

# PLANTS

## 1. What living things make up the plant kingdom?

The first terrestrial living things were plants. They developed about 500 million years ago from green algae.

Most plants are green and have adapted to living on land. They are usually attached to the ground; most of them are non-motile.

The plant kingdom is made up of **multicellular, eukaryotic, autotrophic** organisms.

All plants:

- Have **roots, stems and leaves**. These vary according to the species.
- Are **multicellular**: made up of many cells which form tissues.
- Have **eukaryotic** cells. These cells have a nucleus and organelles surrounded by membranes. They are surrounded by a **cellulose wall**. They have chloroplasts which contain **chlorophyll**. Chlorophyll is necessary for **photosynthesis**.
- Are **autotrophic** beings: they can make their own food through photosynthesis.
- **Live attached to the soil**. However, they are able to make some movements. For example, they grow towards light.

## How are plants classified?

Plants are classified in two groups: non-flowering and flowering.

- **Non-flowering plants** are simple plants without flowers, fruits or seeds.
  - **Mosses and Liverworts**. They are small, and **non-vascular**: they have no conductor vessels.
  - **Ferns**. They are bigger than mosses. They are **vascular**: they have conductor vessels to distribute water and nutrients.
- **Flowering plants** are more complex, with flowers and seeds.
  - **Gymnosperms**. They have seeds inside a false fruit, like a pinecone.
  - **Angiosperms**. They have seeds inside a real fruit, like a water lily, an oak tree, or a barrel cactus.

## 2. What functions do leaves, stems and roots have?

Plants have three main organs: **leaves, stems and roots.**

### Leaves

Photosynthesis takes place in leaves. The leaves take in and expel gases from the atmosphere. They eliminate excess water in the form of water vapour. This process is called **transpiration.**

The main part of a leaf is called the **blade.** A leaf has a **topside** and an **underside.** A **petiole** joins the leaf to the stem. Gases and water vapour enter the leaf and are expelled through small pores.

These pores, **stomata,** are found on the underside of the leaf.

### Stems

Plant stems are usually above ground. The stem keeps the plant upright and supports it. It also carries substances to other parts of the plant. Some stems, for example, the potato, accumulate reserves of water and food.

Leaves and branches are joined to the stem at **nodes.** The part of the stem between the nodes is called the **internode.** Stems grow upwards from the **apical bud.** Lateral branches grow out of **auxiliary buds** along the stem.

### Roots

Plant roots have two functions: to fix the plant to the ground, and absorb water and minerals. Some roots, for example, carrots and beetroots, accumulate food reserves.

The root surface is covered with many tiny hairs which absorb the water and minerals (absorbent root hairs). Each root ends in a **root cap.**

## 3. What is plant nutrition?

Plants are autotrophic: they produce their own food. They use their leaves, stems and roots to carry out these processes:

1. **Absorption.** Plants absorb water and mineral salts from the soil through their roots. When mineral salts dissolve in the water, **raw sap** (or xylem sap) is produced.
2. **Transportation.** The raw sap travels up the conductor vessels (xylem) from the roots to the stem and leaves.
3. **Transpiration.** Excess water is expelled through the **stomata** as water vapour. As a result, raw sap goes up into the leaves.
4. **Photosynthesis.** Raw sap is transformed in the **leaves** into **elaborated sap:** a mixture of water and organic substances. It contains sugars. Sunlight provides the energy needed for this process. During photosynthesis, the plant absorbs carbon dioxide through its leaves. The leaves then expel oxygen through the stomata.

Finally, the elaborated sap is distributed throughout the plant cells by the conductor vessels (phloem).

5. **Respiration.** Plants breathe. During respiration, plant leaves take in oxygen from the air and release carbon dioxide.

#### 4. How do plants reproduce?

- **Asexual reproduction.** Only one plant is involved. When you take a cutting of a geranium and replant it, asexual reproduction takes place. There are two types of asexual reproduction: **vegetative**, such as rizomes, stolons, tubers and bulbs and **spore reproduction** characteristic of ferns and mosses.
- **Sexual reproduction.** Sexual cells from two different plants join together to produce a new plant. Flowering plants have sexual reproduction. In sexual reproduction flowers are hermaphrodite (they contain both female and male sexual cells) or unisex.

##### Main parts of a flower

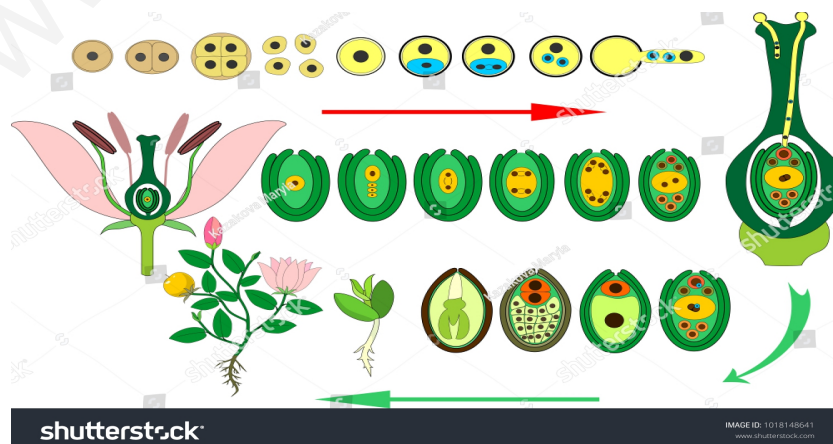
Flowers are the reproductive organs of angiosperms and gymnosperms. Flowers have two parts: the reproductive part and the protective part.

- Reproductive parts: the **stamen** (male reproductive part) and the **pistil** (female part). The **ovules** are found inside the **ovary**. During reproduction, the ovules come into contact with the **pollen** which is produced in the stamen.
- Protective parts: the **petals**, which make up the **corolla**, and the **sepals**, which make up the **calyx**.

##### The reproductive stages

Plant reproduction has the following stages: pollination, fertilization, formation of fruit and seeds, dispersal and germination.

- **Pollination.** Pollen from one flower's anther reaches another flower's stigma.
- **Fertilisation.** Pollen reaches the stigma, penetrates it, and fertilises the ovules inside the ovary.
- **Fruit and seed formation.** The fertilized flower is transformed. The corolla and the calyx dry up. The ovary changes into the fruit. The ovules are transformed into seeds inside the fruit.
- **Dispersal.** The ripe fruit falls off the plant or releases the seeds.
- **Germination.** The seeds fall on the ground and germinate. A small root and shoot grow.



## 5. How do plants interact with the environment?

Plants receive information from the environment (stimuli) and react to them (responses). There are two types of plant responses: tropisms and nastic movements.

**Tropisms.** They are growth responses to external stimuli. They result in a permanent change. They can be **positive** (towards the stimulus) or **negative** (away from the stimulus). Tropisms have different names depending on the related stimulus: **phototropism** (light), **hydrotropism** (water) and **gravitropism** (gravity).

**Nastic movements.** They are temporary responses. When the stimulus stops, the plant returns to its original position. Nastic movements have different names according to the stimulus: **photonasty**, response to changes in light; **seismonasty**, response to touch; **thermonasty**, response to temperature and **chemonasty** response to chemical substances.

### ACTIVITIES

1. Fill in the gaps.

Nutrition. It includes five stages:.....  
.....

Interaction. Plants respond to the environment in two ways: permanent changes such as .....and temporary changes such as.....

Reproduction. There are two types: Asexual: one progenitor using parts such as stolons, .....Sexual: male and female .....

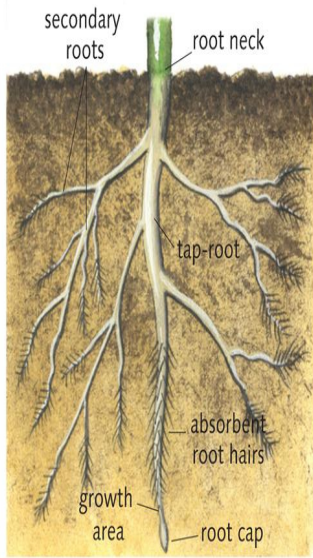
2. Match the columns. Write the letter with the number.

- |             |  |
|-------------|--|
| a) Leaf     | 1. Absorbs substances from the soil                  |
| b) Stem     | 2. It protects the end of the root.                  |
| c) Root     | 3. Shoots of a stem that allow it to develop         |
| d) Top      | 4. Joins the leaf to the stem                        |
| e) Root cap | 5. Upperside of the leaf                             |
| f) Bud      | 6. Axis that provides support to a plant             |
| g) Petiole  | 7. Small holes on the leaves use for gases exchange  |
| h) Stomata  | 8. Part of the plant that carries out photosynthesis |

3. Decide if these plants are angiosperms or gymnosperms.

	Gymnosperms	Angiosperms
Cypress		
Orange tree		
Cedar		
Pine		
Olive tree		

4. Label the diagrams.



5. Fill in the diagram.

1 ovary   2 style   3 anther   4 filament   5 petal   6 sepal   7 stigma

