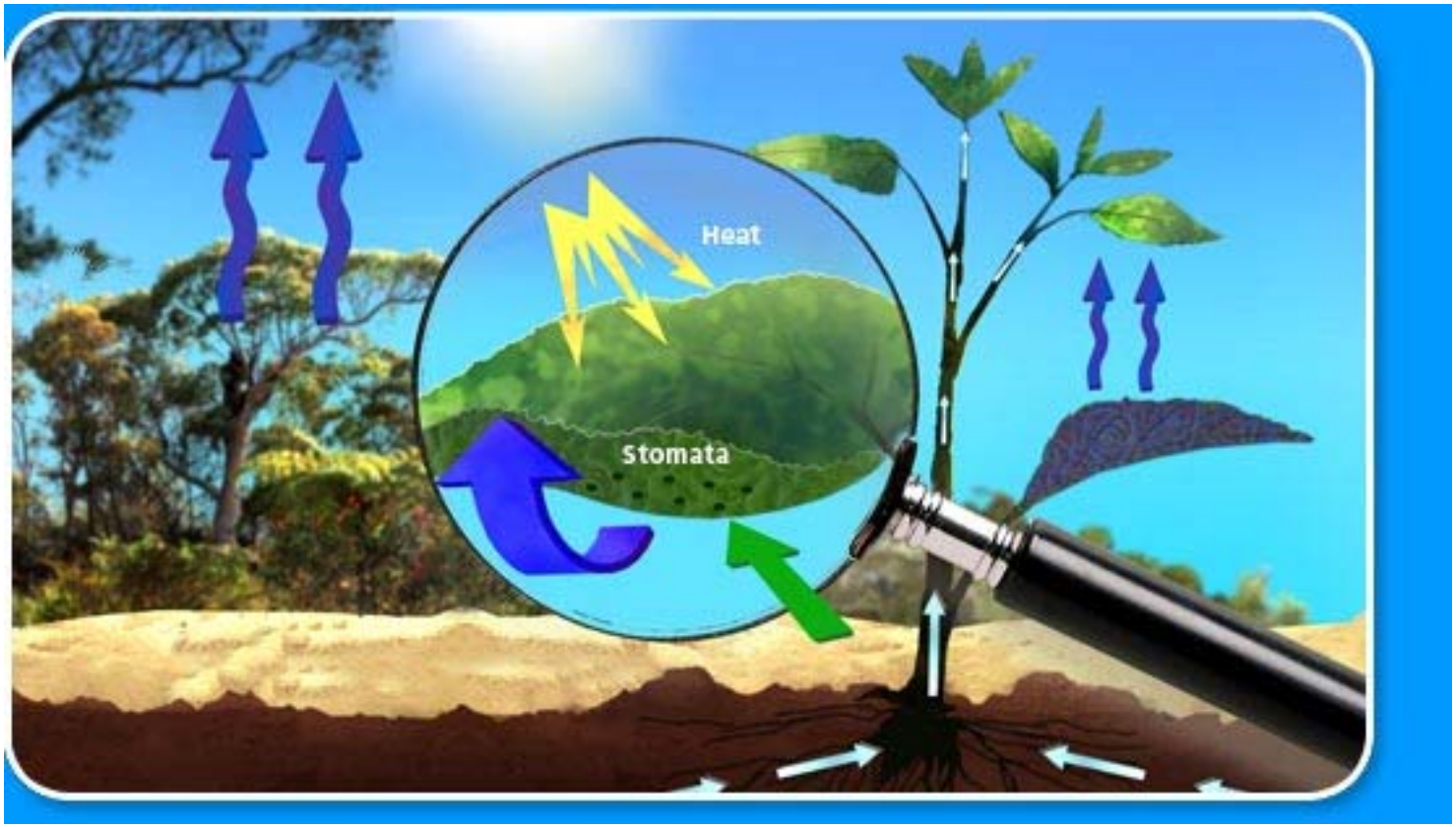


Affect factors the rate of Transpiration

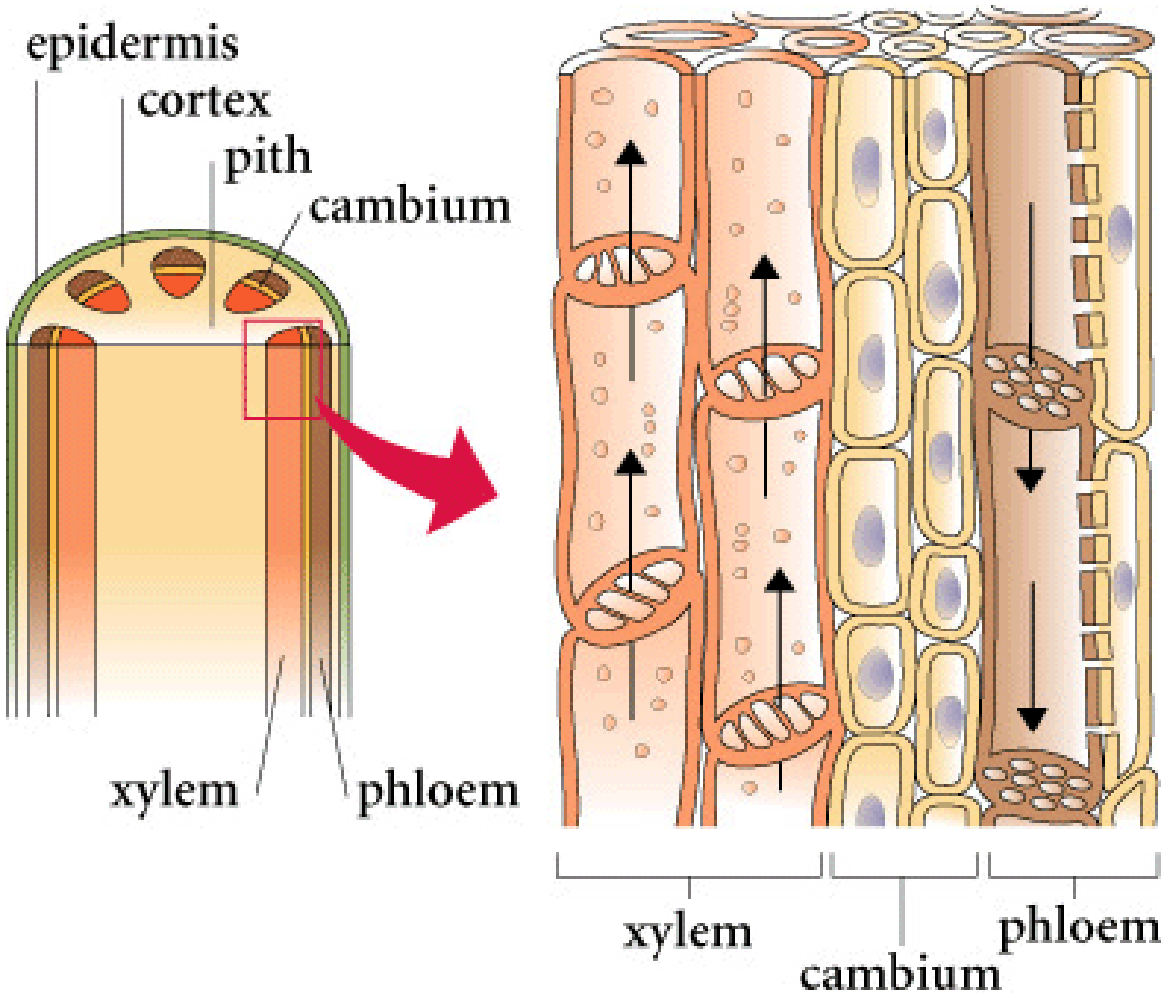
- Light
- Temperature
- Relative humunity
- Wind speed
- Water availability
- altitude

The roles of transpiration

- Transport Water and Mineral
- Prevent the heat from sunlight

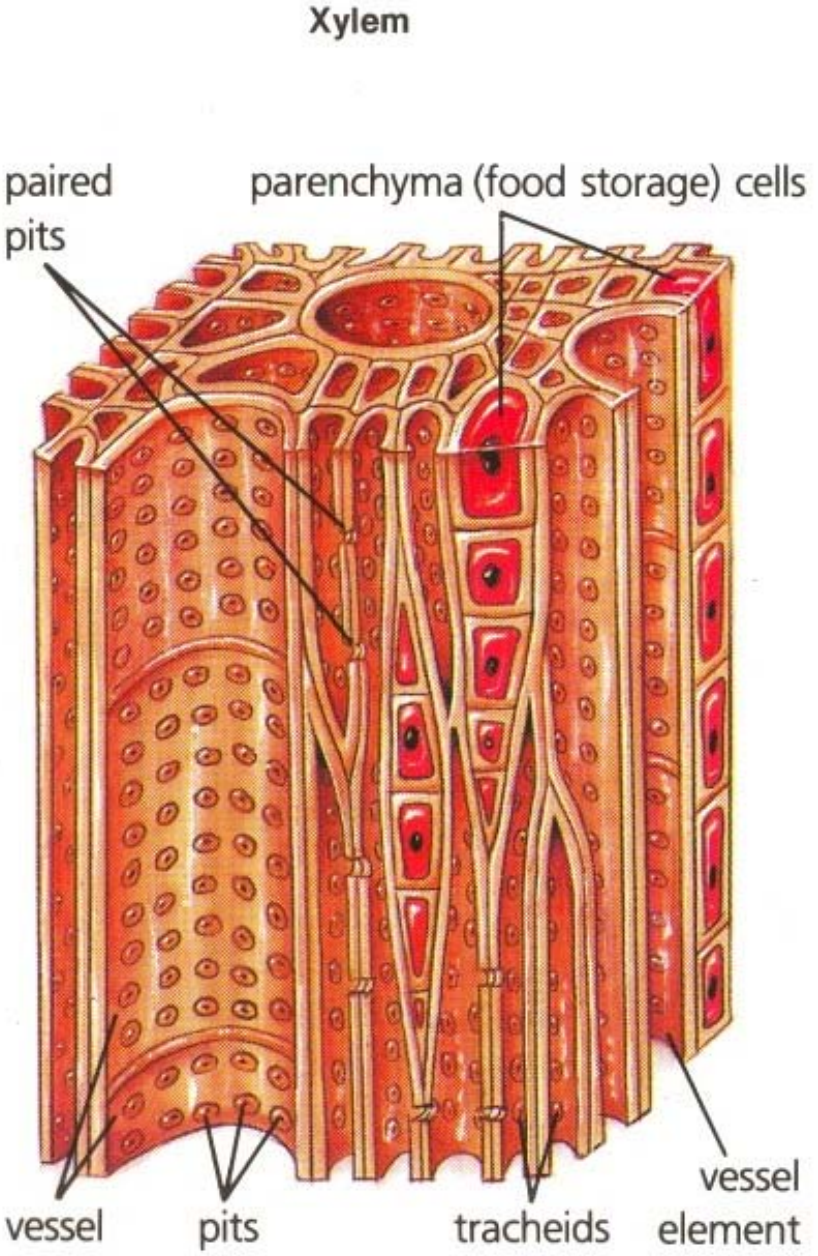


Vascular tissue of a plant



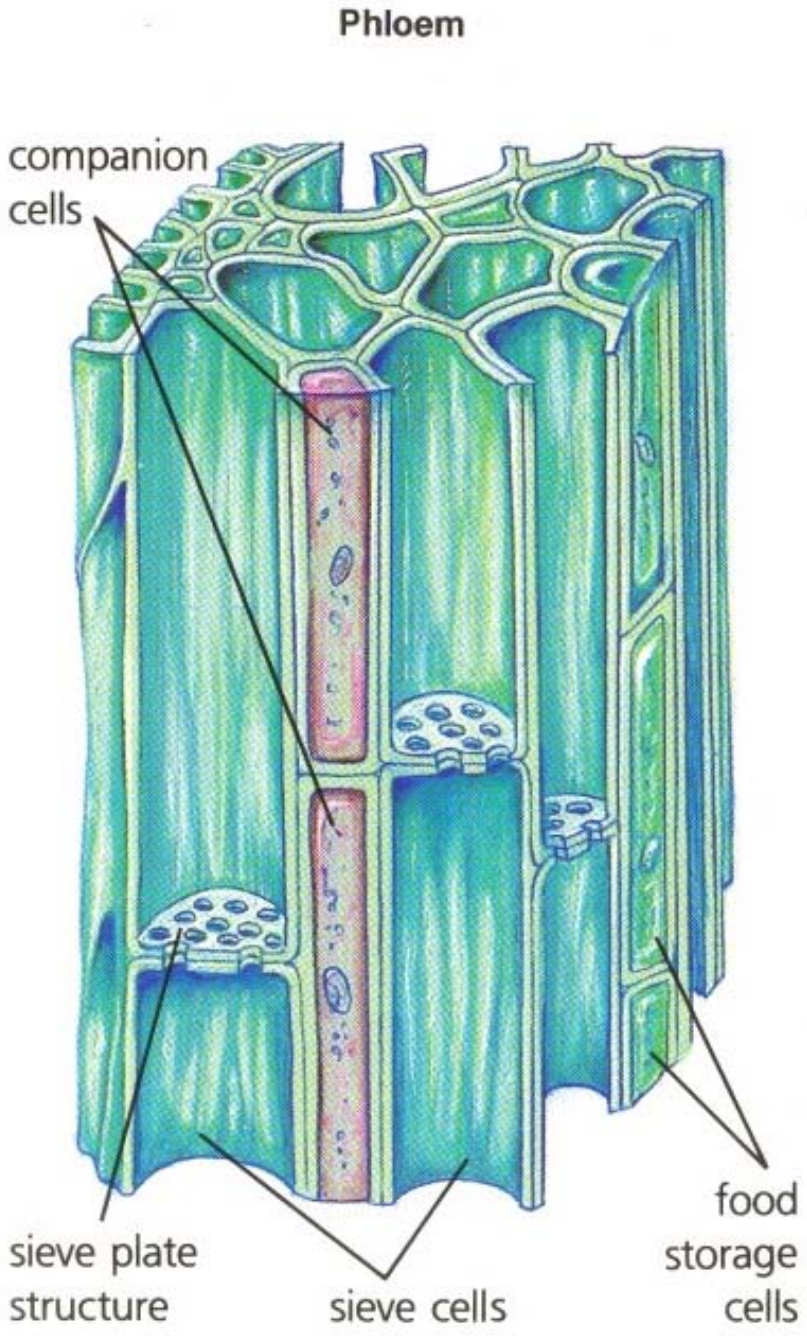
Xylem

- To transport water and mineral from the root to the stem and leaves.

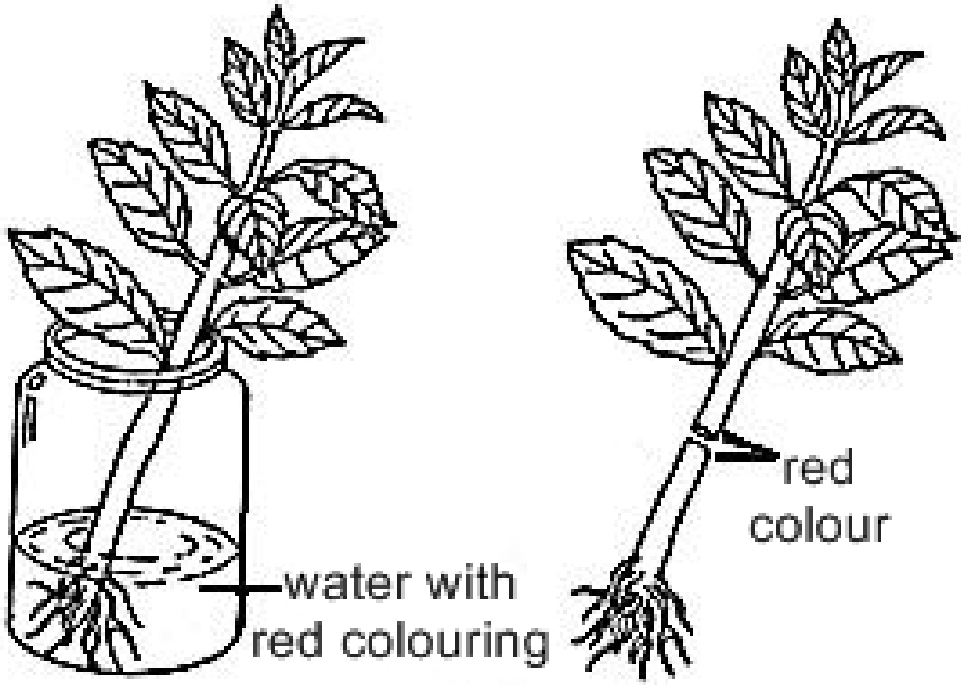


Phloem

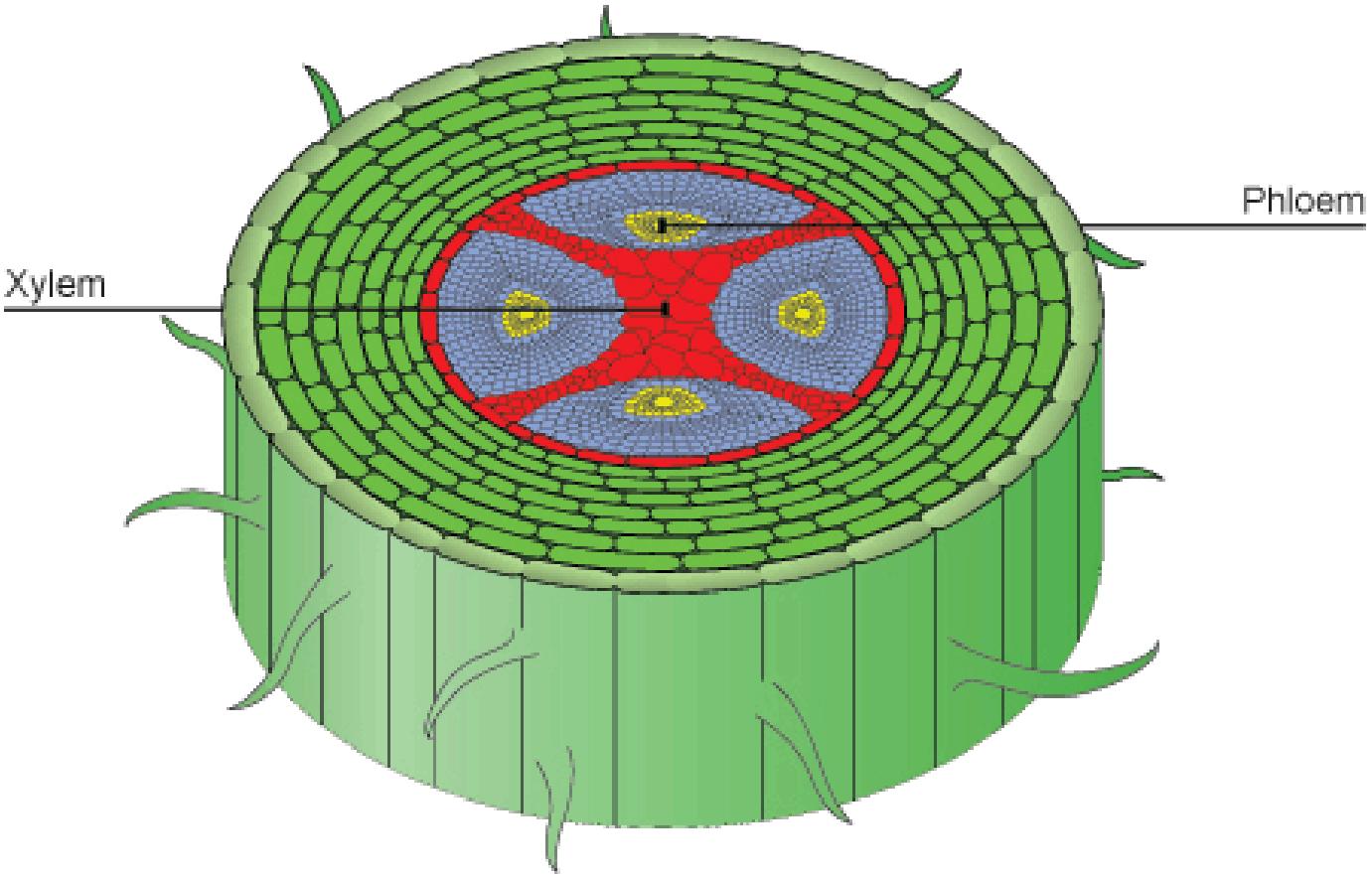
- Transport synthesized food substances from one part of the plant to another.



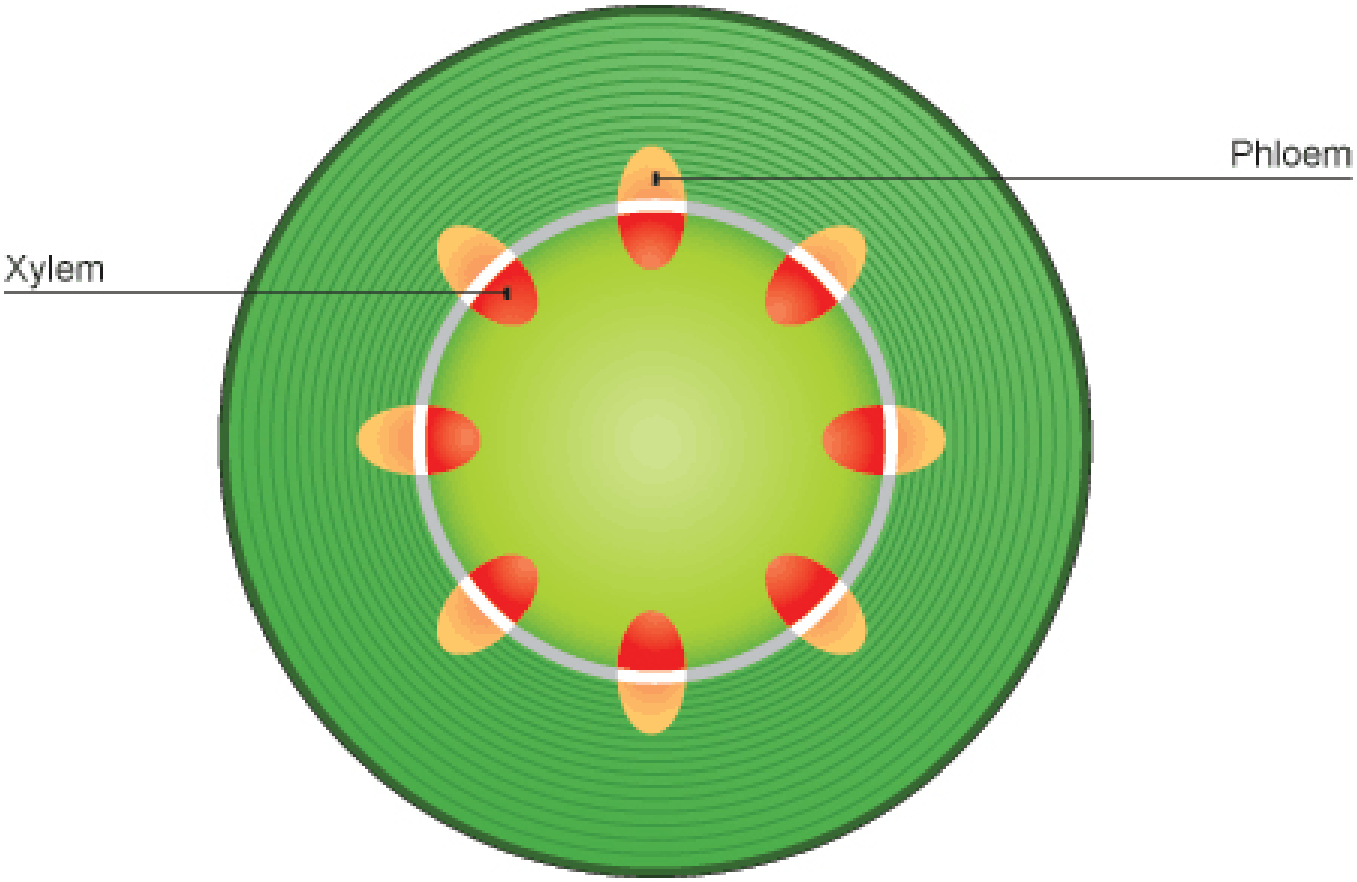
the pathway of water in plant



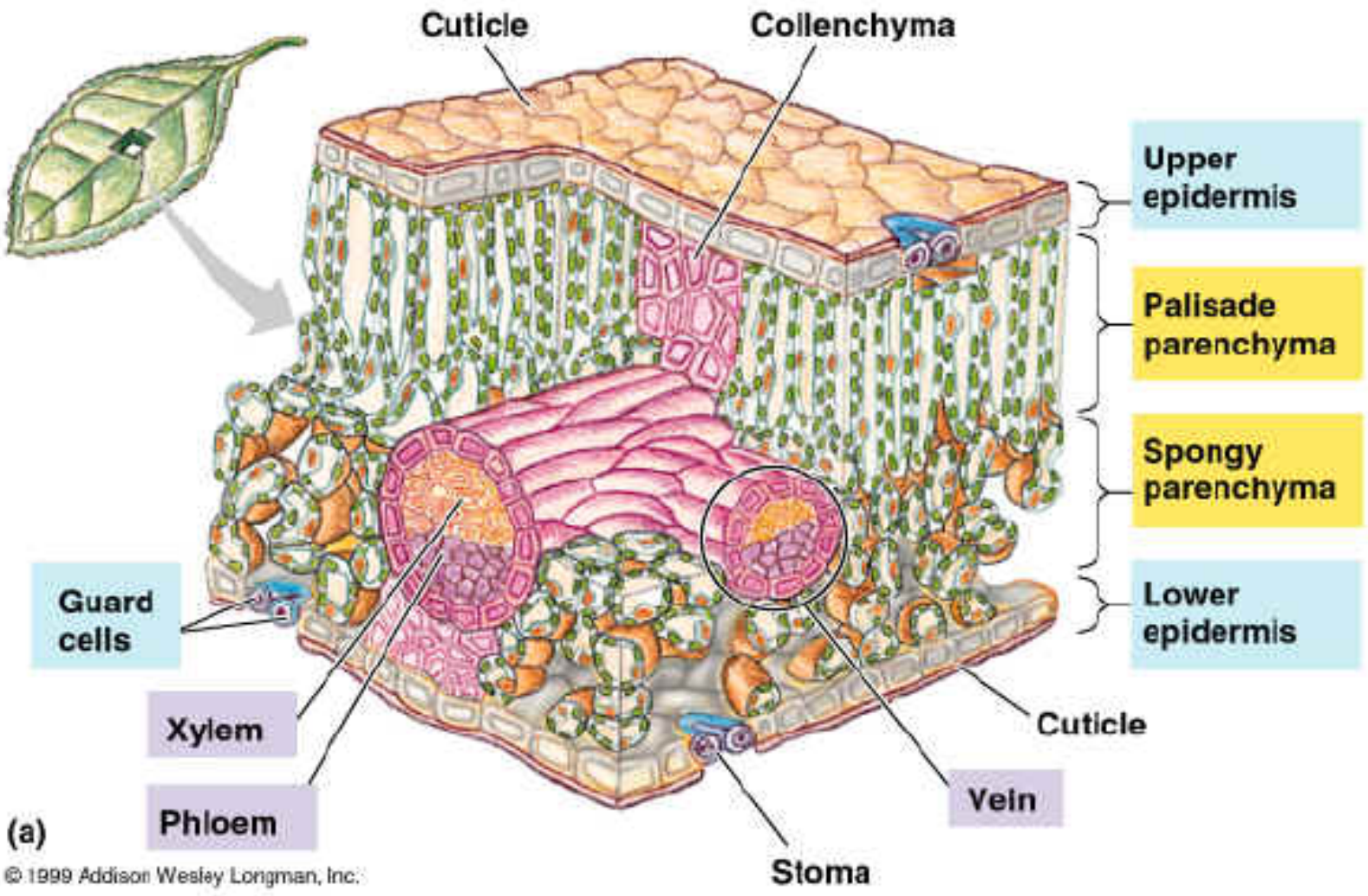
root



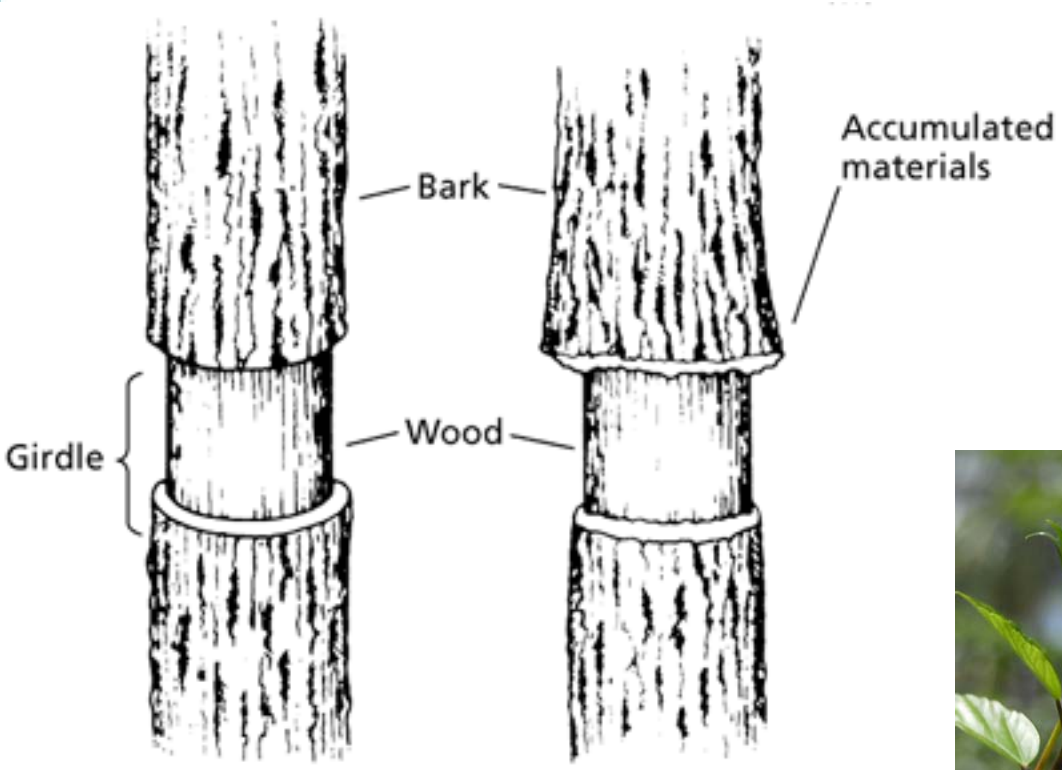
stem



leaf

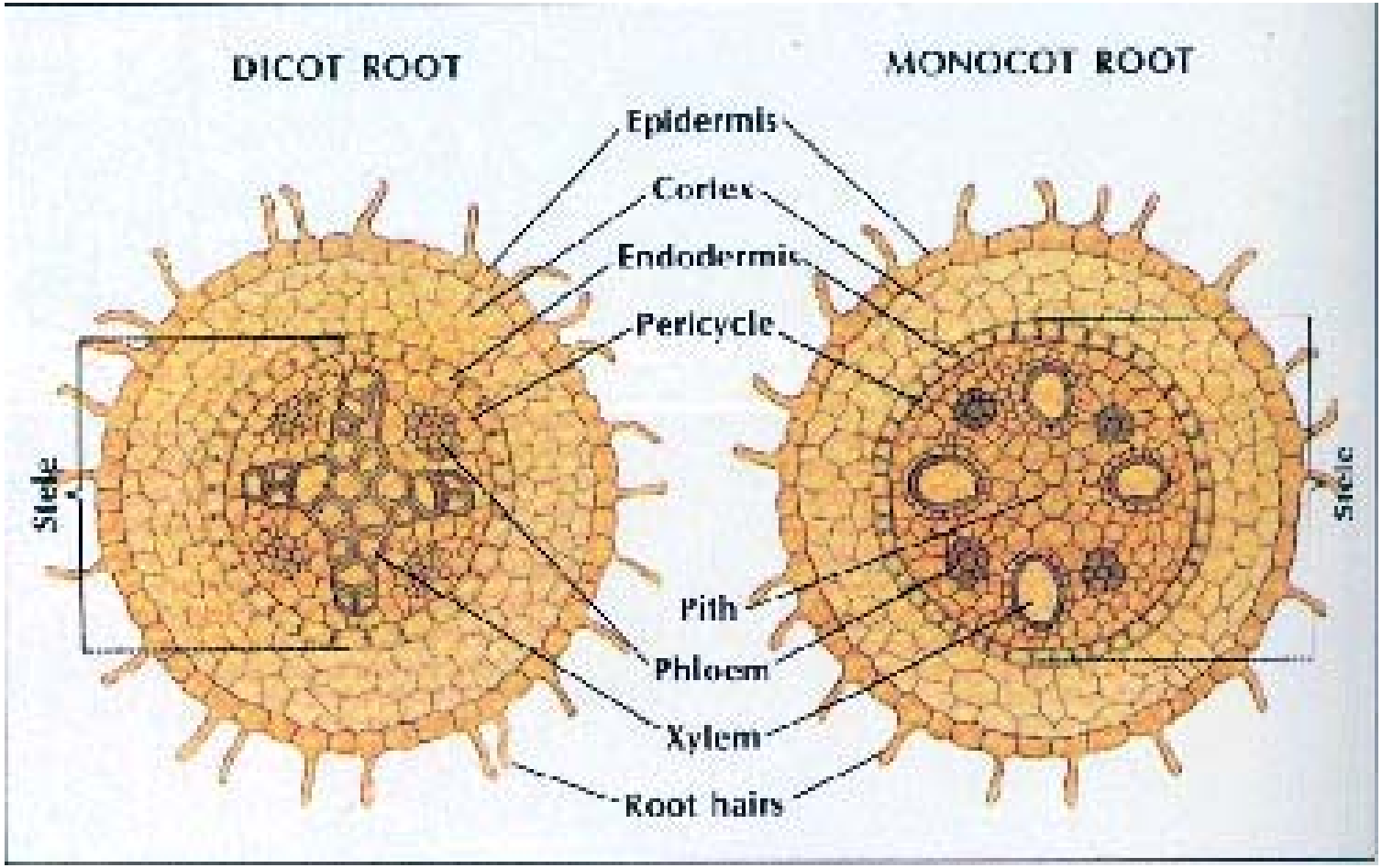


Transport of synthesized food substances in phloem



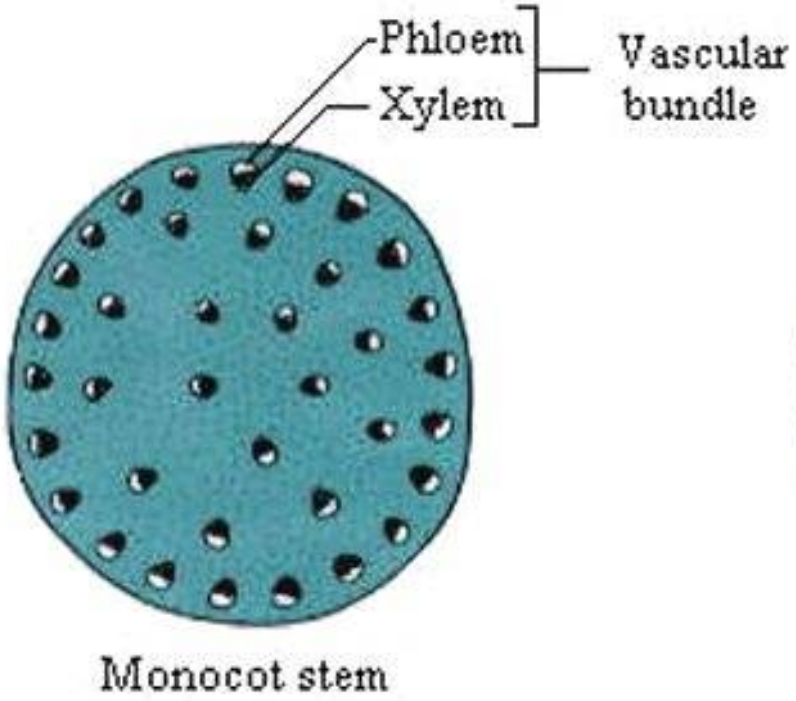
Location of xylem and phloem

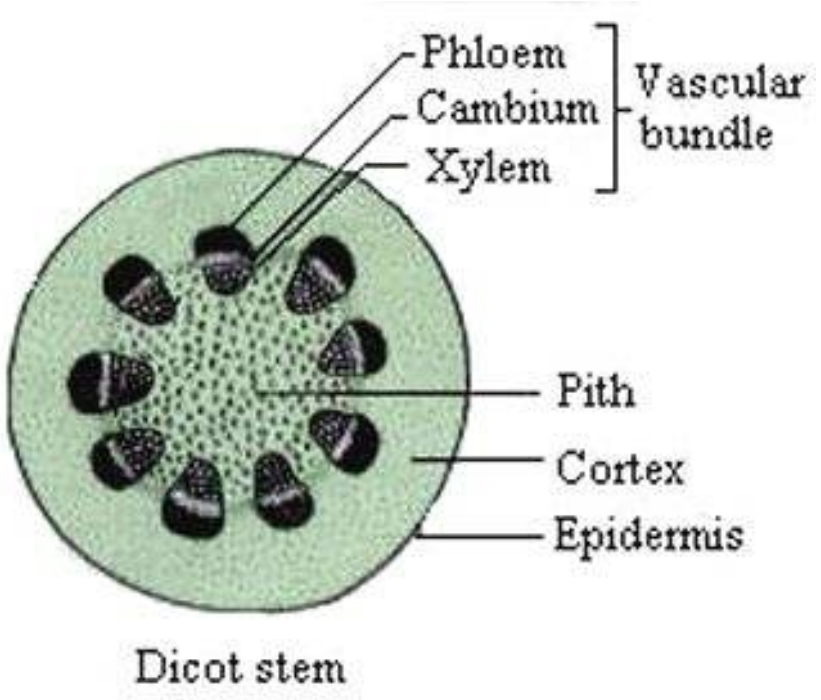
- root



Location of xylem and phloem

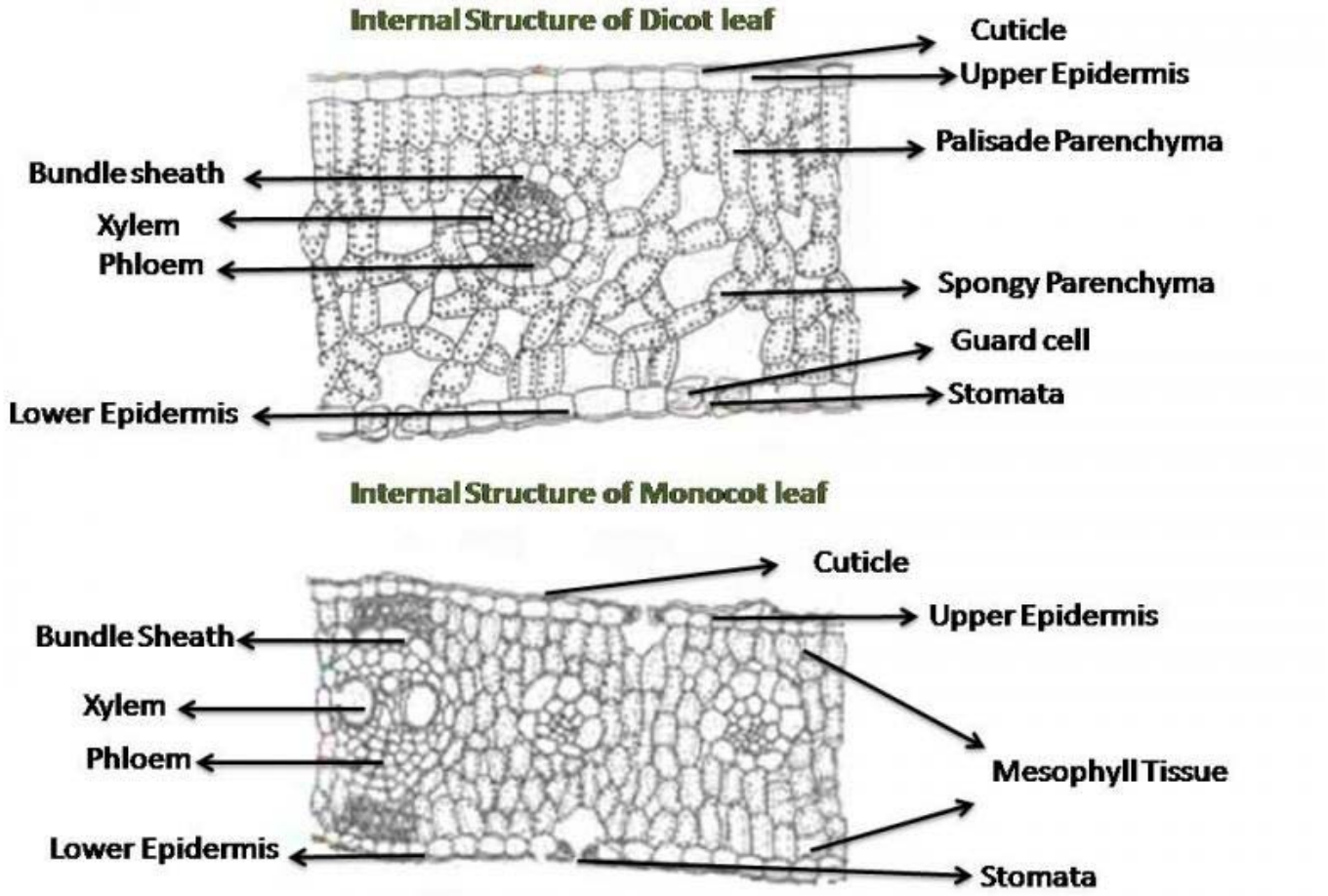
- stem



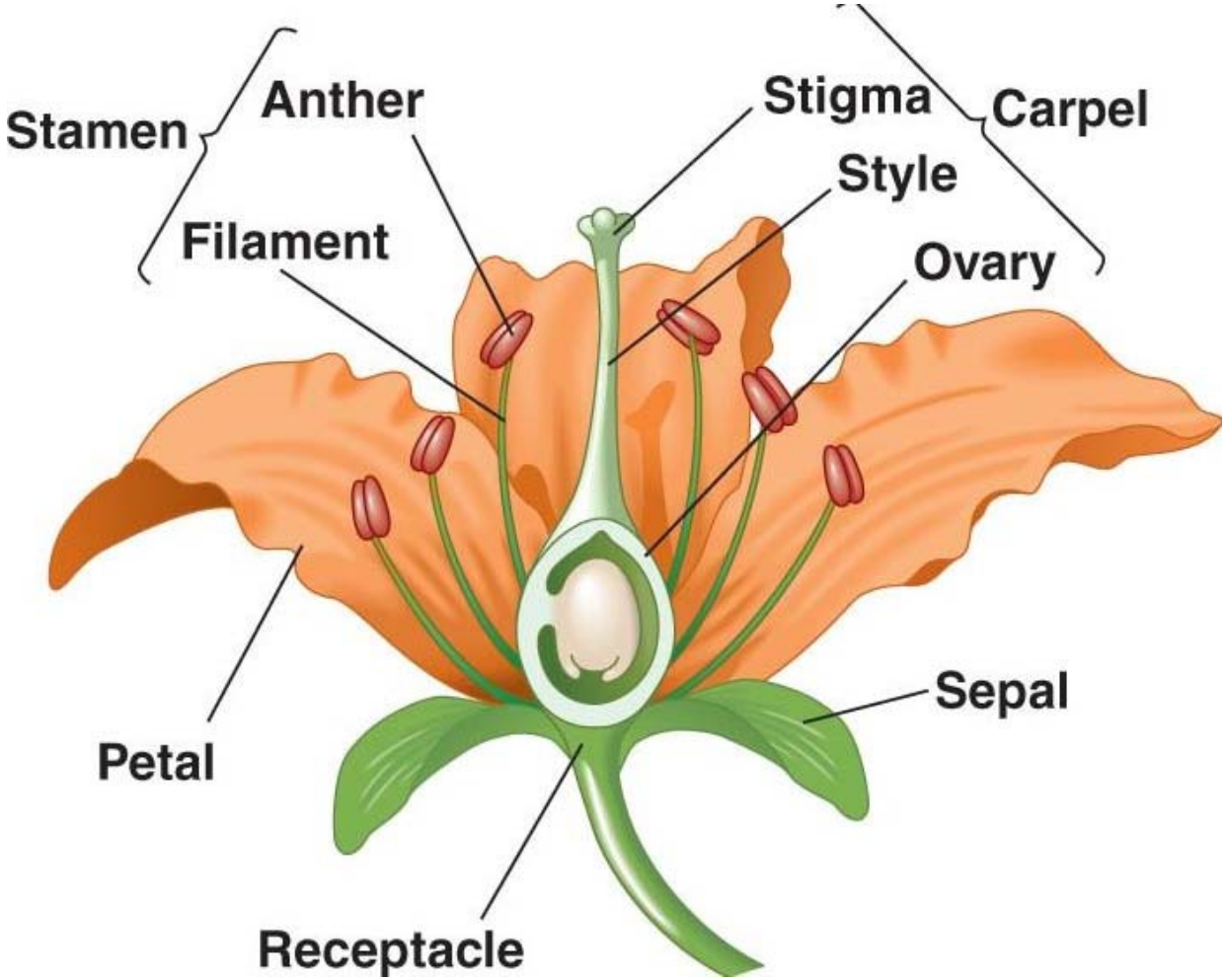


Location of xylem and phloem

- leaf



Structure of flower



Structure of flower

- A **flower** may comprise four organs made of modified leaves:
- **Sepals** enclose the flower.
- **Petals** may be brightly colored to attract pollinators.
- **Stamens** produce **pollen** that contain sperm.
- **Carpels** produce **ovaries** that contain eggs.

Type of flower

A **complete flower** has all four basic floral organs.

A **perfect flower** contains both male and female structures.

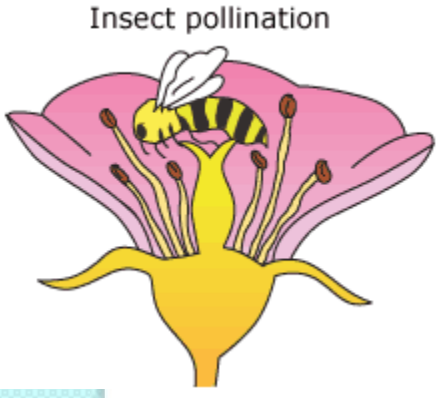
An **imperfect flower** may be

- **staminate** and contains no **carpels**, or
- **carpellate** and contains no **stamens**.

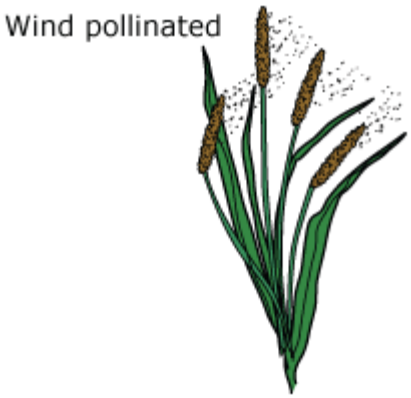
- Pollination is when the pollen lands on the female part of a flower. In most plants the stigma needs to receive pollen from another flower.

Pollination

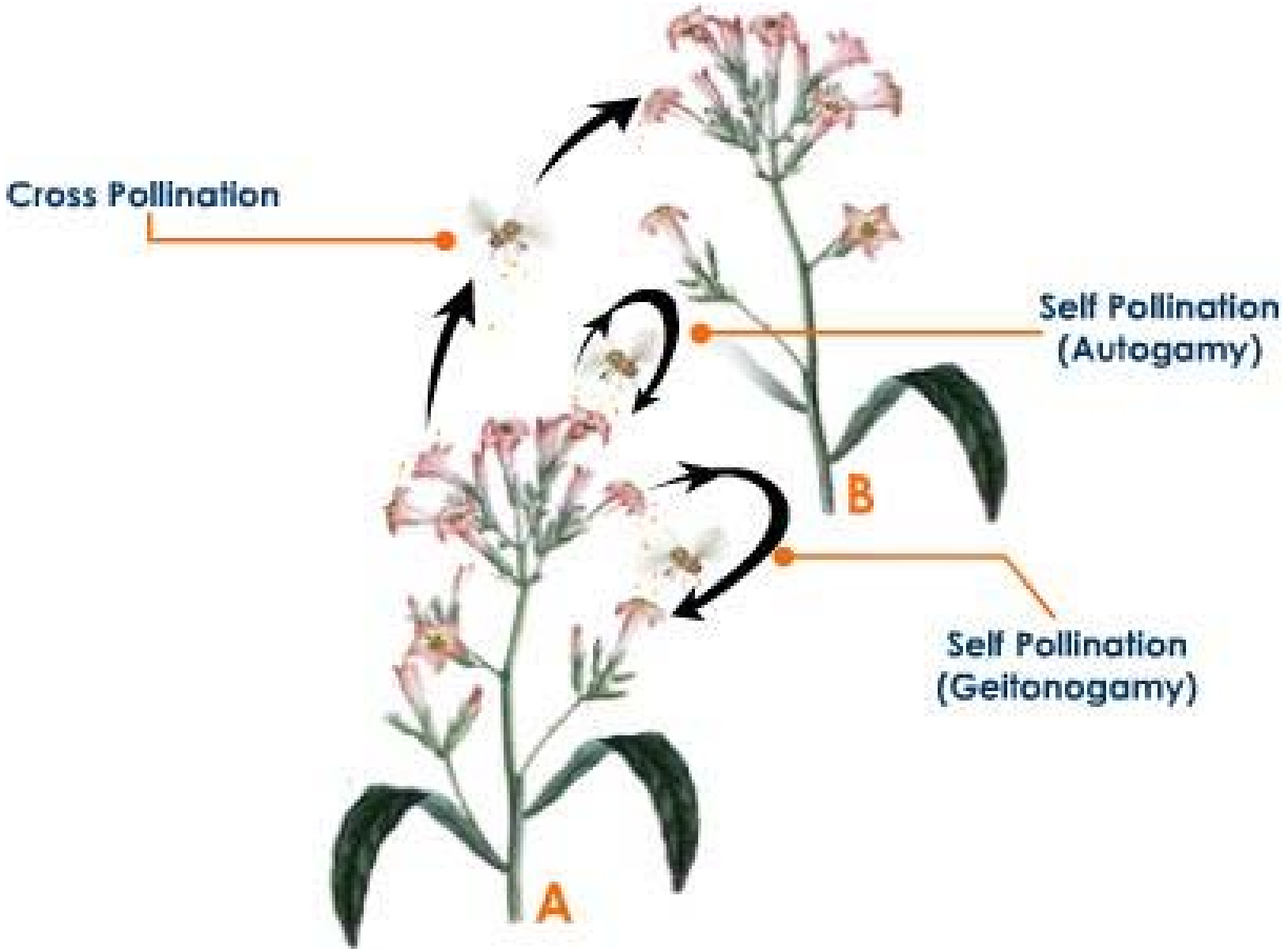
Insect Pollinated vs Wind Pollinated



- **Insect pollinated**
- When insects like bees or flies visit flowers and pollen sticks onto their hairy legs. When they visit another flower the pollen rubs off on its stigma.
- Insect pollinated flowers may have large brightly coloured petals, large pollen grains, and be scented.



- **Wind pollinated**
- The wind carries pollen from one plant to another. Wind pollinated flowers may have small petals, no scent, a lot of small light pollen grains on long, droopy stamens.
- Grass pollen is carried by wind. Grass has feathery stigmas to catch the pollen.

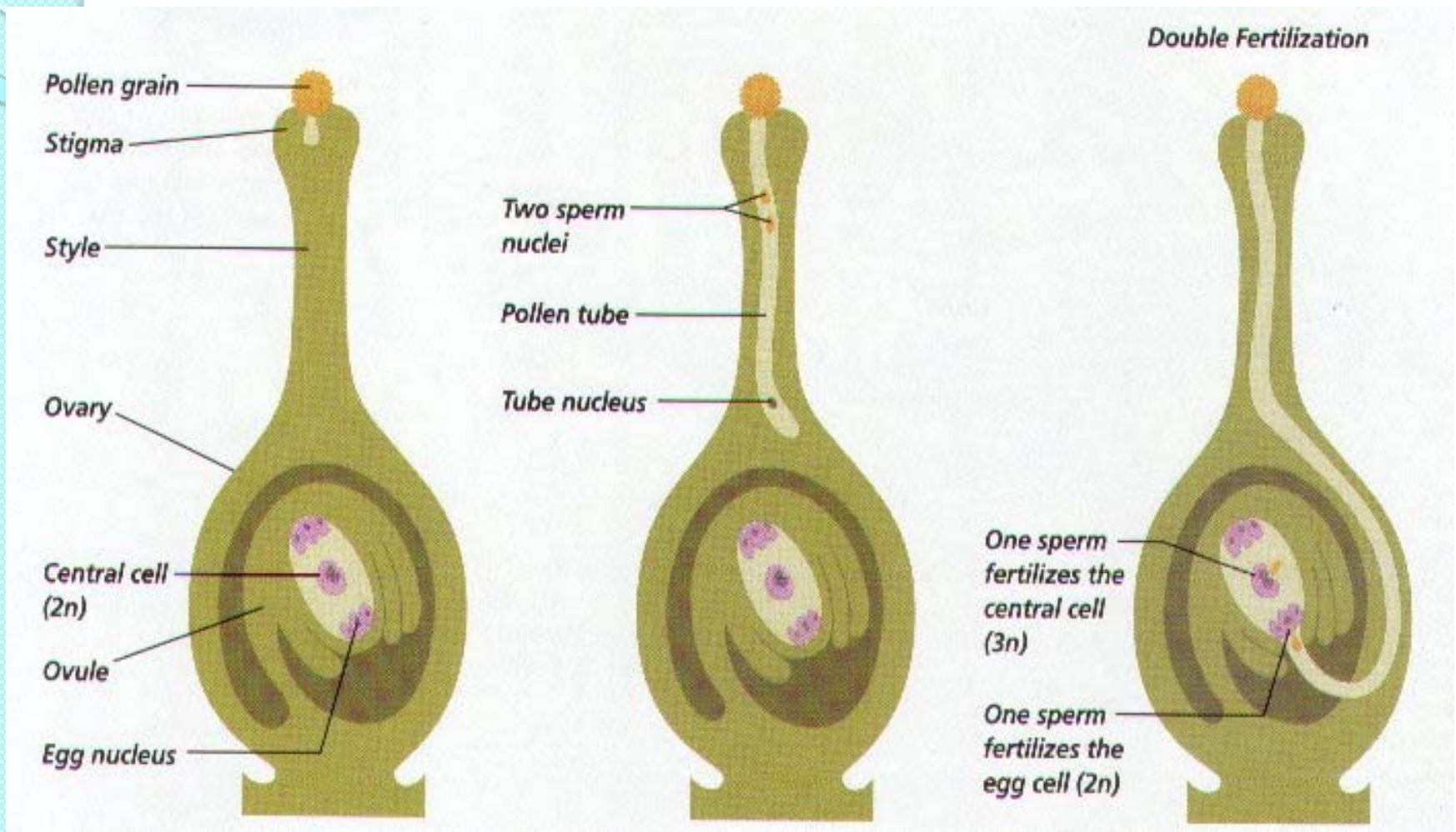

Cross Pollination
Self Pollination
(Autogamy)
Self Pollination
(Geitonogamy)
B
A

Difference between Self Pollination and Cross Pollination

- **Self Pollination**
- When pollen grains from a flower are carried to the stigma of the same flower or on the other flower of the same plant
- Flowers exhibiting self pollination, sometimes do not need any pollinating agent.
- From the genetical as well as quality point of view Self pollination is less preferable.

- **Cross Pollination**
- When the pollen grains from a flower are carried to the stigma of the flower on other plant
- Flowers exhibiting cross pollination need some pollinating agents.
- From the genetical as well as quality point of view Cross pollination is better and more preferable than self pollination

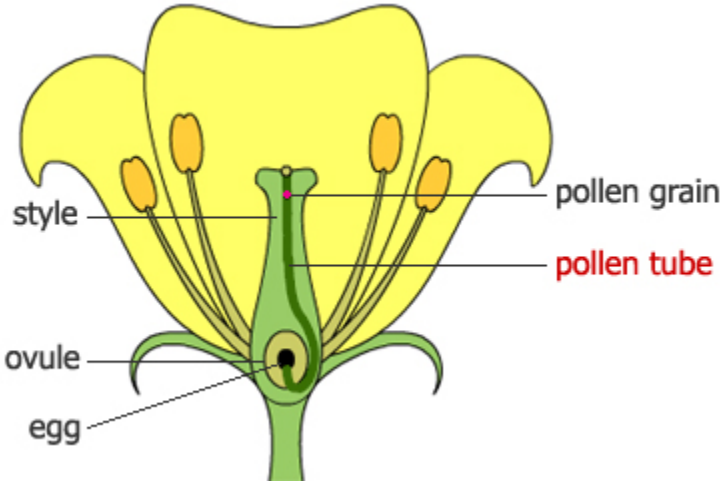
Fertilization in plant

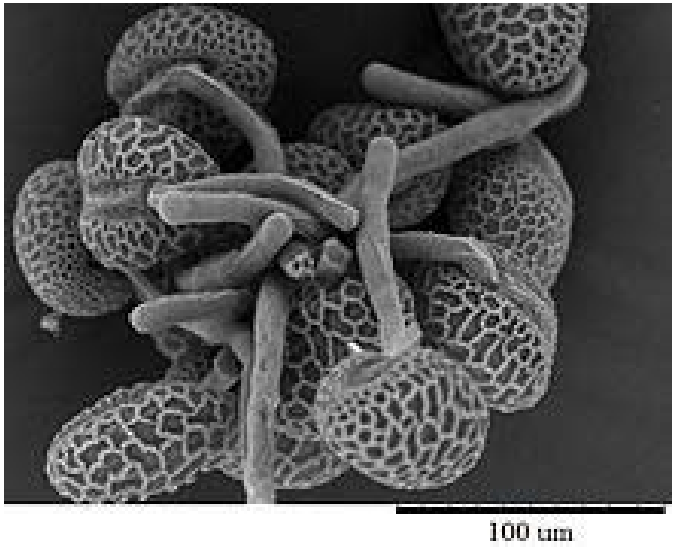


Fertilization in plant

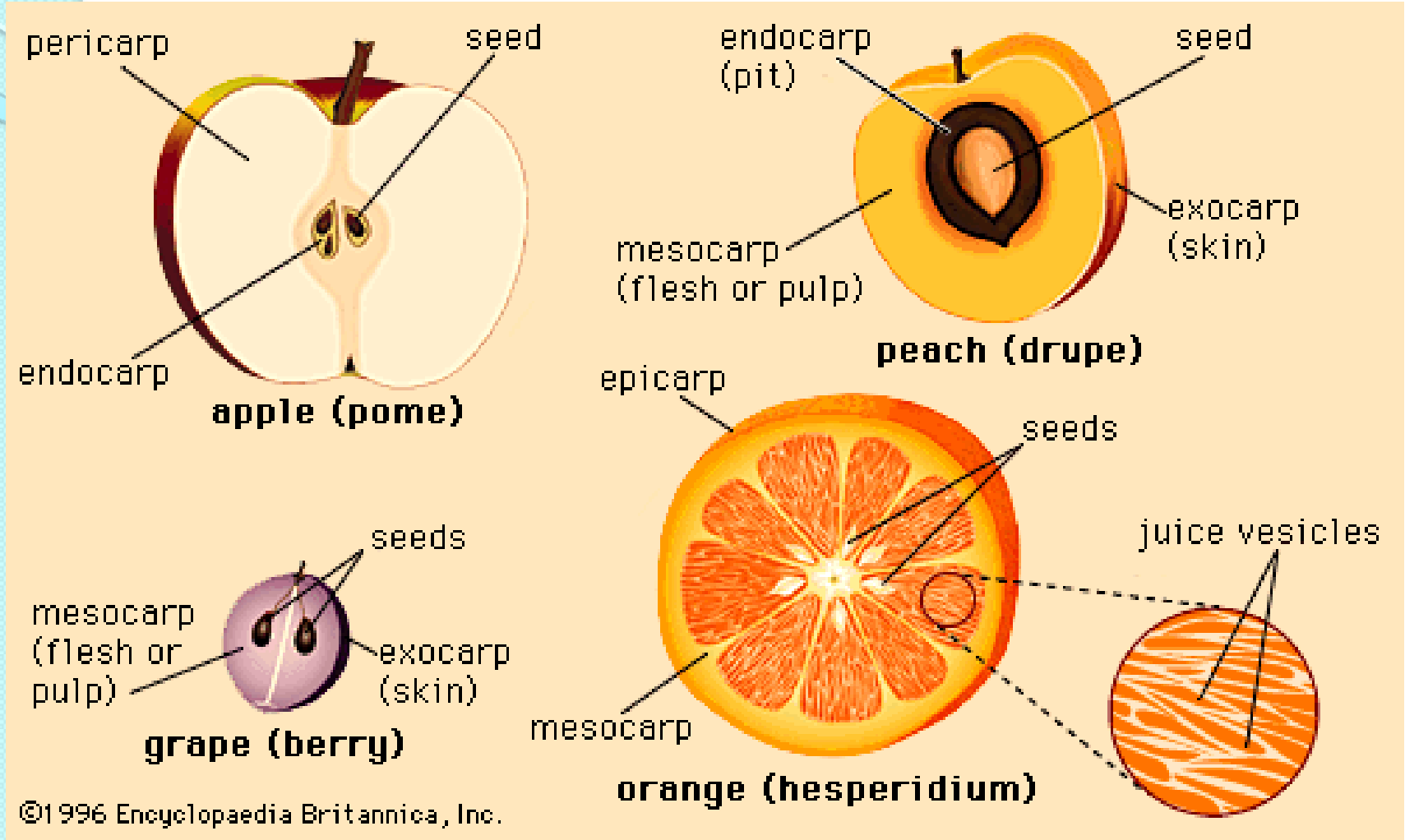
- Before fertilization can occur, the pollen grain on the stigma has to germinate.
- Each pollen grain contains a tube cell and a generative cell.
- The tube cell forms a pollen tube that grows down inside the style to an ovule.
- The generative cell divides to form two sperm that move down the pollen tube.
- The pollen tube provides a pathway for the sperm to reach the egg cell in the ovule.
- One sperm fertilizes the egg cell and together they form the zygote.
- The other sperm unites with the polar bodies in the ovule and together they form the nutritive tissue for the zygote.

Pollen tube

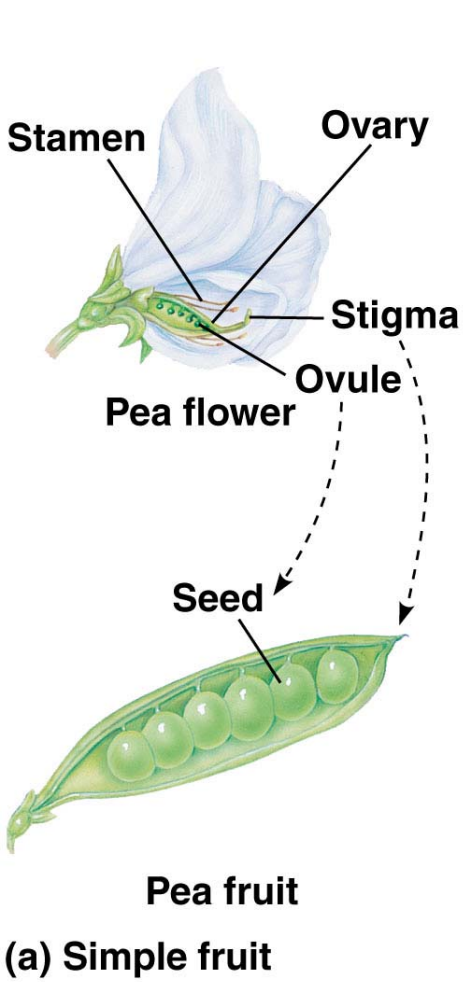


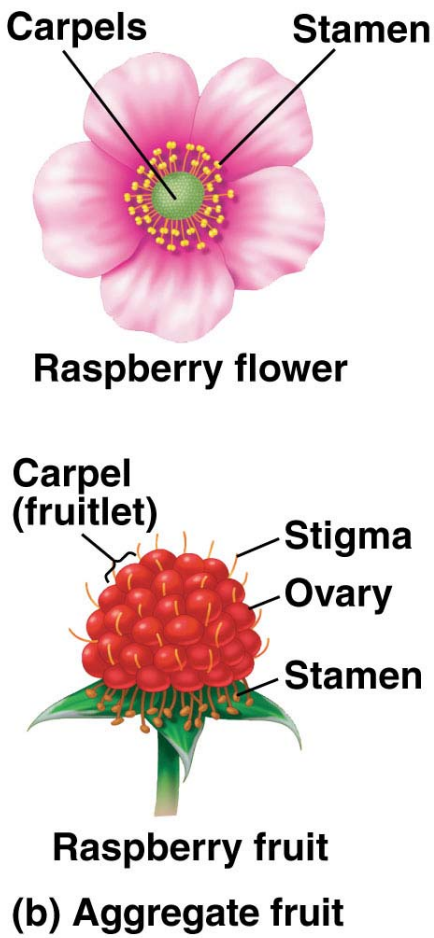


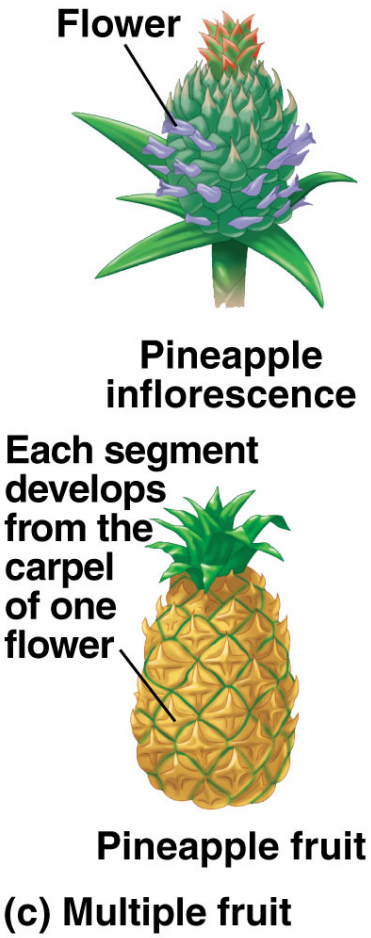
Formation of fruit

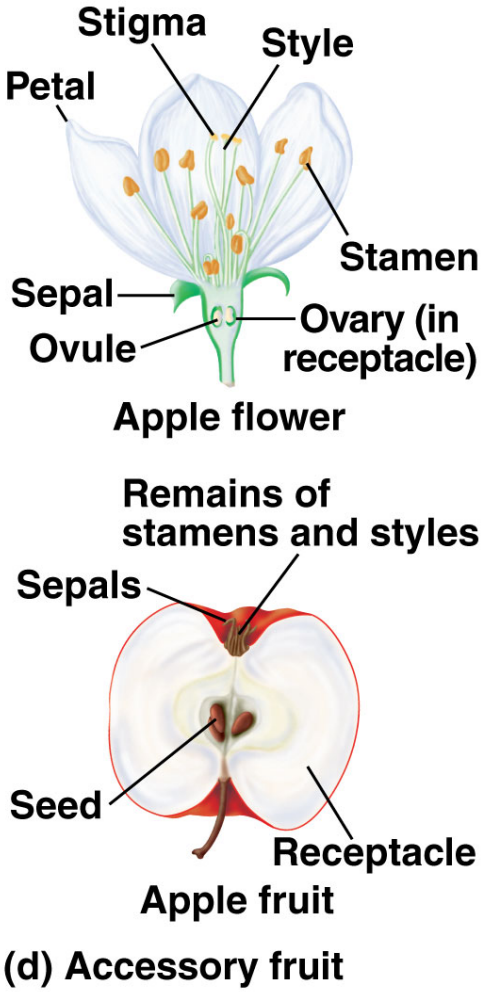


Type of fruit



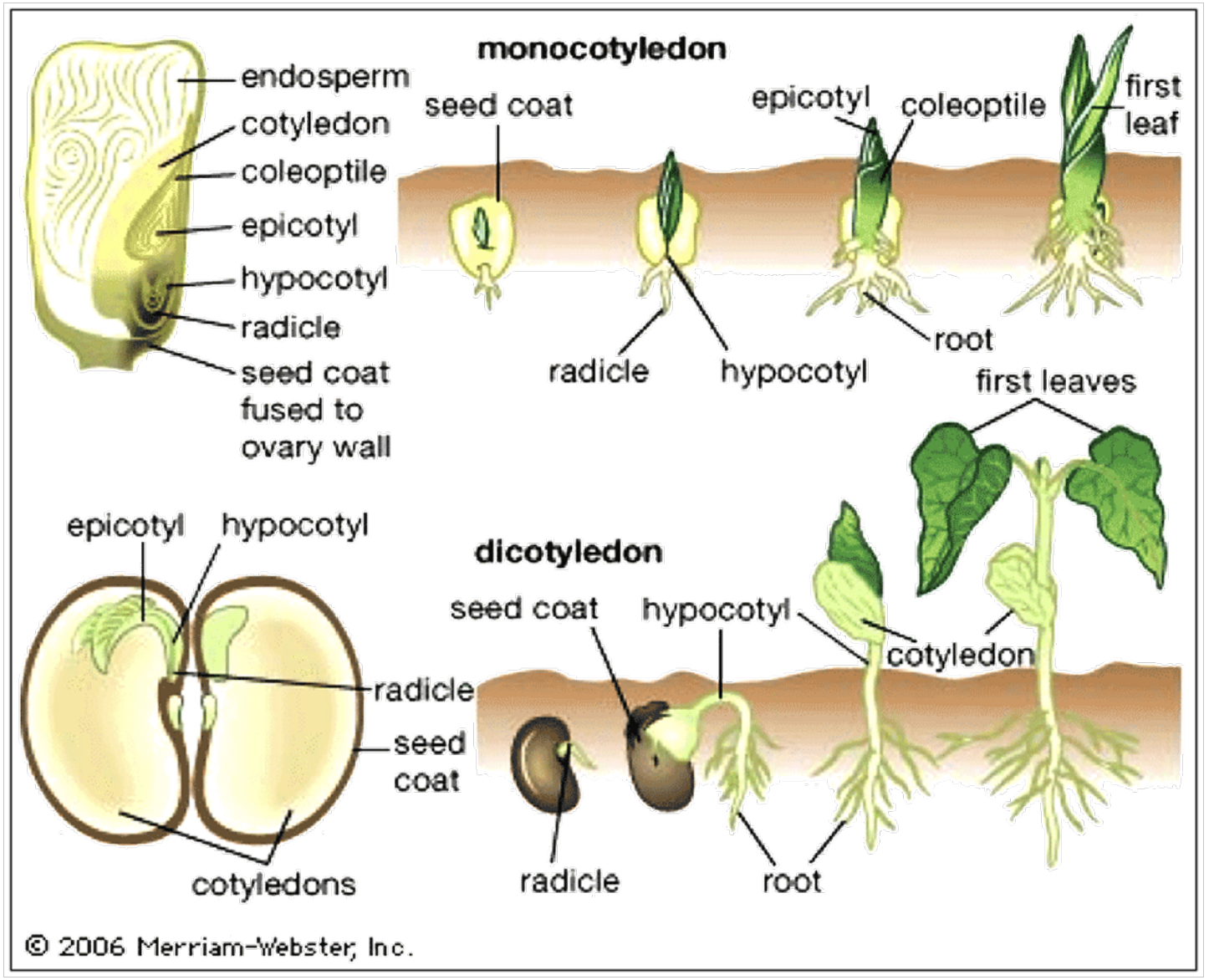






© 2011 Pearson Education, Inc.

Seed Germination

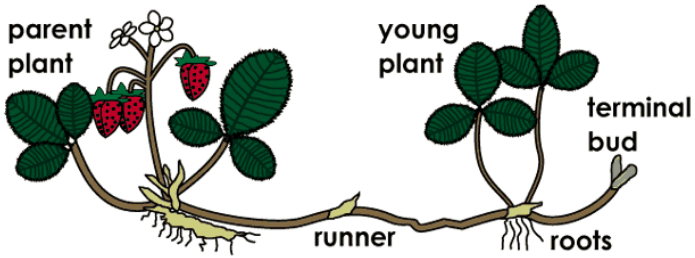


Conditions Needed for Seed germination

- **Water**
- **Oxygen**
- **Temperature**
- **Light or darkness**

vegetative reproduction

- (Vegetative propagation)
- is a form of asexual reproduction in plants. It does not involve flowers, pollination and seed production.
- Instead, a new plant grows from a vegetative part, usually a stem, of the parent plant.



Vegetative structures

Bulbs

- Bulbs consist of very short stems with closely packed leaves arranged in concentric circles round the stem.

Vegetative structures

Corms

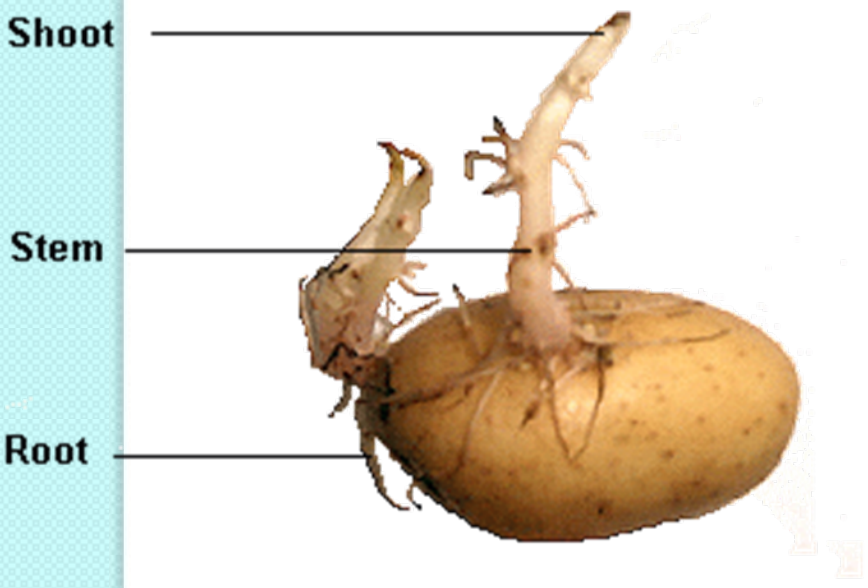
- Corms also have a short stem but in this case it is the stem itself which swells and stores food. The circular leaves form only papery scales.

Vegetative structures

- **Rhizomes (root)**
- Rhizomes are stems which grow horizontally under the ground. In some cases the underground stems are swollen with food reserves.

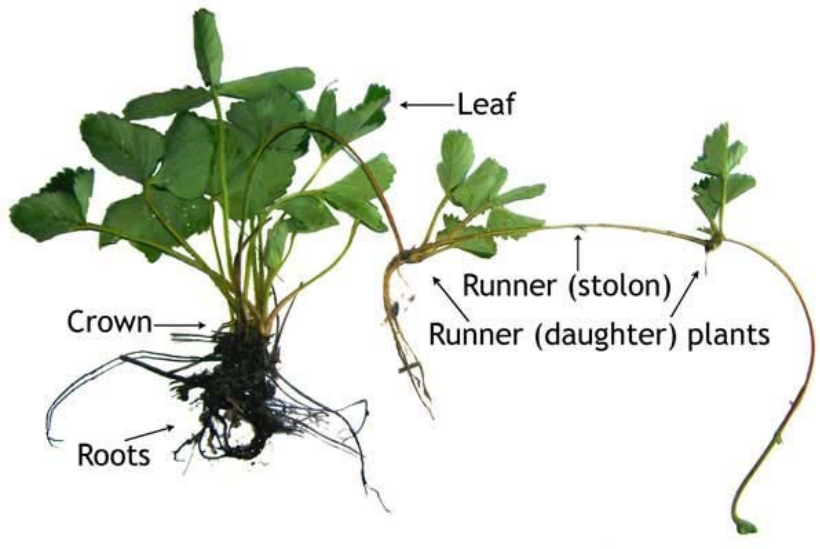
Vegetative structures

- **Stem tubers**
- Stem tubers are enlarged, fleshy underground stems.



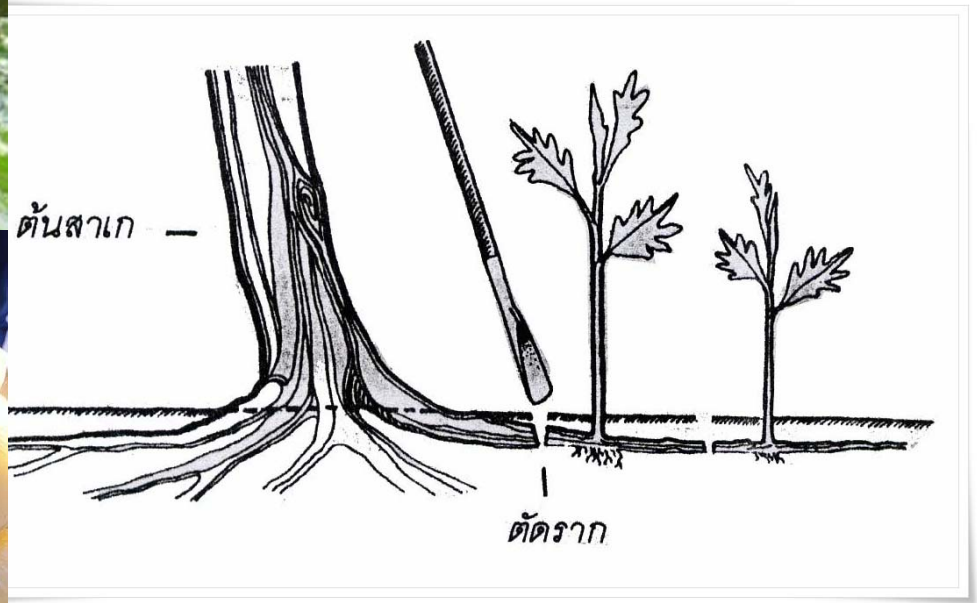
Vegetative structures

- **Stolons**
- stems form a rather different type of runner in which the main shoot forms the new individual.



Vegetative structures

- **Root**



Vegetative structures

- **Leave**

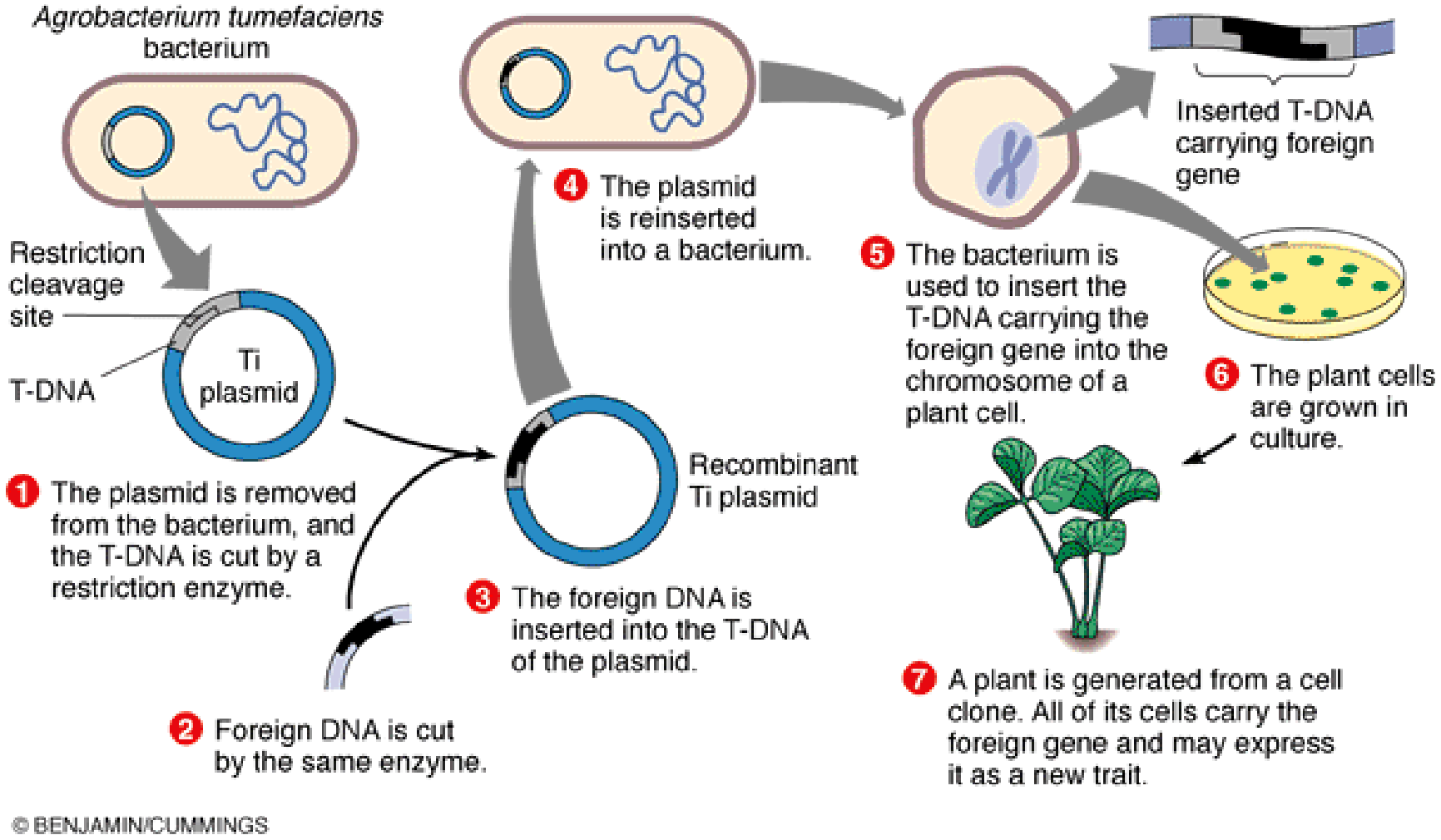
Biotechnology

Biotechnology is defined as the application of biological process to improve human health and food production.

Biotechnology

Genetic engineering is a process in which DNA technology is used to introduce desirable traits into organisms

Genetic engineering



GMOs

genetically modified organisms (GMOs)

is organisms that have changed genetic by genetic engineering

Chemical industry

Medicine

Food industry

Agriculture

Environmental protection

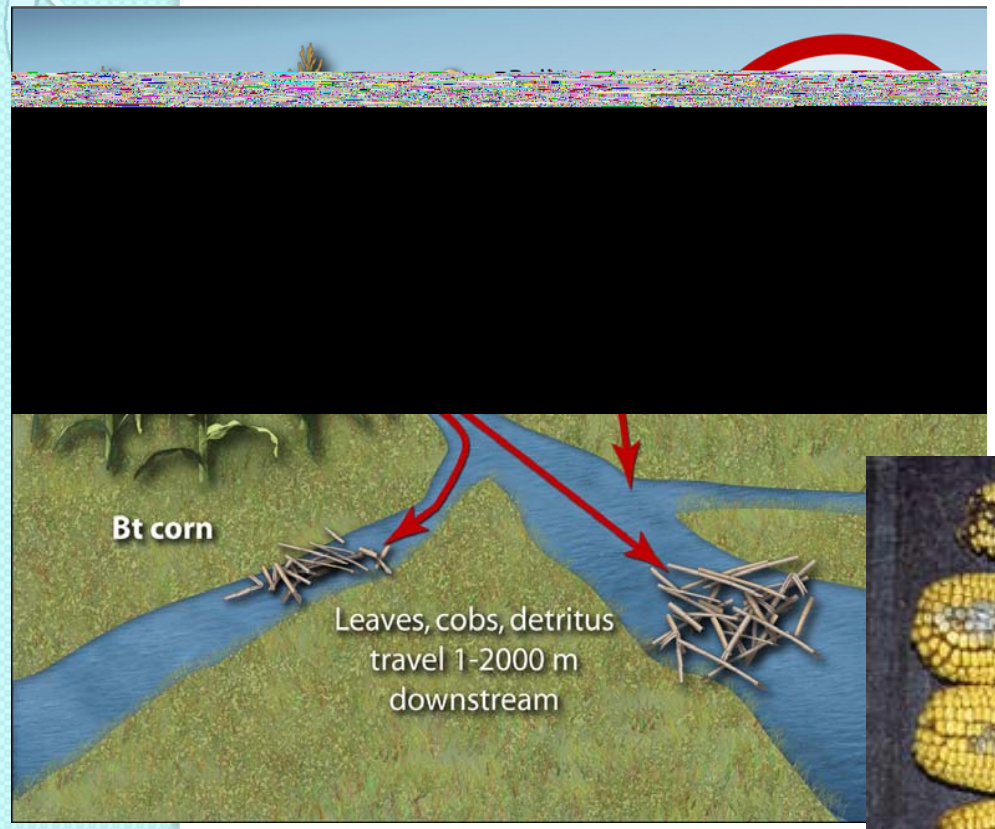
Power industry

?

Biotechnology in agriculture

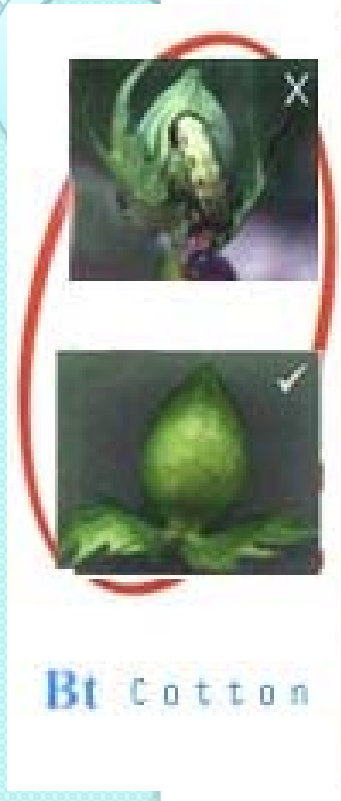
- Increase food yields
- More nutrition
- More resistance to droughts, pests, water extremes and diseases
- Reduce pollution from pesticides

Bt corn


Bt corn
Leaves, cobs, detritus
travel 1-2000 m
downstream


©Gary Munkvold

Bt cotton



Biotechnology in industry

- Beer, cheese, bread, antibiotic, detergent and textile

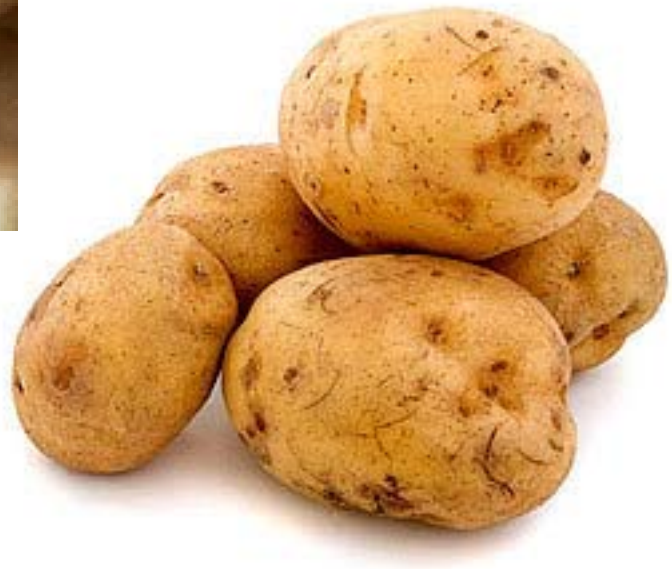
- Use enzyme from microbiology

Biotechnology in food

- More nutrition
- Soybean and maize have higher protein

Biotechnology in food

- higher protein in potato



Golden rice

- Rice contain vitamin A

Canola

Biotechnology in food

- Fruit and vegetable stay fresh longer

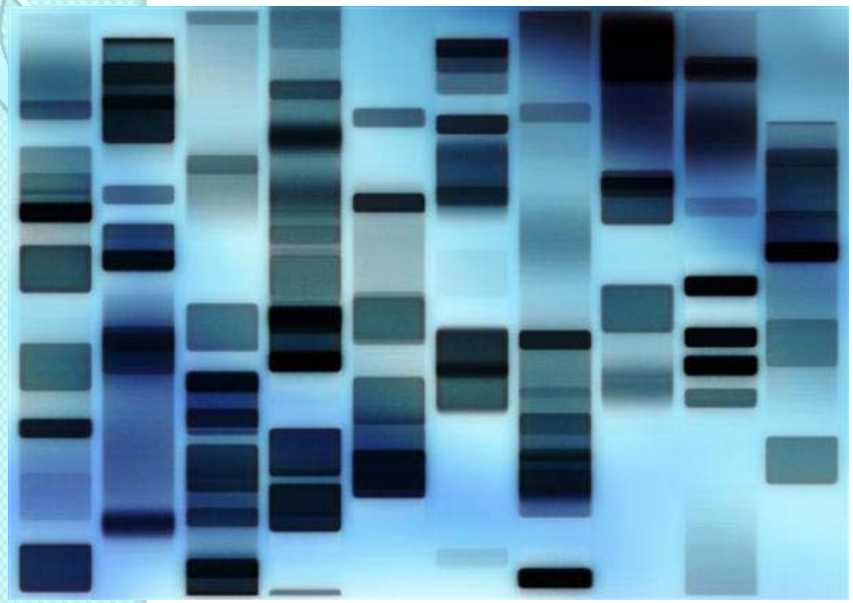
Biotechnology in medicine

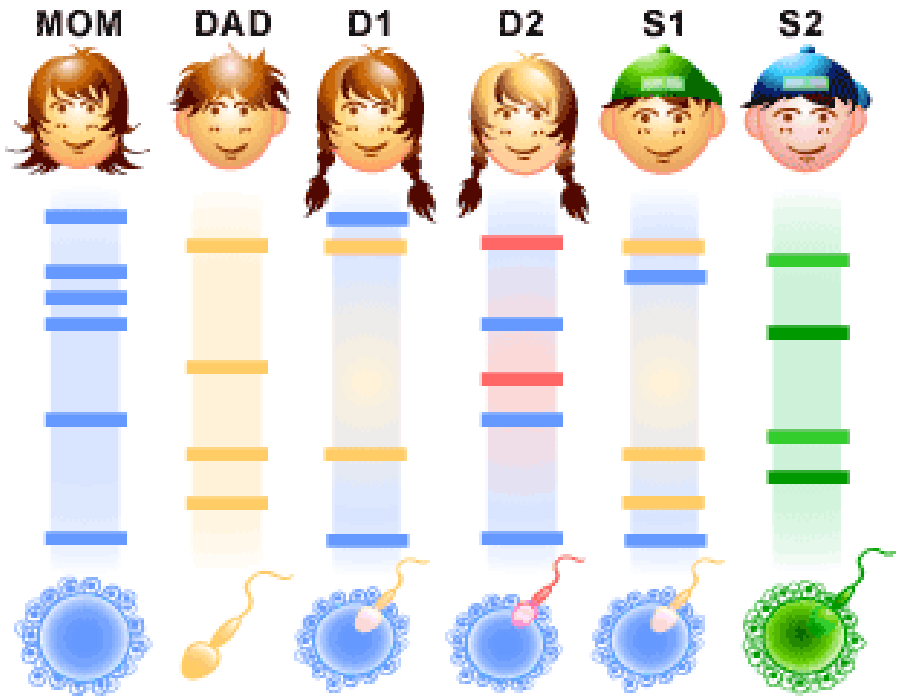
- Produce new drugs and medicine

Biotechnology in medicine

- Field diseases by gene

DNA fingerprinting





DNA fingerprinting