Flowering Plants

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FLOWERING PLANTS

These are plants which bear flowers.

They are divided into two main groups;

Monocotyledonous plants: These have one seed cotyledon or seed leaf for example maize plant.

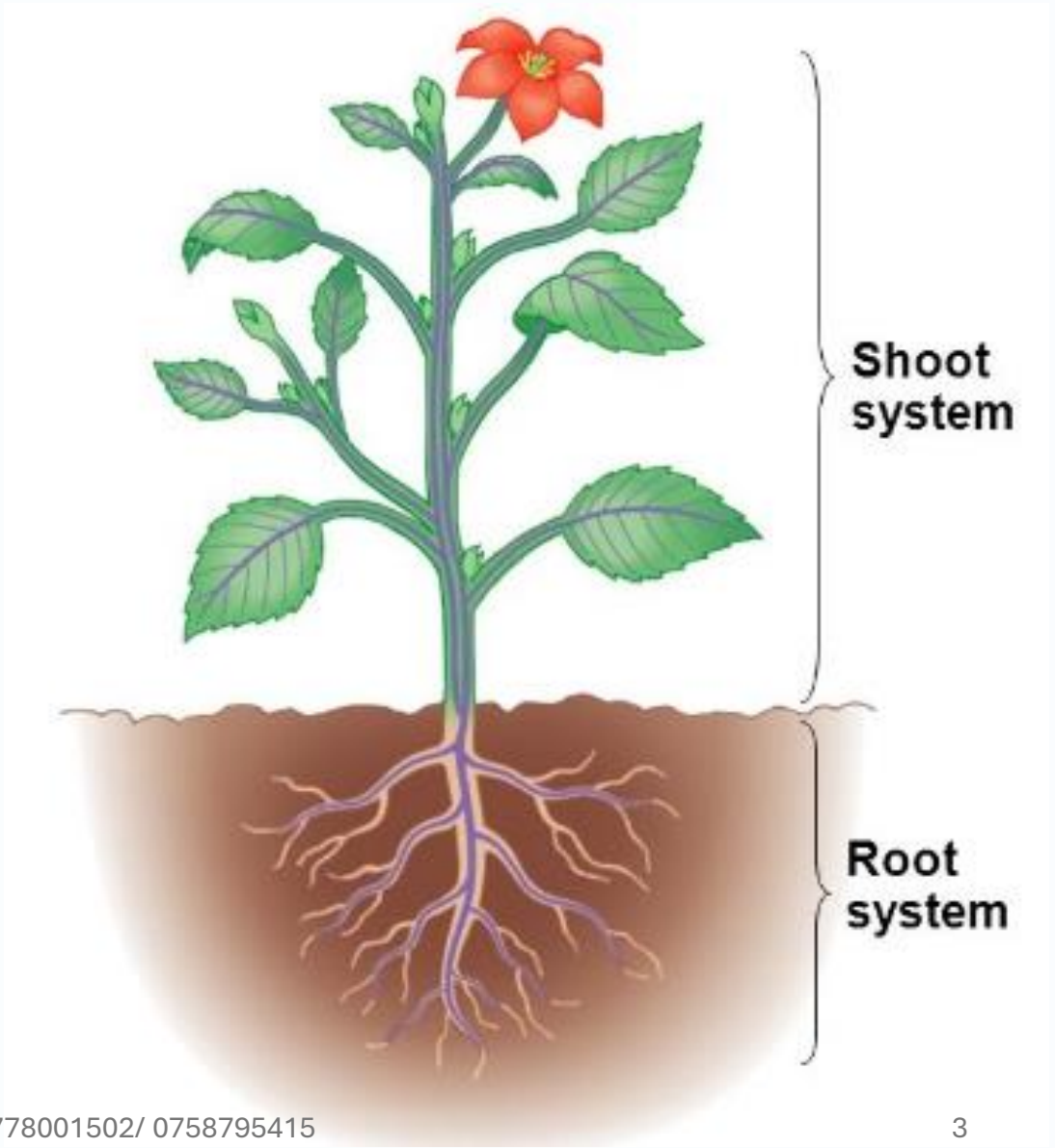
Dicotyledonous plants: These are plants with two seed cotyledons for example bean plants.

External parts of a typical flowering plant

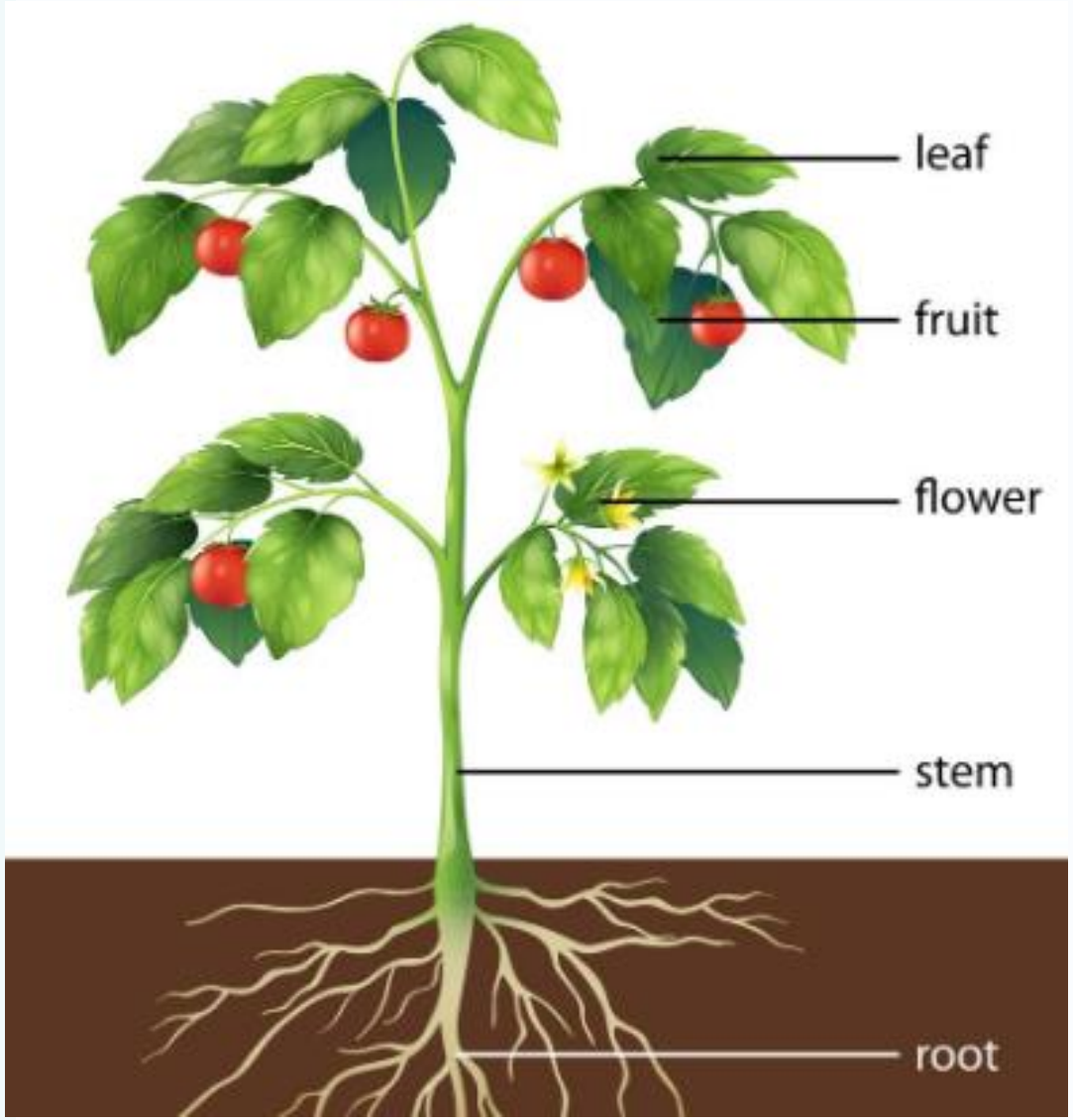
Flowering plants have different parts that are grouped into two systems i.e.

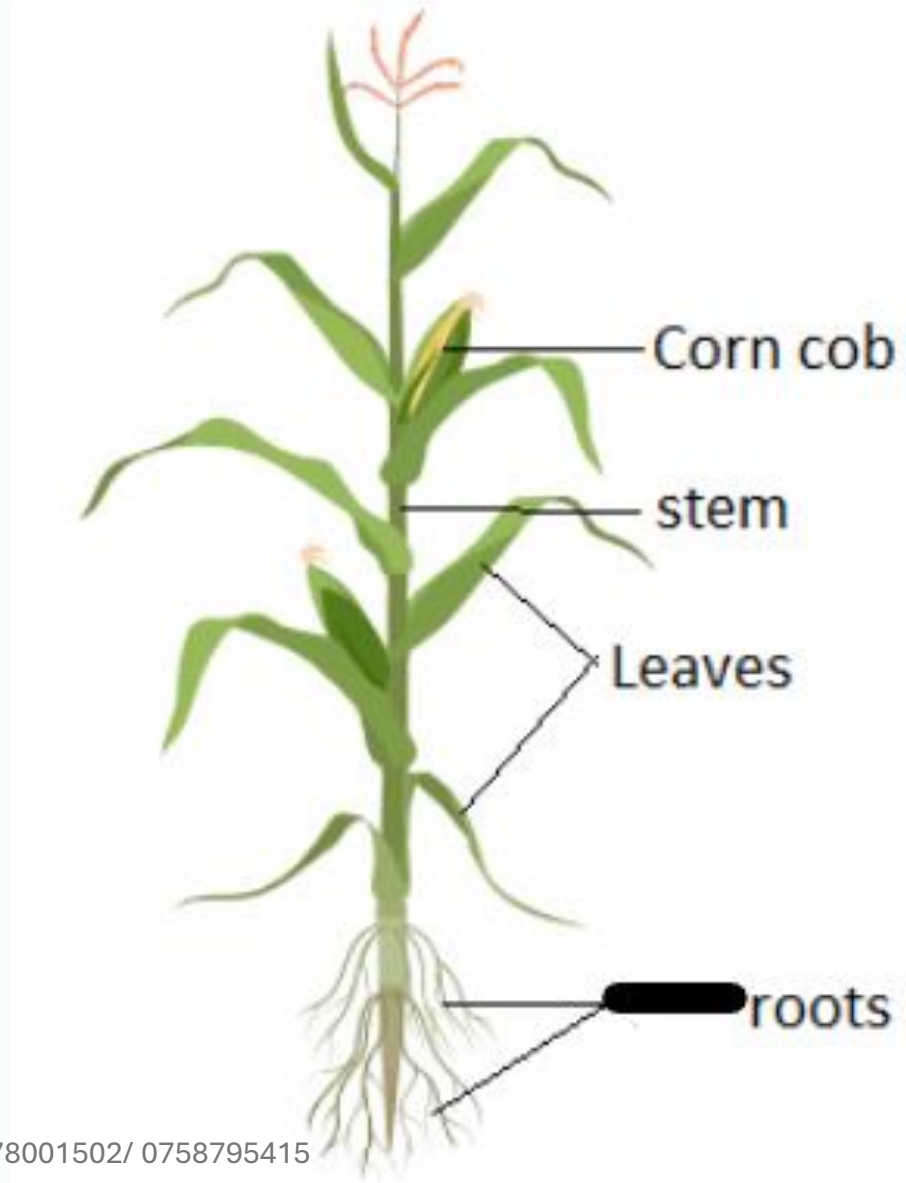
Shoot system: This is the portion of the plant above the ground. It is composed of **flowers, stems, leaves and fruits.**

Root system: This is the portion of the plant below the ground. It is composed of **roots**.



Drawing showing the external parts of a typical dicot & monocot plant





Comparing structural features of dicotyledonous plants and monocotyledonous plants

Dicotyledonous plants	*Monocotyledonous plants*
They have a broad leaf lamina	They have a narrow leaf lamina
Their leaves have network venation	Their leaves have parallel venation
They have tap root system	They have fibrous root system
Their leaves have a leaf stalk attached to the stem	Their leaf stalk is modified into a leaf sheath
Their flower parts are brightly colored	Their flower parts are dull colored

Root system

The root system of a plant consists of just one organ of the plant, the Roots.

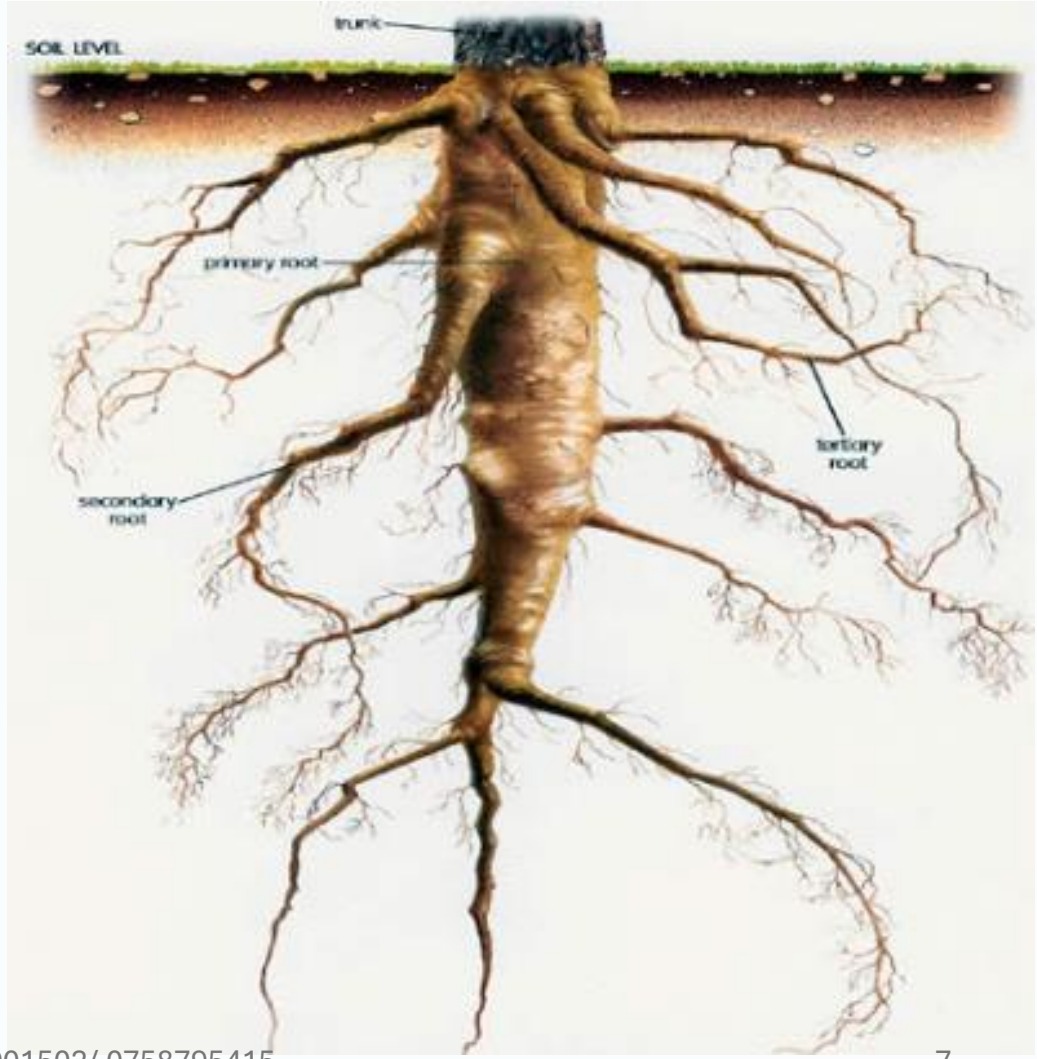
Types of root systems

Fibrous root system

Comprises of many slender roots of approximately the same size and length, that spread out in all directions from a common point at the base of the stem. This root system is more common among Monocot plants.

Tap root system

Consists of a main root originating from the base of the stem, growing downwards into the soil. Smaller roots known as **lateral roots** branch sideways from the main root.



Adventitious roots

These are roots that grow directly from the Stem but Not from the main root.

Primary functions of roots

- ✓Anchor/fix the plant firmly into the soil.
- ✓Absorb water and mineral nutrients from the soil
- ✓Form a pathway for water and mineral nutrients from the soil into the shoot.

Modified roots

These are roots adapted to perform Additional functions for the plant other than their main or primary roles.

Types of modified roots

Root tubers or storage roots

Examples include; **carrots, cassava roots and sweet potato roots**.

Modification/adaptation: These roots are thick (swollen), fleshy and succulent

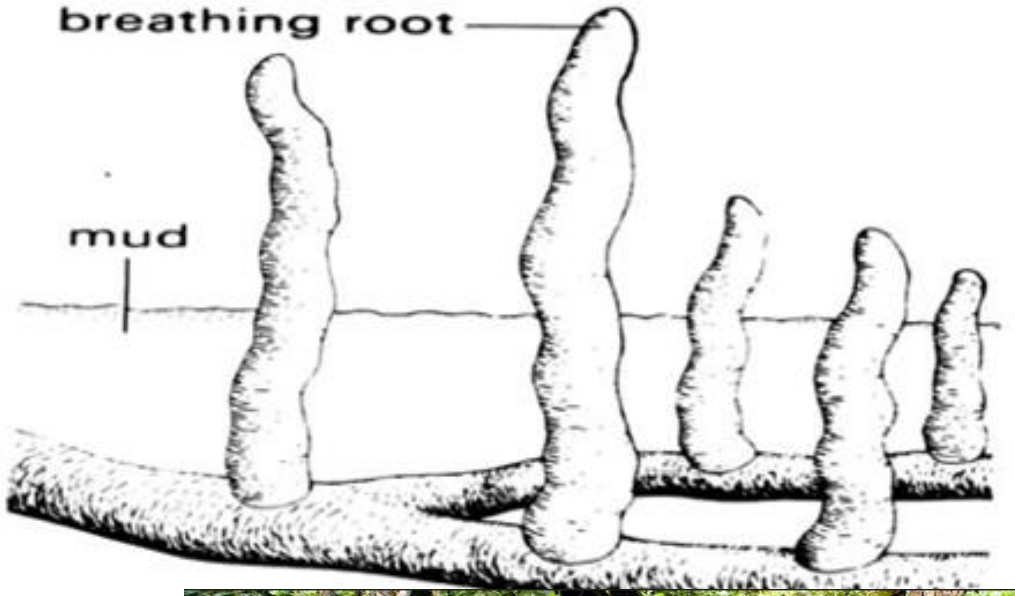
Modified role: Storage for food materials and water for the plant.

Breathing roots

Examples include; **roots of white and black mangrove.**

These are branch roots which grow from the main root up through the mud into the air.

Modified role: Absorb oxygen from the atmosphere used for respiration of cells in roots or for breathing.



Buttress roots

Examples include; roots of **Mvule trees**

These are large thick roots growing from the base of certain stems.

Modified role: Provide extra support to the plant by anchoring it firmly into the soil.

Roots of legume plants

Examples include; **beans, ground nuts**

These bear root nodules that contain the nitrogen fixing bacteria known as Rhizobium.

Modified role: Bacteria fixes atmospheric nitrogen into the soil.

Prop roots

Examples include; on **maize, sugarcane, sorghum.**

These roots often develop from nodes and branches of the stem close to the soil surface,

Modified role: Provide extra support to plants having weak stems.

Clasping roots

These are roots that grow from the nodes of plants with weak stems such as **vanilla, orchids** and then cling or clasp onto other nearby plants.

Modified role: Enable plants with weak stems to climb around other plant structures for support.

Stilt roots

These roots develop from the main stem in certain plants such as **red mangrove** which grow in muddy areas.

Modified role: Provide additional support to the plant.

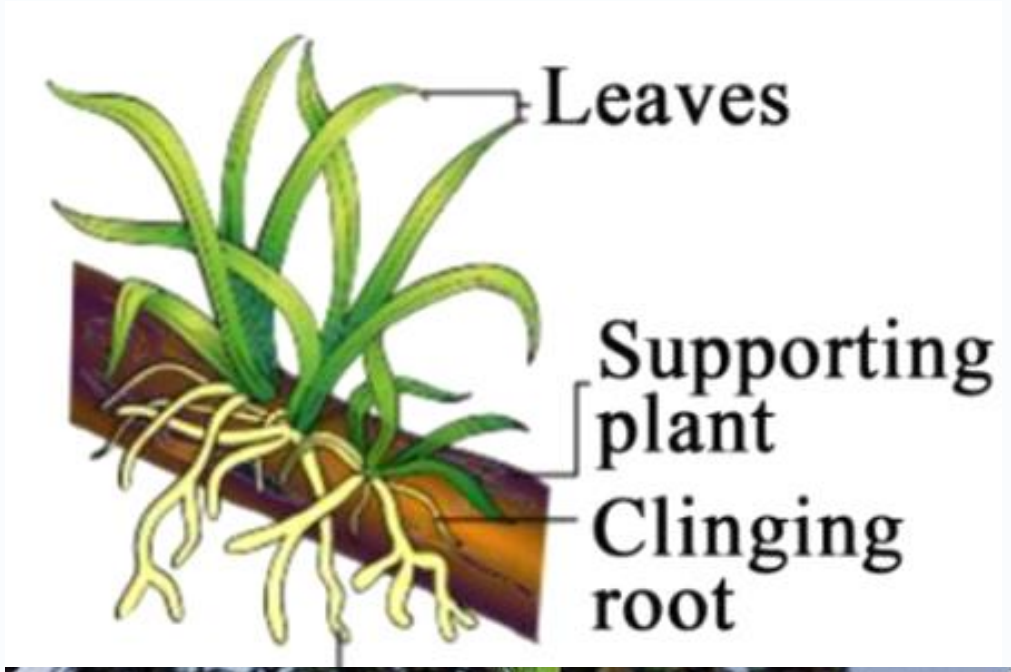
Epiphytic roots

These grow on certain plants called **epiphytes**.

Epiphytes are plants which grow and get support from other plants.

These roots hang freely in the atmosphere.

Modified role: Absorb moisture from the atmosphere.



Sucking roots

These are roots found growing on certain parasitic plants e.g. **figs (Mituba).**

They grow from the stem and penetrate the host plant.

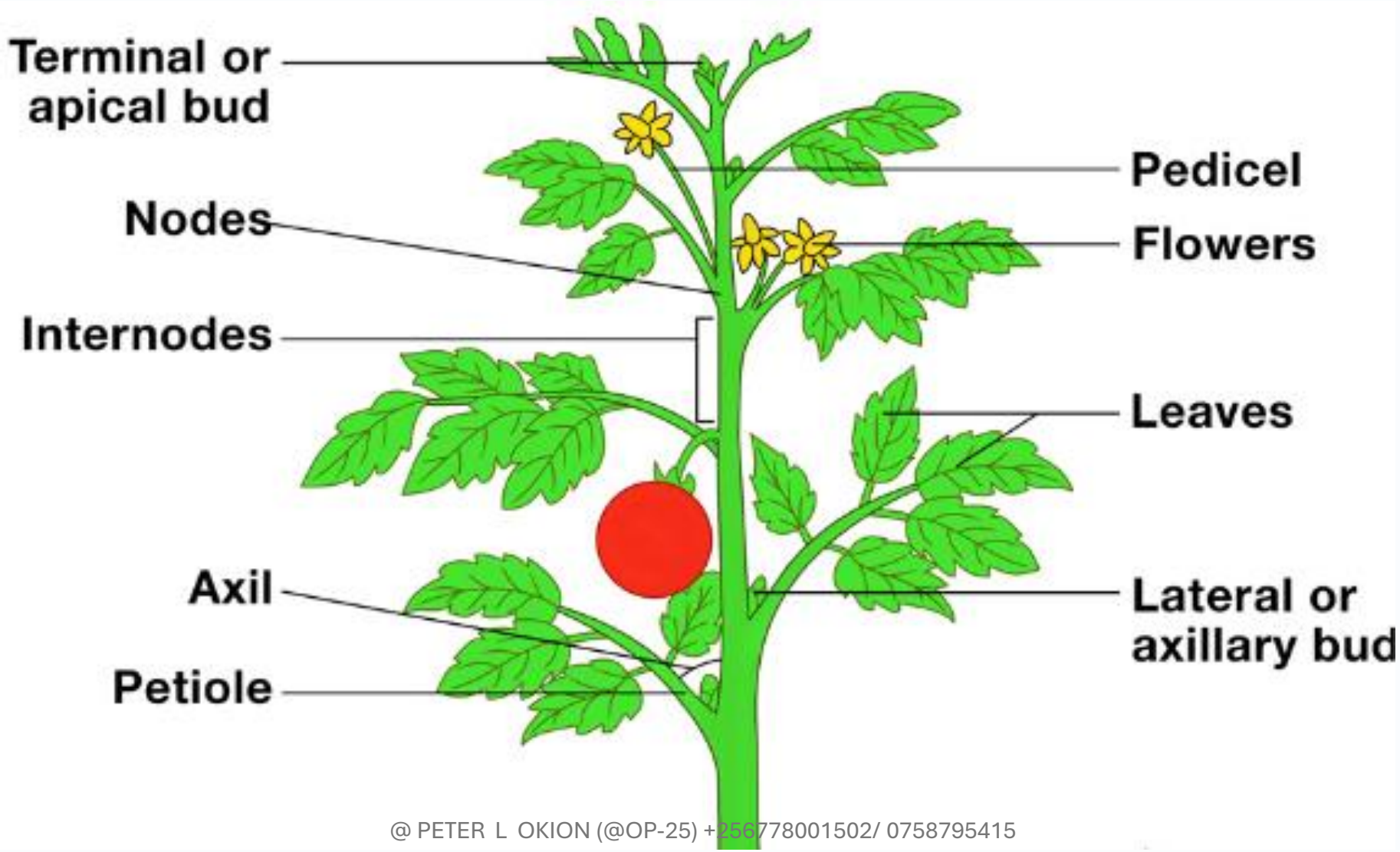
Modified role: Absorb water, mineral salts and organic food compounds from the **host plant**.

Stems

This is the ascending portion of the plant axis. It is the largest part of the plant comprising of several different parts.

Stems can be **Erect** (those that can support themselves in an upright position), **Weak** (those that can not support themselves upright) or **Underground** (modified stems that remain permanently underground)

Parts of a stem



Axillary or lateral bud: This part is found between a leaf stalk and the main stem. It develops into a branch, leaf or flower.

Apical or Terminal bud: Grows from the tip of the stem or branch. It increases the length of the stem or branch.

Node: The point of origin of a leaf/branch/flower on a stem.

Internode: The section of the stem between two successive nodes.

Branch: A side stem that develops from an axillary bud.

Functions of the stem to a plant

Characteristics stems

- ✓Have nodes and internodes
- ✓Has buds

- ✓Transports water and mineral nutrients from the roots to the leaves of the plant through the xylem
- ✓Transport manufactured food from the leaves to other plant parts through the phloem
- ✓Holds the leaves in best positions to receive sunlight and carry out photosynthesis
- ✓Holds flowers in best positions for pollination
- ✓Support fruits in best positions for dispersal

Modified stems

Twinning stems

These are long, slender stems which grow spirally e.g. **morning glory, Dutch man's pipe** and **lianas.**

Modified role: Provide extra support to the plant

Climbing stems

These stems have **Tendrils** which develop from some of the axillary buds. For example; stems of **passion fruit plants, soya beans.**

Modified role: The tendrils provide extra support to a plant by coiling around other structures.

Rhizome

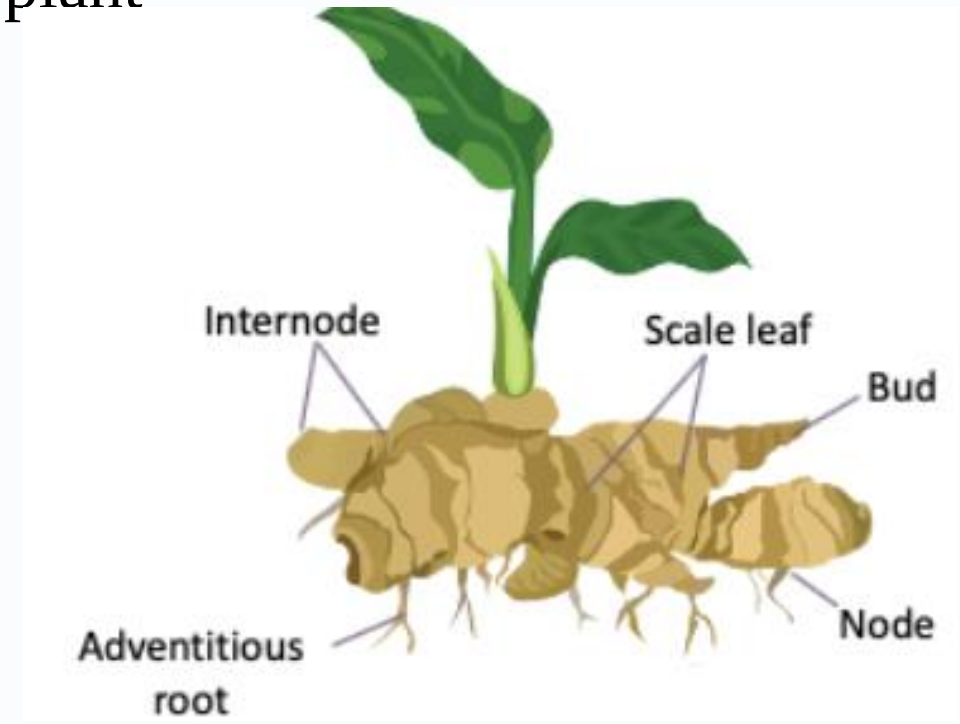
This is a thick horizontal underground stem for example **stem of ginger, Cana lily, couch grass and spear grass.**

Characteristics of Rhizome

- ✓Thick, fleshy and swollen.
- ✓Has scale leaves for protection of the buds from desiccation.
- ✓Has adventitious roots
- ✓Has nodes and internodes
- ✓Has buds

Modified roles of a rhizome

- ✓Vegetative propagation
- ✓Storage of water and food materials for a plant



Adaptations of a Rhizome to its functions

- ✓Thick (swollen) and fleshy (succulent) for storage of food and water for the plants.
- ✓Has buds for vegetative propagation
- ✓Has adventitious roots for absorption of water and mineral nutrients.

Stem tuber

This is a short, fleshy underground swollen stem for example the stem of an **Irish potato**

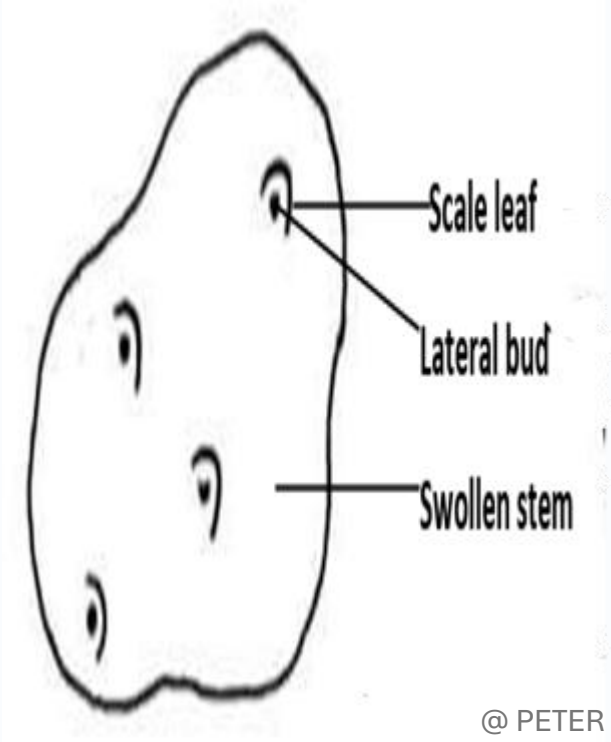
Characteristics of a stem tuber

- ✓Has buds
- ✓Is swollen
- ✓Has scale leaves

Note: The axillary buds and scale leaves form the "**eyes**"

Modified roles of a stem tuber

- ✓Vegetative propagation
- ✓Storage of food and water



Adaptations of the stem tuber to its functions

- ✓Swollen and fleshy to store food and water.
- ✓Has buds for vegetative propagation
- ✓Has scale leaves to protect buds from desiccation

Bulb

This is a short conical-shaped stem with adventitious roots. The stem also has thin, dry scale leaves that surround inner, thick fleshy leaves for example in **onions, garlic.**

Characteristics of a bulb

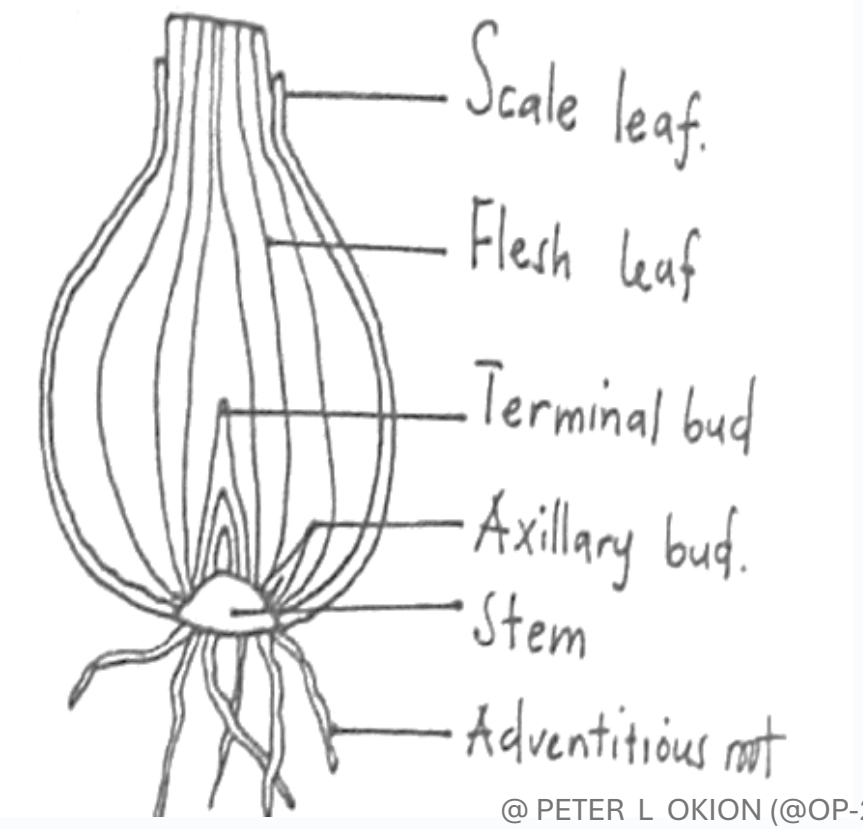
✓Has a short stem with adventitious roots

✓Has thick fleshy leaves

✓Has scale leaves

Modified roles of a bulb

- ✓Storage food and water
- ✓Vegetative propagation



Adaptations of a bulb to its functions

- ✓Has buds for vegetative propagation
- ✓Thick/swollen for storage of water and food
- ✓Has adventitious roots for absorption of water and mineral nutrients

Suckers

A sucker is a creeping stem that grows obliquely upwards, directly giving rise to a leafy shoot.

E.g. **banana, pineapple, sisal plant.**

Modified role: Vegetative propagation i.e. grow into new plants

Stolon

A stolon is a horizontally growing stem that roots at the nodes and develops buds that grow into new plants. E.g. **straw berry.**

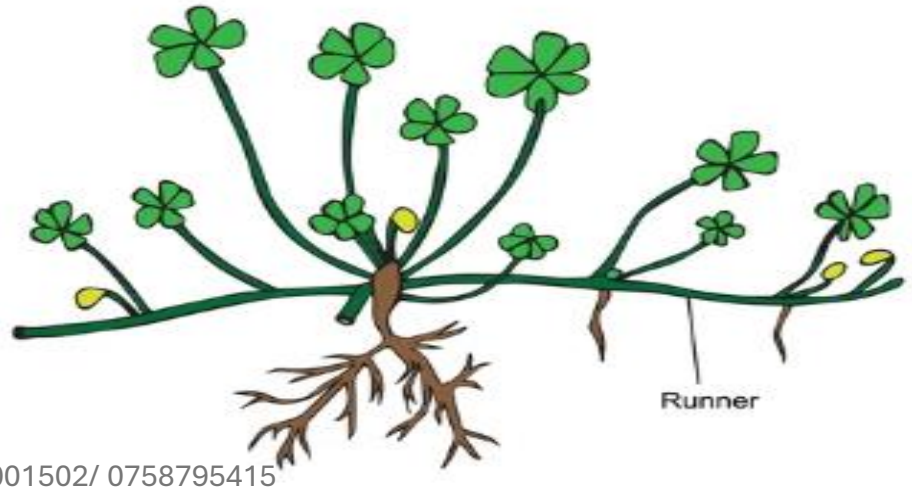
Modified role: Vegetative propagation

Runners

This is a slender trailing stem lying flat on the ground possessing long internodes.

It arises as an axillary bud and creeps some distance away from the mother plant and grow into another plant e.g. **oxalis**.

Modified role: Vegetative propagation



Offset stems

This is a horizontal thickened short stem.

It originates from the axil of the leaf and grows flat on the ground.

It produces many leaves above and a cluster of roots below e.g. **water hyacinth** and **water lettuce**.

Corm

Examples of corms are **coco-yams crocus and yams.**

A corm is a swollen fleshy underground stem that grows in a vertical direction.

It has a terminal bud lying at the top of the stem and has **scale leaves** a rising from the nodes.

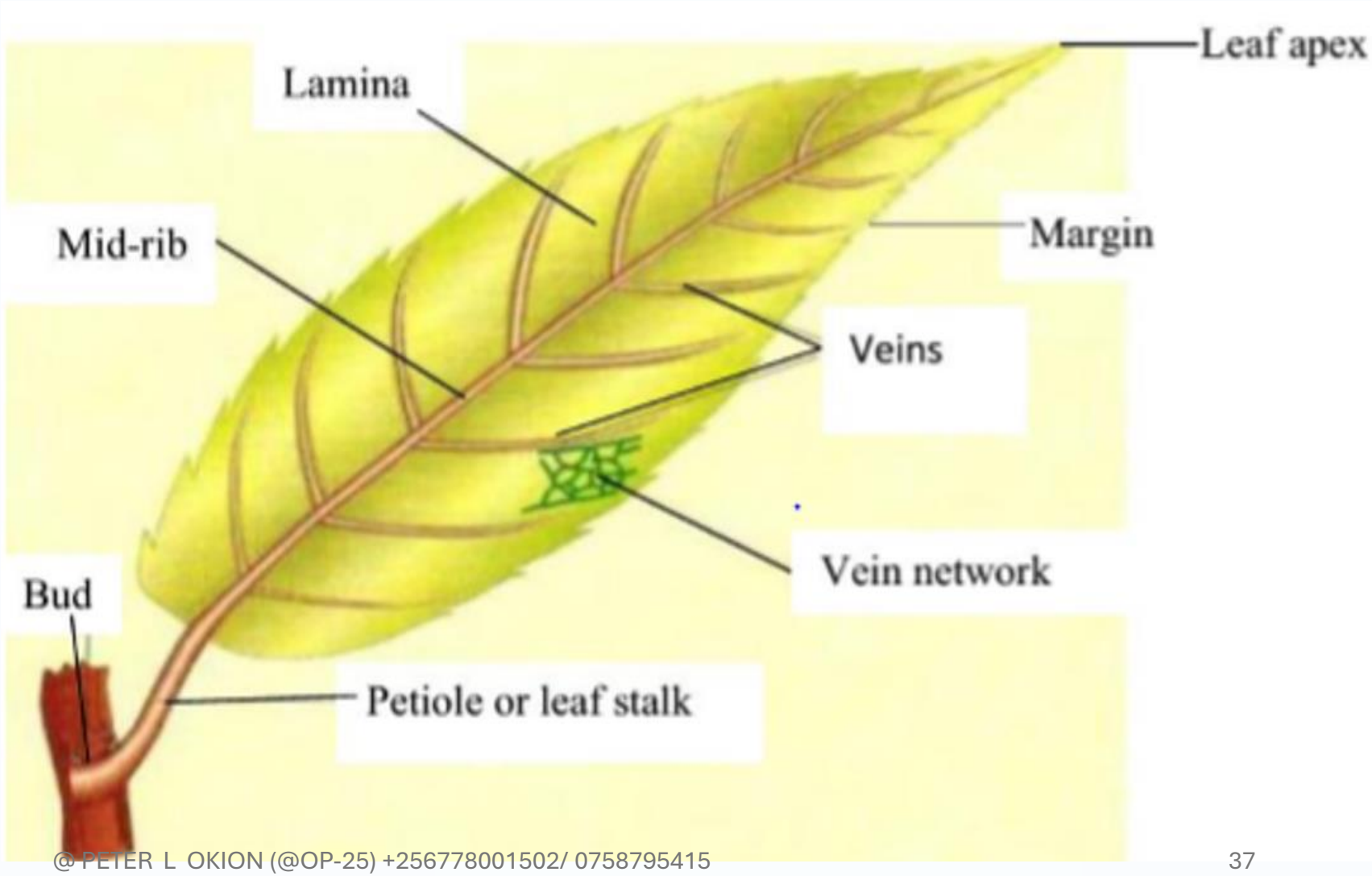
Its roots grow randomly from the stem.

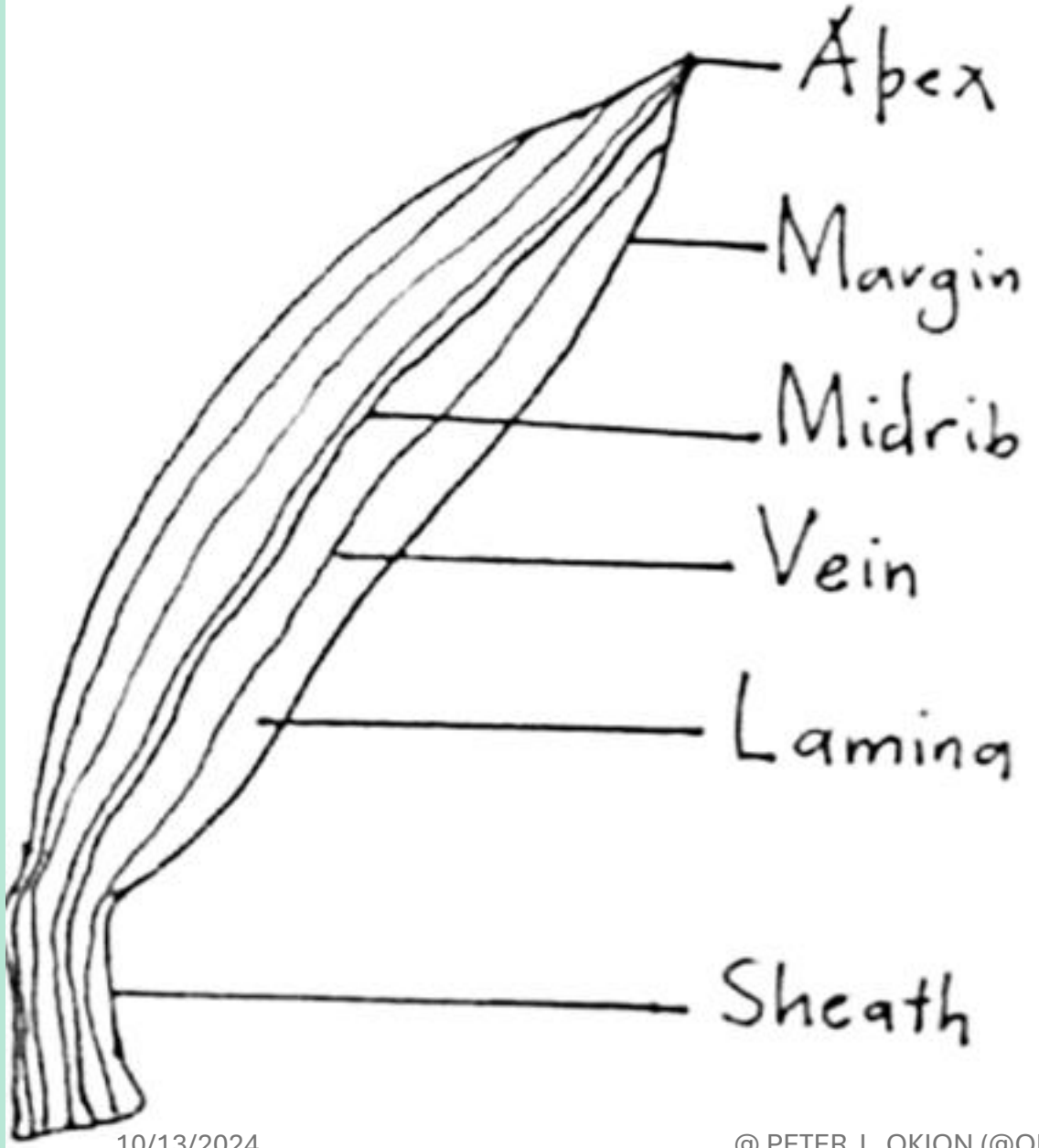
Leaves

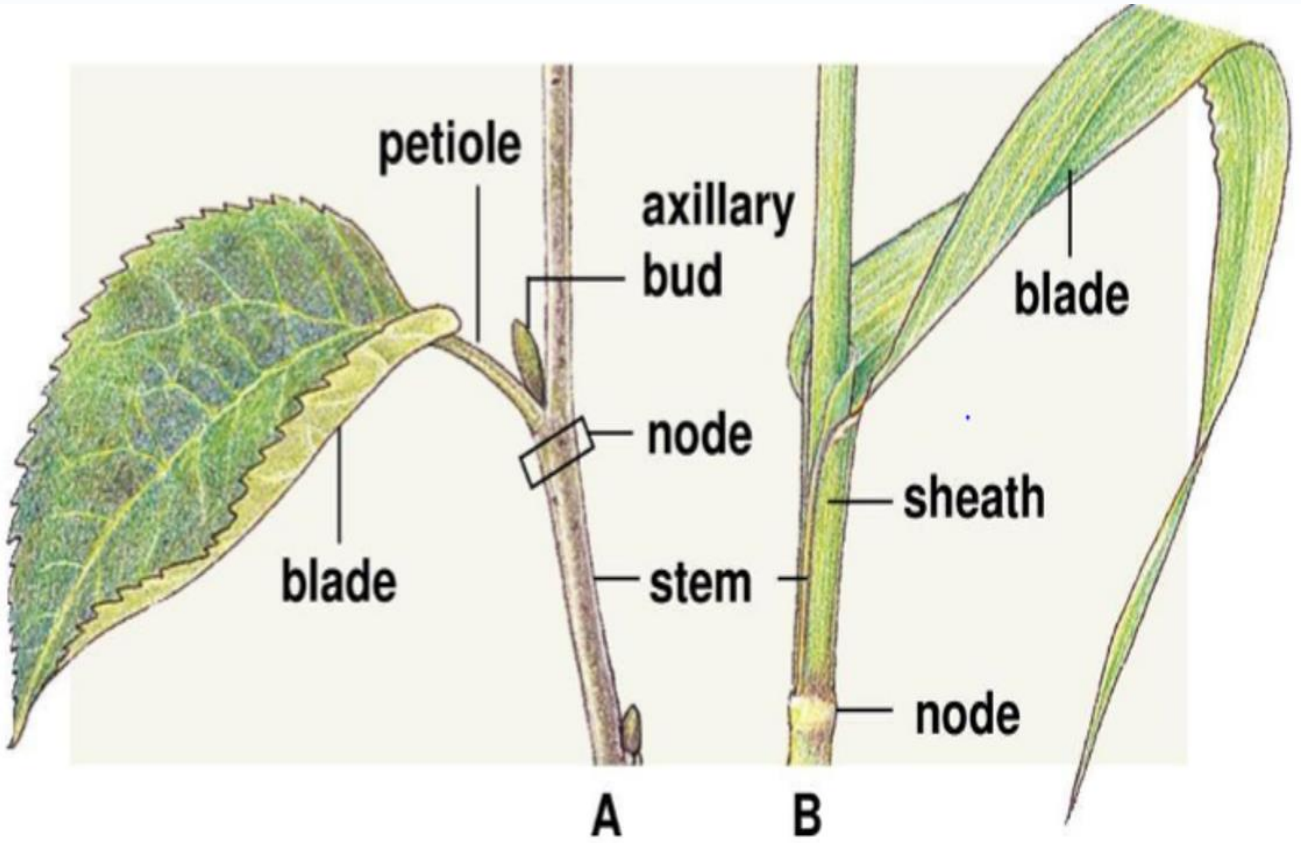
A leaf is a thin flattened plant structure which grows from the nodes of a stem or its branches and has a bud in its axil.

Characteristics of a leaf

- ✓Has a lamina
- ✓Has a petiole
- ✓Has a leaf apex




Apex
Margin
Midrib
Vein
Lamina
Sheath


petiole
axillary
bud
blade
node
sheath
stem
blade
node
A
B

Leaf arrangement

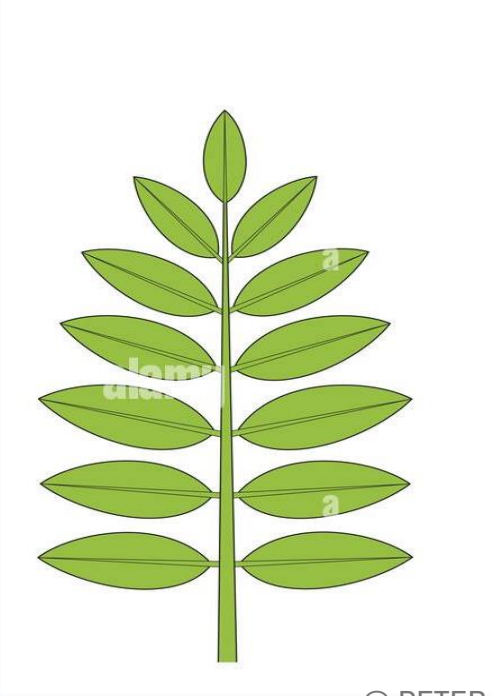
Refers to the arrangement of leaves on the stem of a plant

Types of leaf arrangement

Leaves develop at the nodes of the stem and are arranged in different ways as illustrated below.

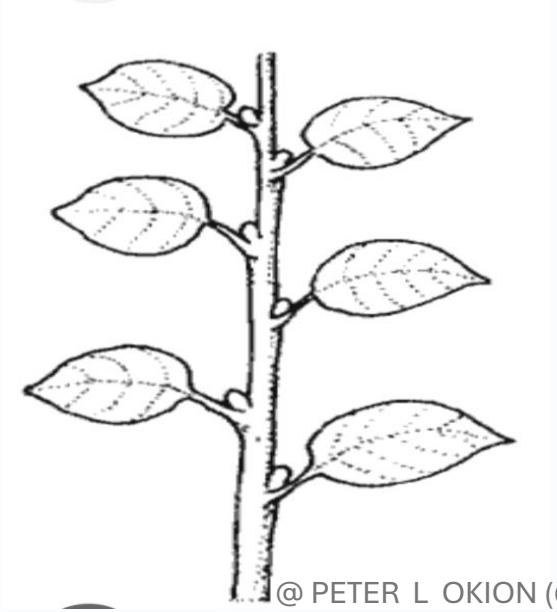
Opposite leaf arrangement

Two leaves arise from the same node but face opposite sides of the stem



Alternate leaf arrangement

One leaf arises from each node but for each two neighbouring nodes, the leaves are on opposite sides of the stem



Whorled leaf arrangement

More than two leaves arise from the same node

Leaf forms

There are two main types of leaves;

✓Simple leaves

✓Compound leaves

Simple leaves

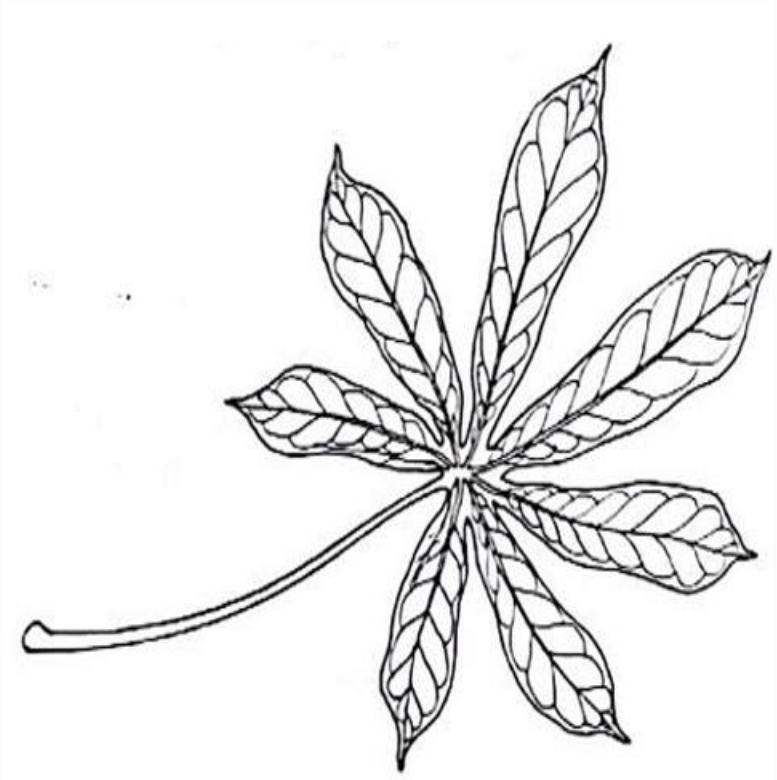
These are leaves whose lamina is either completely undivided or if divided, then the divisions don't reach the midrib.

Forms of simple leaves

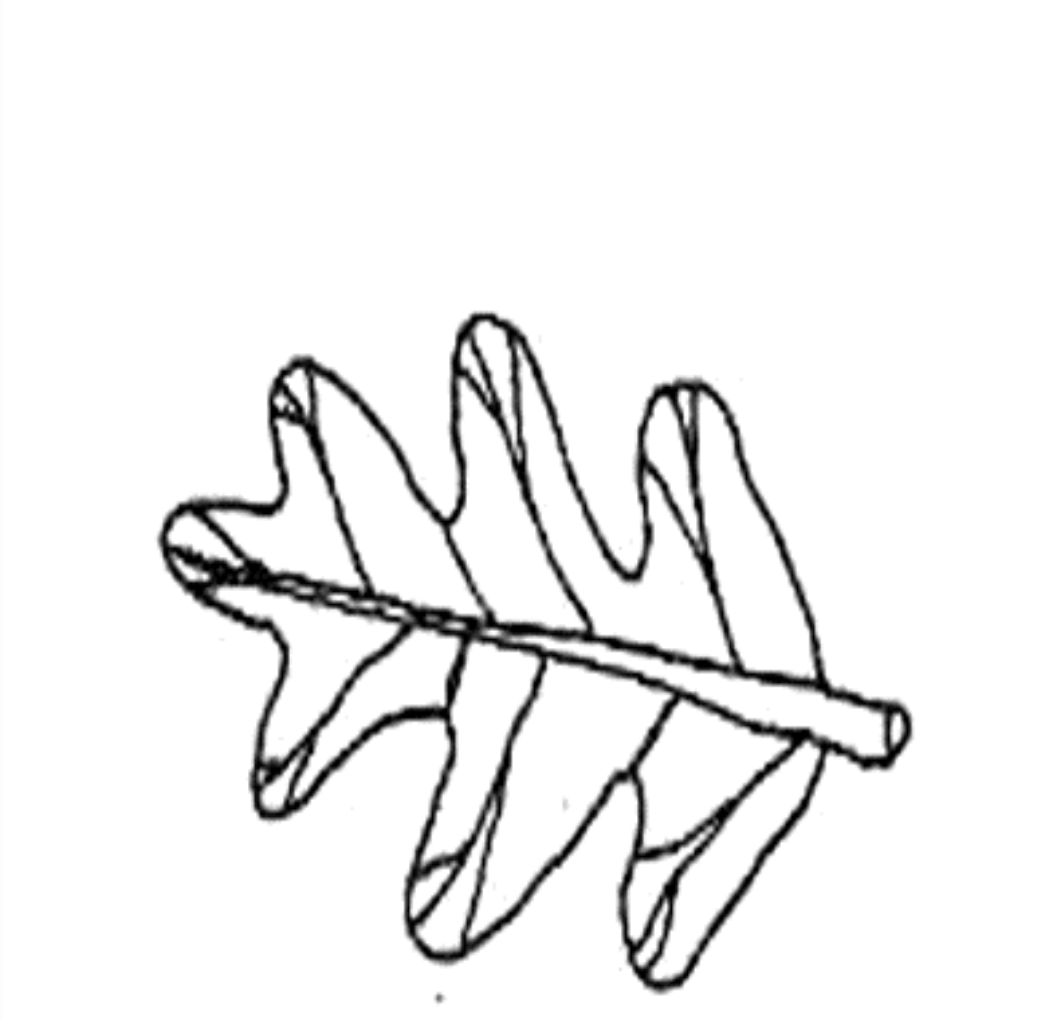
Simple entire

Simple palmate

For-example cassava leaf

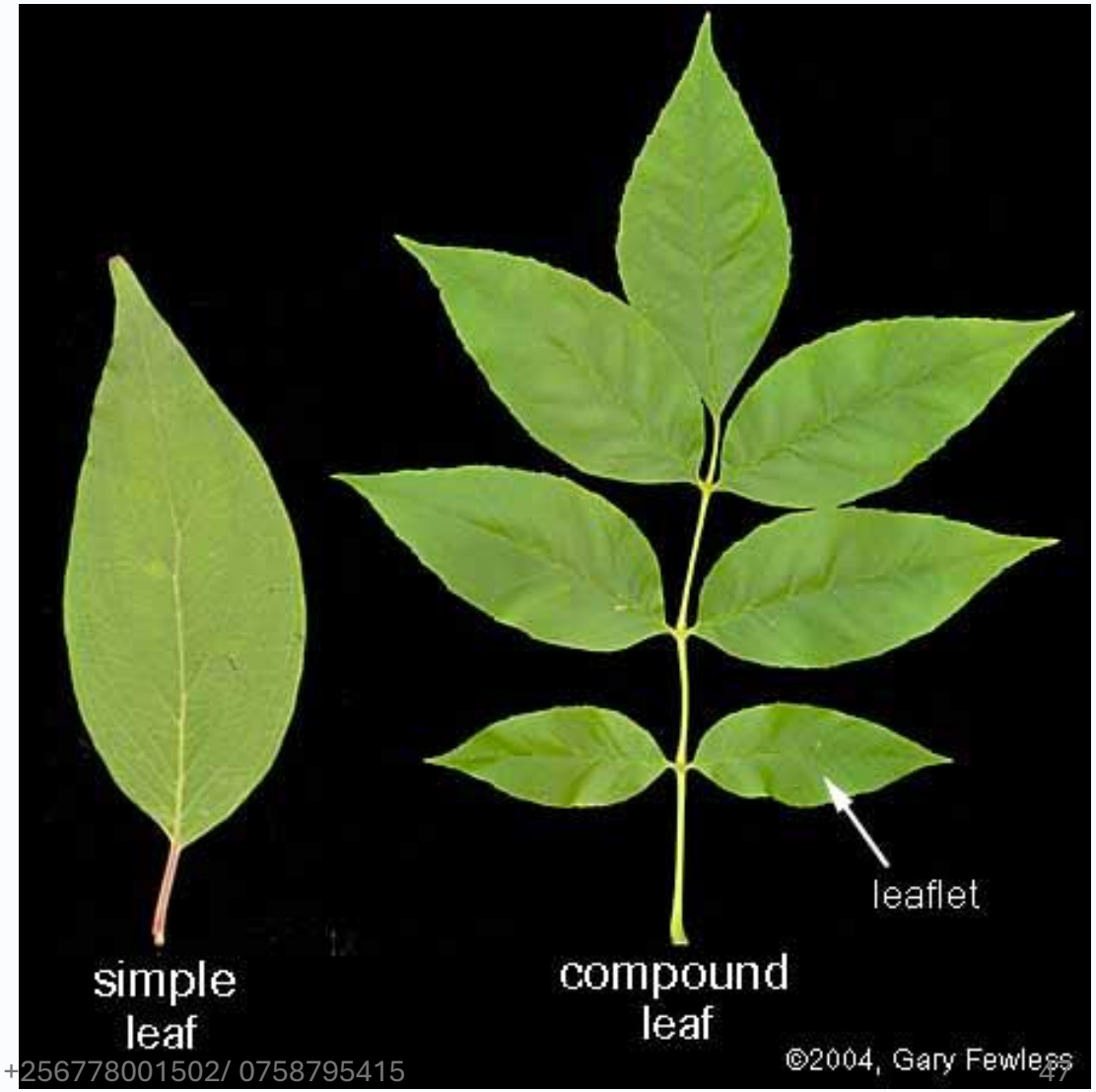


Simple lobed



Compound leaves

These are leaves in which the lamina is completely divided into leaflets.



Forms of compound leaves

Compound trifoliate leaf

The lamina is completely divided into Three leaflets joined at a common petiole as in **beans, peas**.

Compound digitate

Each leaf is completely divided into leaflets which extend outwards from the end of the leaf stalk as in **silk cotton**.

Compound pinnate

The leaflets are arranged in pairs opposite one another or alternately along the midrib of the leaf as in **cassia.**

Compound bi-pinnate

Each pinnate leaflets is further divided into smaller leaflets known as pinnules or pinnulets as in **Jacaranda**

Main or primary roles of leaves to a plant

- ✓Synthesize food for the plant through the process of photosynthesis
- ✓Bear stomata for gaseous exchange
- ✓Carry out transpiration which cools the plant and contributes to transport of water and dissolved mineral nutrients from the roots up the stem

Modified leaves

These are leaves with special features that enable them to perform additional functions for a plant other than the primary functions

Types of modified leaves

Leaves with tendrils

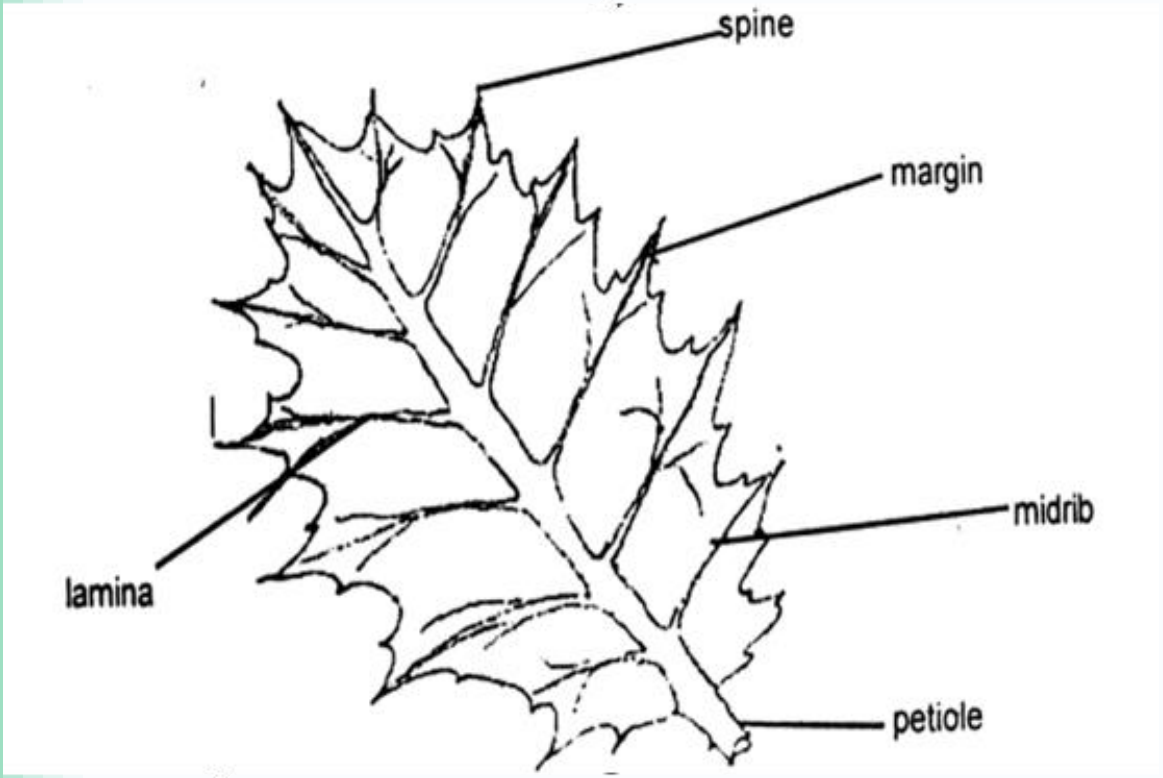
Some leaves such as those of **Peas** have wire like , coiled structures known as leaf tendrils that coil around nearby supports or plants

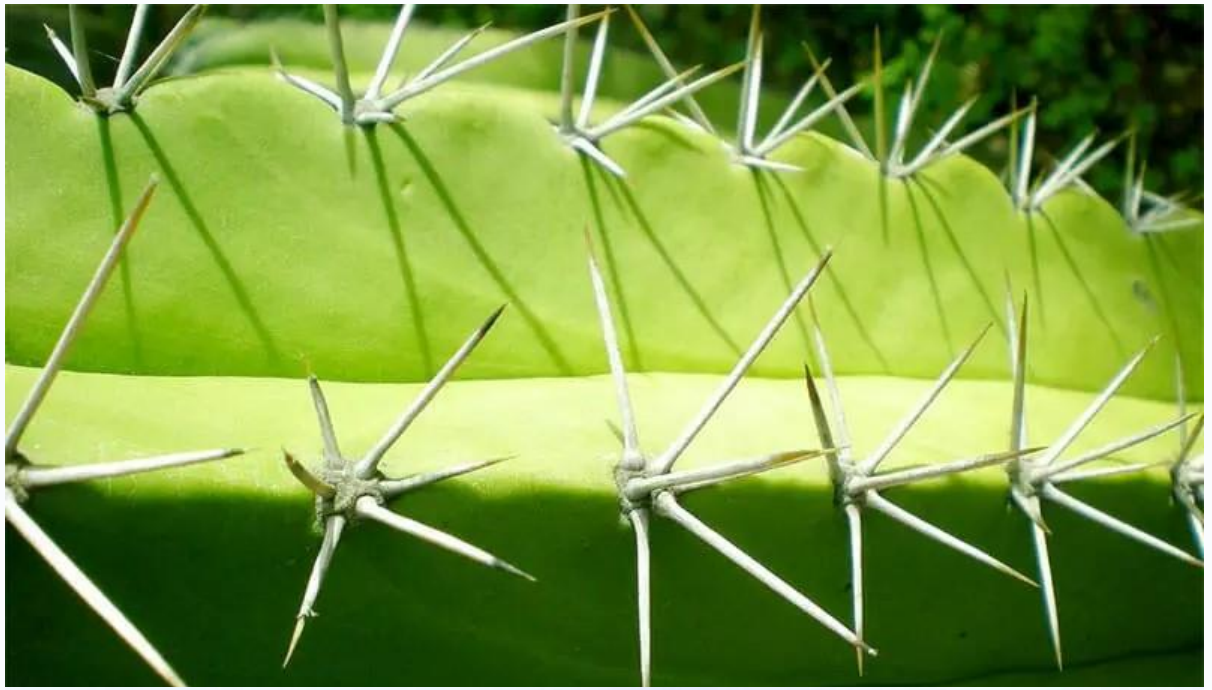
Modified role: Provide extra support to the plant by coiling around nearby structures.

Leaves with spines

Spines are sharp pointed structures which develop on the lamina or margin of certain leaves for example leaves of **aloe vera, cactus, sisal, prickly pear**

Modified role: The spines protect the leaves of the plant from damage by browsing animals.


spine
margin
midrib
lamina
petiole

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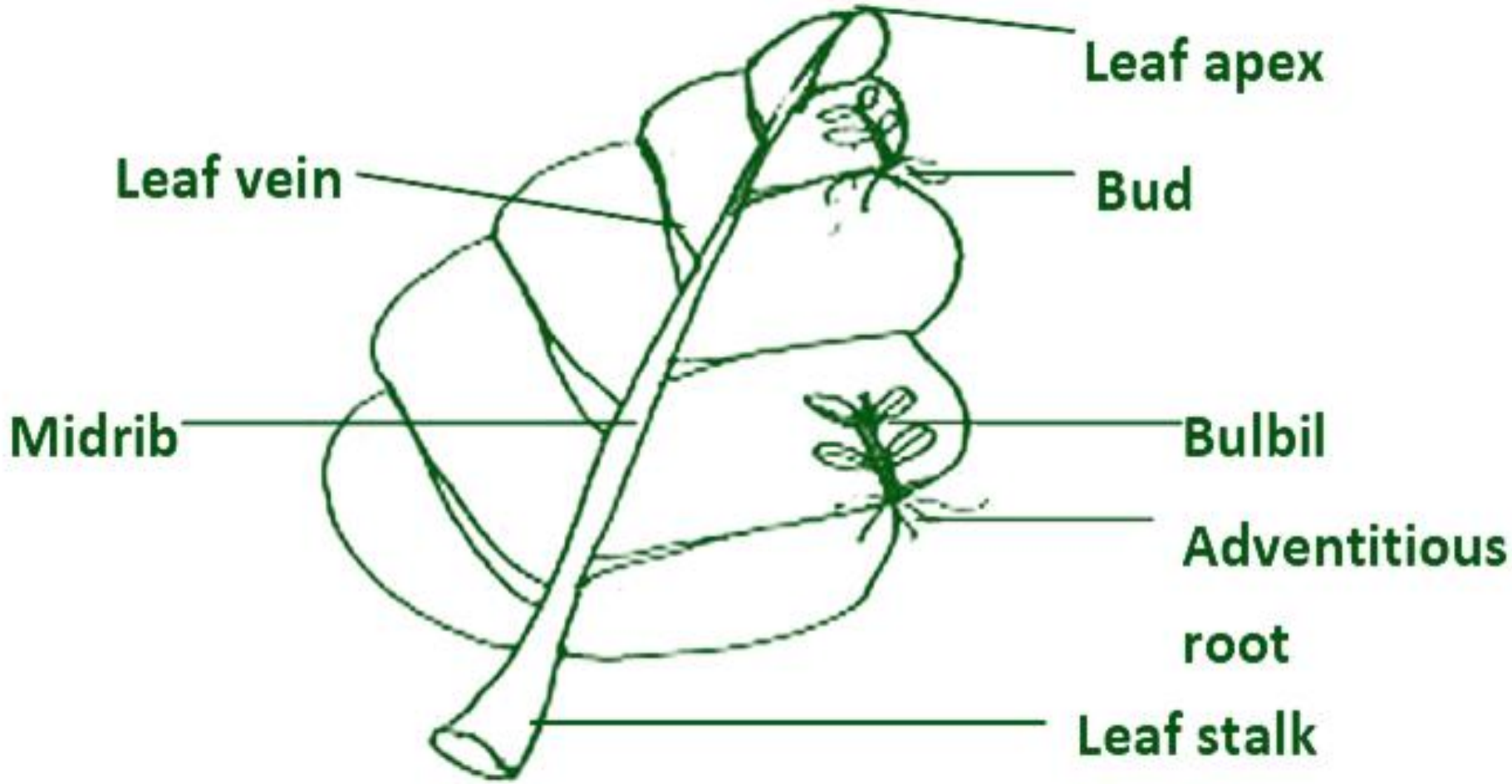
Bryophyllum leaf

This leaf is modified for vegetative propagation and storage of food and water

Adaptations of the Bryophyllum leaf to its functions

- ✓Has buds in the notches along the margin for vegetative propagation
- ✓Thick and fleshy for storage of water and food materials for the plant

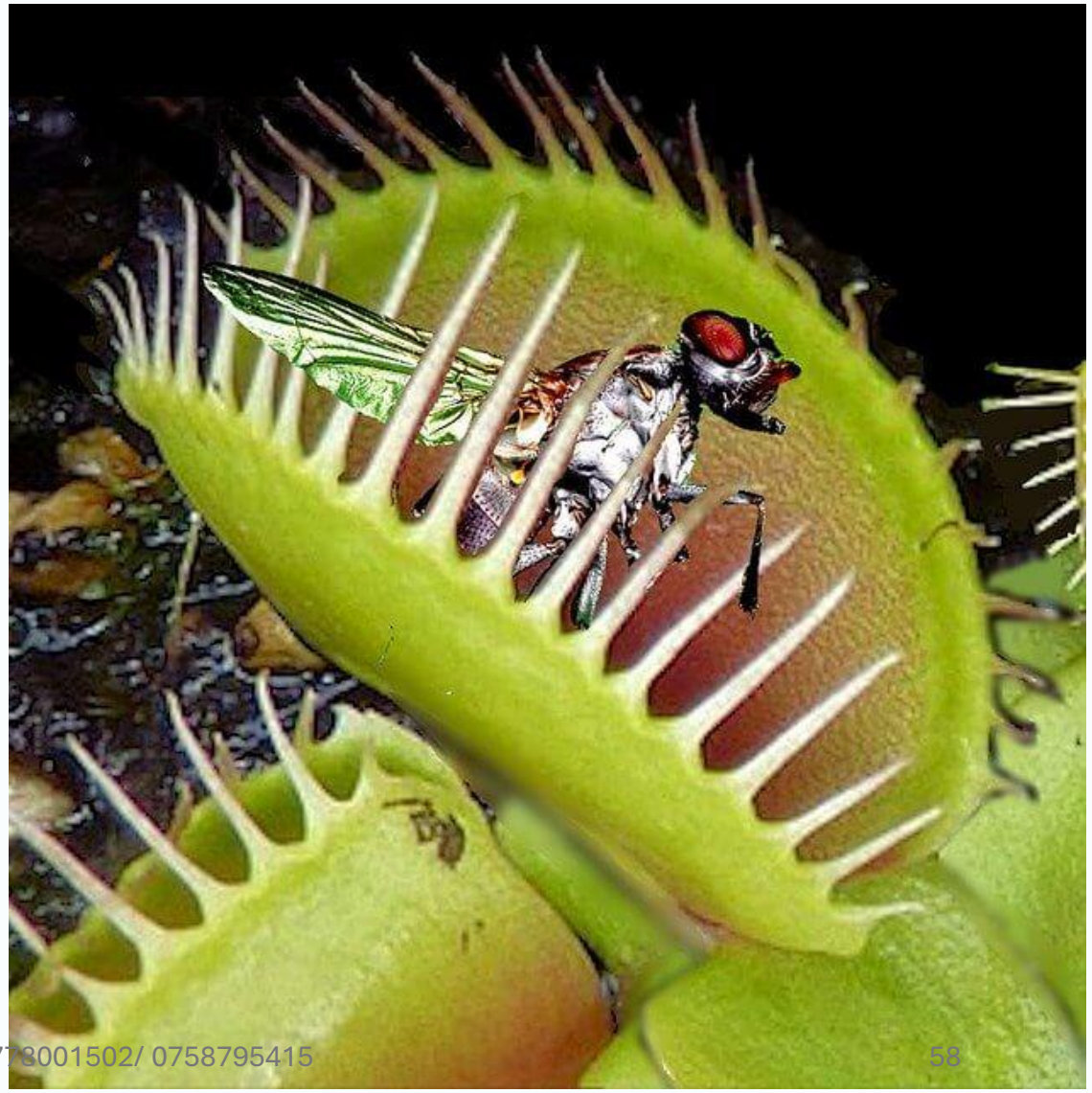
A drawing showing the structure of a Bryophyllum leaf



Insectivorous leaves

These are leaves modified for capturing and digesting insects. They are found on insectivorous plants such as the pi**tcher plant, Venus-fly trap, bladder wort.**

These plants often grow in areas lacking nitrogen therefore feed on insects as a way of obtaining **Nitrogen**.

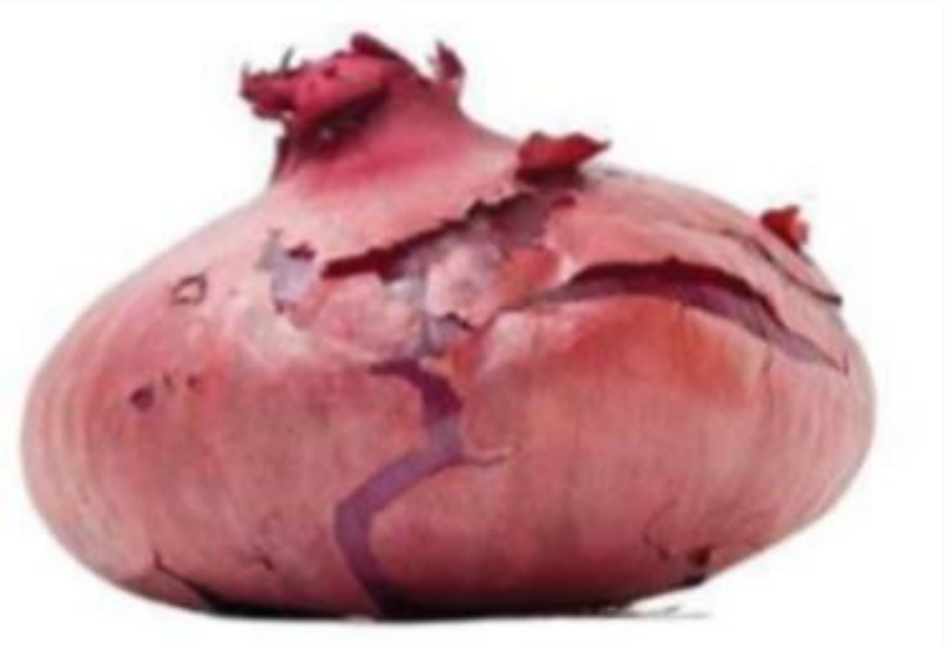




Onion leaves

Scaly leaves

Modified role: Protection from desiccation



Swollen and fleshy

Modified role: Storage of materials

Bracts

For-example **bracts of bougainvillea**

Modification: Brightly colored

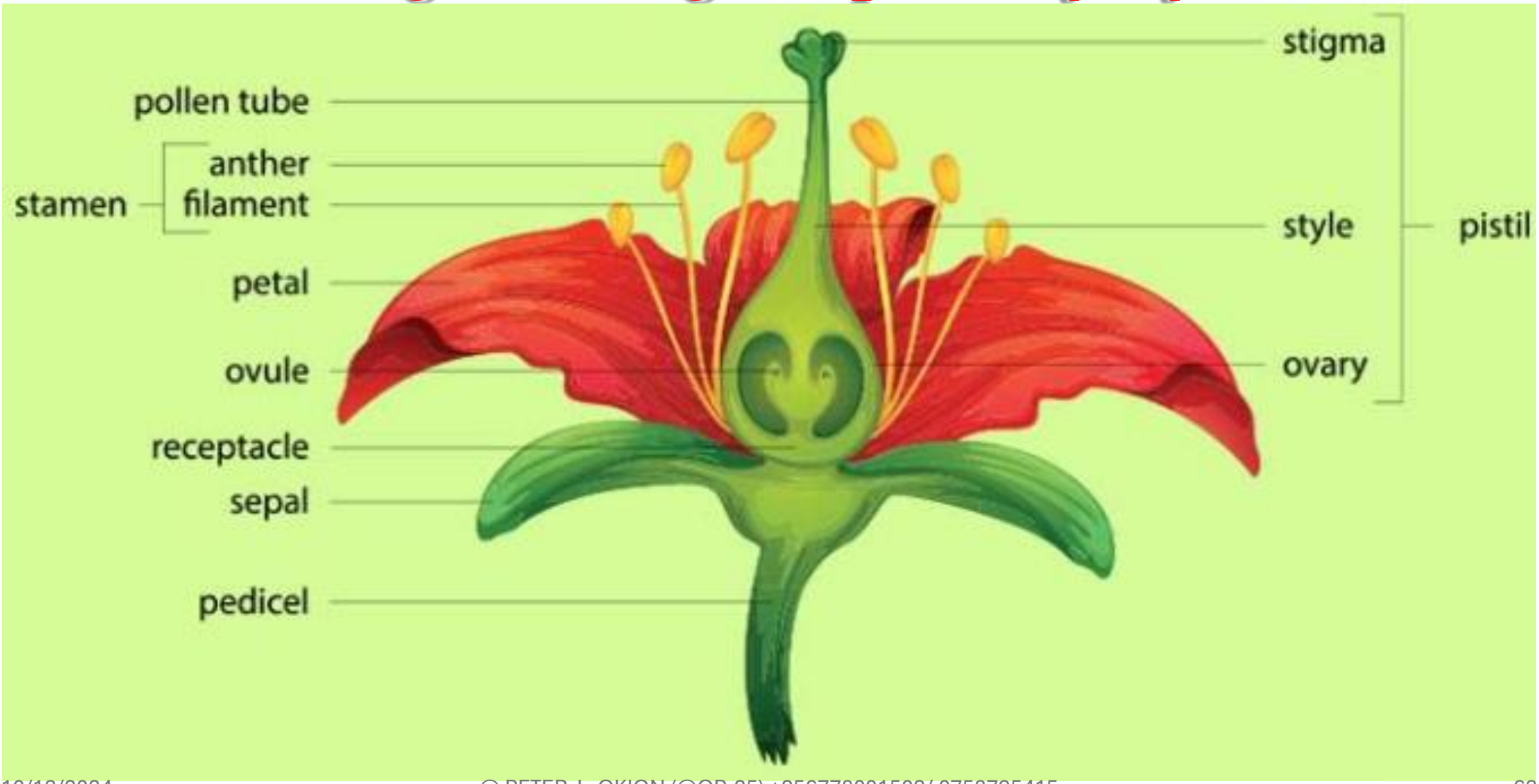
Modified role: Attracting insects to pollinate flowers

Flowers

This is the reproductive organ of a flowering plant

Flowers are attractive and appear in different **colors** and **shapes**.

Drawing showing the parts of a flower



Functions of the Main Parts

Sepals

These are the small, leaf-like parts growing at the base of the petals.

Collectively, sepals are known as the **Calyx**.

Function: Protect the flower during the bud stage.

Petals

They are often bright in color

The petals are collectively known as the **Corolla**.

Function: Attract pollinators such as insects, butterflies.

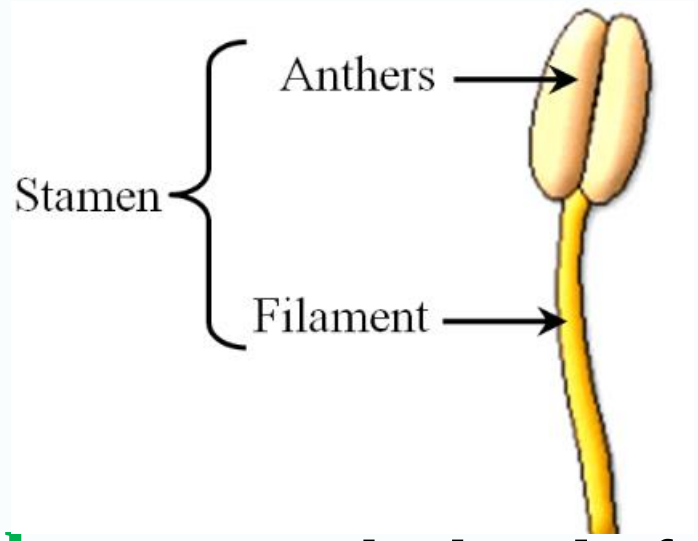
Stamens

These are the Male parts of a flower.

They are structurally divided into two parts:

Filament: The part that is long and slender

Function: Attaches the anther to the flower.



Anthers: It is the head of the stamen

Function: Producing the pollen which is transferred to the pistil of the same or another flower to bring about Fertilization

Pistil

This forms the Female parts of a flower. Pistil consists of four parts:

Style: Long slender stalk that holds the stigma. The style directs pollen from the stigma to the ovaries.

Stigma: Found at the tip of the style, forms the head of the pistil, contains a sticky substance that traps pollen grains.

Ovary: The ovary holds the ovules.

Ovules: These are the egg cells of a flower.

They fuse with pollen during the process of fertilization.

The fertilized product forms the Fruit and Ovules become the seeds of the fruit.

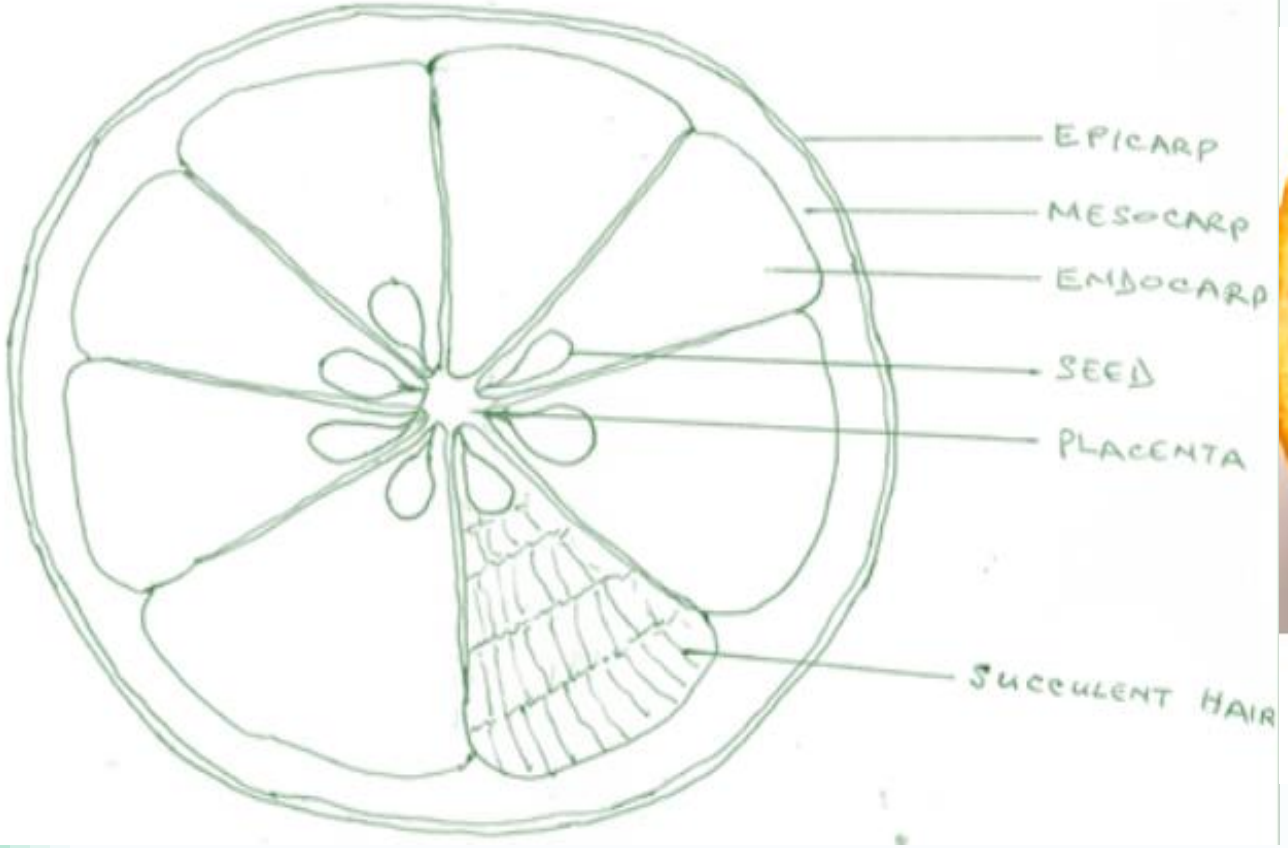
Fruits

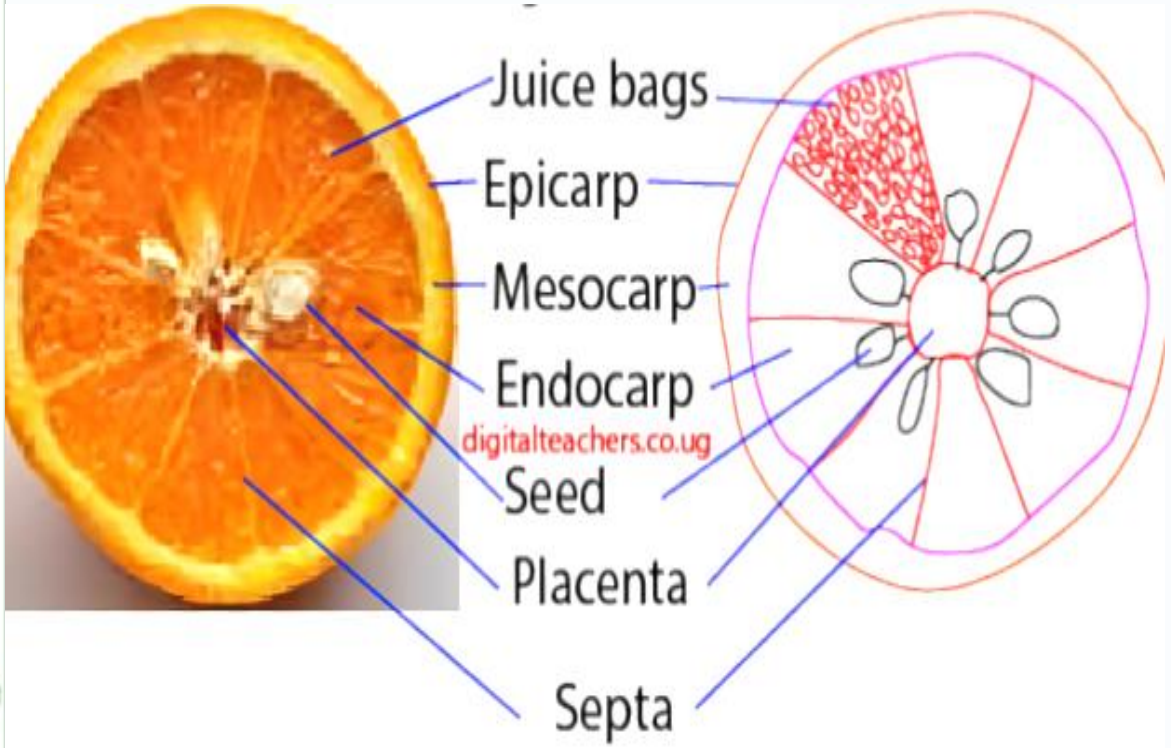
A fruit is the part of a plant that develops from the flower. It contains the seeds of the plant.

The outer parts of the fruit cover and protect the seeds

When fruits are mature and ripe, the seeds they contain can be carried away and if they land in places with suitable conditions they develop into new plants.

Drawing of transverse section of an orange fruit

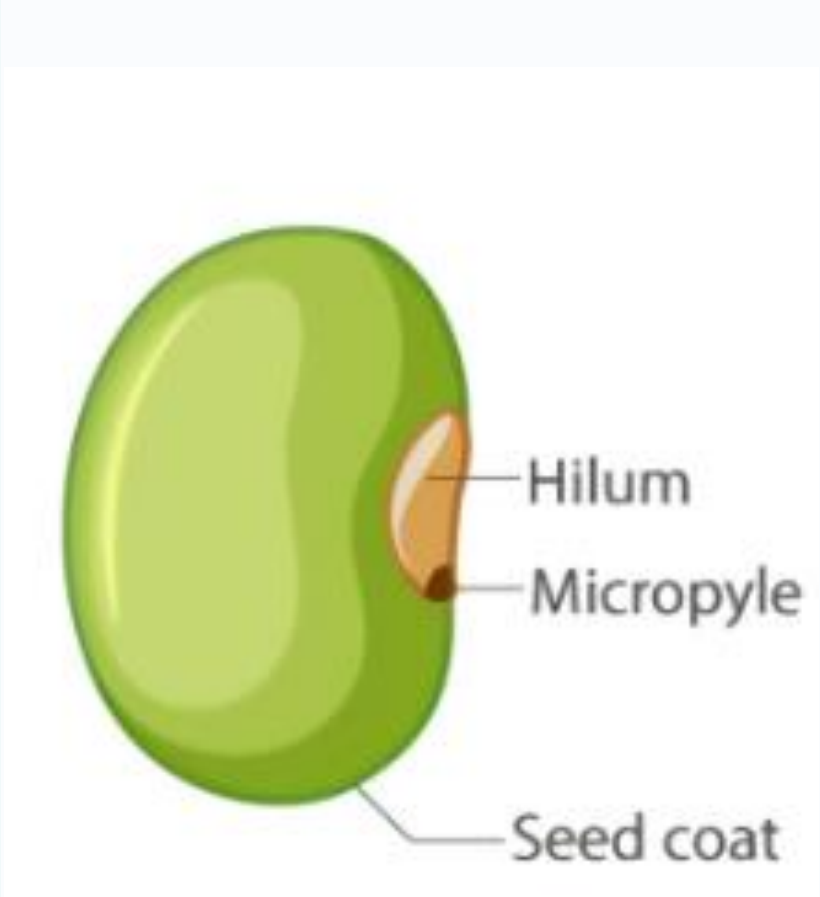


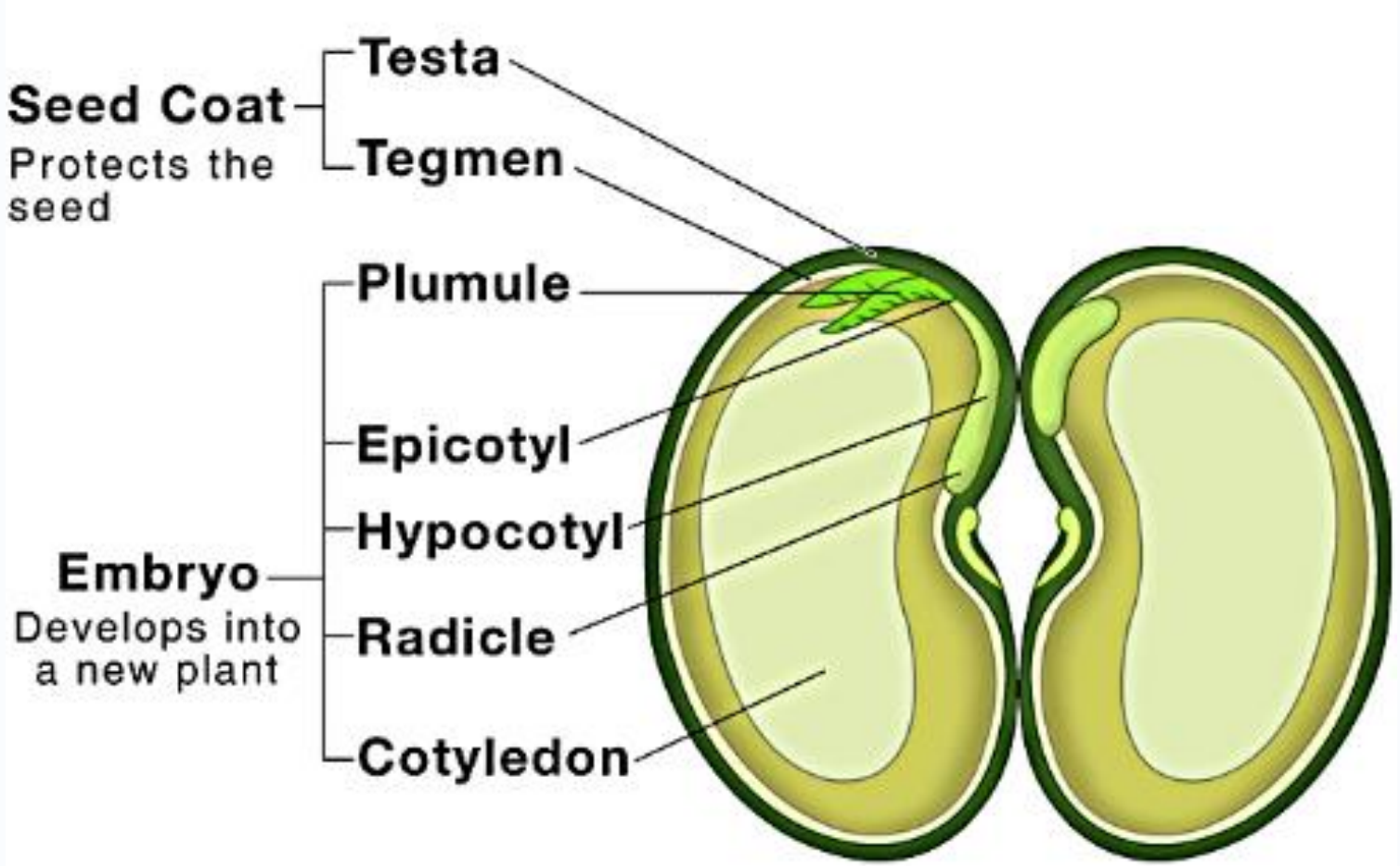


Functions of parts of fruits in a plant

PART	*DESCRIPTION*	*FUNCTION*
Epicarp	Bright colored	Attract animals that eat the fruit and disperse the seeds
Endocarp	Juicy	For animals to eat the fruit and disperse the seeds
Seed	Small, hard	To resist digestion along the alimentary canal of animals for their dispersal

Drawing of external and internal structure of a seed





Functions of parts of seeds in a plant

PART	*DESCRIPTION*	*FUNCTION*
Seed coat	Dry, hard	Protects inner parts from mechanical injury
Embryo	Shoot like plumule Root like radicle	Grows into plant shoot Grows into the root system
Cotyledon	Large (thickened) Sac-like	For storage of food for developing embryo Protects the delicate embryo

comparing a seed and fruit

Similarities

- ✓Both have a scar for attachment
- ✓Both are covered with an outer covering

Differences

Fruit	Seed
Its outer layer is the epicarp	Its outer layer is the testa
It is divided into 3 layers	Its wall is undivided
It contains high moisture and it is more succulent	It is dry or it contains low moisture content
It has 2 scars for attachment	It has 1 scar for attachment
It consists of seeds	It consists of an embryo

END

BIOLOGY IS LIFE

SLIDES PREPARED

BY TR. PETER L OKION