

The Plant Kingdom

Plants are living organisms that belong to the Kingdom Plantae. They are **autotrophs**, which are living things that can make their own food. All plants are **multicellular** organisms made up of eukaryotic cells, with rigid cell walls and chloroplasts, where an essential process called **photosynthesis** is performed.

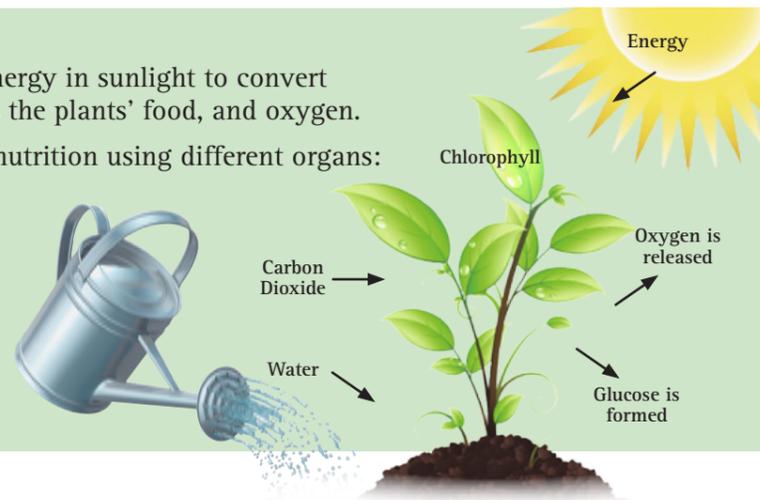
How do plants produce food?

Through photosynthesis, green plants use the energy in sunlight to convert carbon dioxide and water into glucose, which is the plants' food, and oxygen.

Plants obtain inorganic minerals they need for nutrition using different organs:

- Water and mineral salts in the soil are absorbed through the roots.
- Leaves take carbon dioxide from the atmosphere using their plant pores or **stomata**.

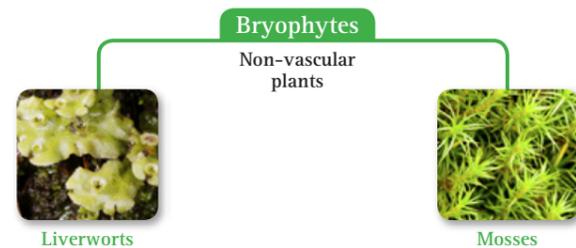
These inorganic minerals are converted into organic substances in the **chloroplasts** of plant cells.



How are plants classified?

Plants are classified by their tissue structure into **non-vascular plants** or **bryophytes**, and **vascular plants** or **tracheophytes**.

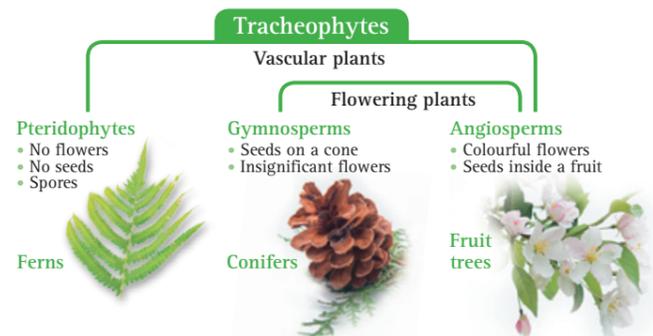
Mosses and liverworts are non-vascular plants and make up the bryophyte group. They haven't got true stems, leaves or roots. Bryophytes have **rhizoids** that anchor the plant to the ground, but they don't absorb water like normal roots do. The part of the plant above the ground obtains water from the air through small leaves called **phyllodes**.



Mosses and liverworts grow in wet shady habitats. These plants have no flowers and don't produce seeds. They reproduce by means of **spores**. Bryophytes play two important roles in nature: they are the first colonisers of rocks and they supply food and shelter for small animals and insects.

Vascular plants contain vascular tissue or vessels that transport substances between the different plant parts. They include:

- **Flowering plants**, which are divided into **angiosperms**, that produce seeds inside a fruit and have colourful flowers and **gymnosperms**, plants with seeds in a cone and insignificant flowers.
- **Pteridophytes**, which are non-flowering plants like **ferns**. They grow from spores, not seeds. In cold regions, ferns have a horizontal underground stem called a **rhizome**. In warmer climates, they can have an erect woody stem above the ground. The stem has got big leaves called **fronds**. On the underside of the leaves, ferns have got **sori**, or clusters of **sporangia**, which produce spores.



Activities

1. Complete the sentences with the words below.

gymnosperms • **angiosperms** • **bryophytes** • **tracheophytes**

Plants are usually classified in two groups: plants with fluid-carrying vascular tissue, or 1. and non-vascular plants, or 2. Vascular plants are divided into 3., which have seeds on cones, and 4., which have seeds within a fruit.

2. Find the words in the word snake and match them to the definitions.

rhizoids vascular tissues sporangia ferns photosynthesis

1. The process by which plants create food from inorganic substances.
2. Their function is to anchor mosses to the ground.
3. Plants with a vascular system and spores.
4. It is necessary to transport substances in some plants.
5. Clusters grouped in sori which contain spores.

3. Answer the questions.

1. How do bryophytes absorb water?
2. What do plants create from carbon dioxide and water?
3. In which part of the plant does photosynthesis take place?
4. Where are spores produced in ferns?
5. What plants reproduce by means of spores?

Working With the Web

Go to the web to learn more about plants and their requirements for photosynthesis. Then answer the questions below.

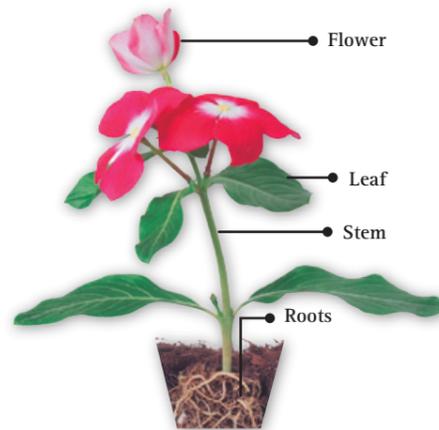
1. What are the four elements needed for photosynthesis?
2. What is produced and released during photosynthesis?
3. How can the process of photosynthesis help combat global warming?
4. Draw a diagram explaining the process of photosynthesis.

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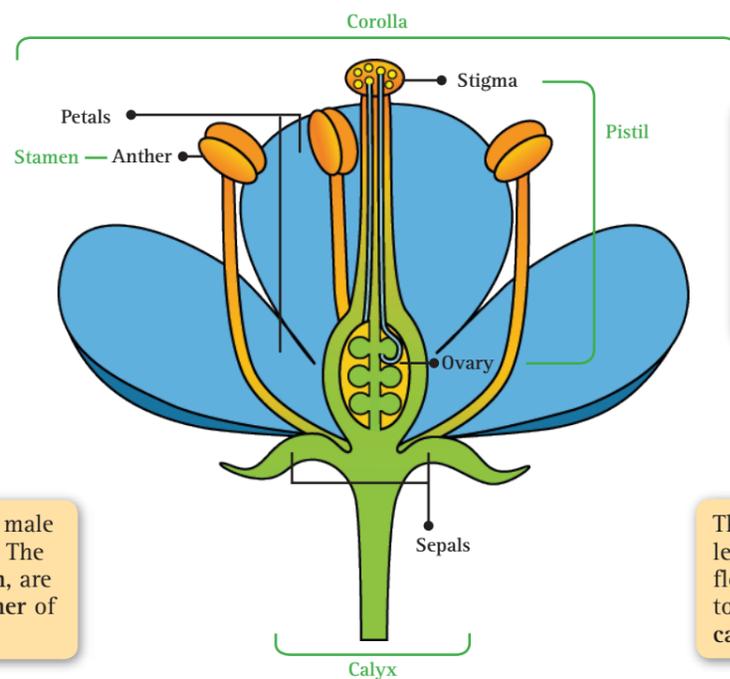
Flowering Plants

Flowering plants are divided into gymnosperms and angiosperms. Both have a vascular system, roots, a stem and leaves, and both produce seeds. However, the seeds of angiosperms are enclosed in the ovary of the flower which forms the fruit, whereas gymnosperms have seeds in cones.

What are the parts of flowering plants?



- The root is the organ which fixes the plant in the soil and absorbs water and mineral salts.
- The stem transports water through the plant. It raises the height of the flowers and leaves, bringing them closer to the sun.
- The plant's leaves are where photosynthesis takes place. Leaves are usually green because their cells have organelles called chloroplasts that contain chlorophyll, a green pigment. Transpiration and respiration take place through the leaf's pores, or stomata.
- The flower is the reproductive organ of the plant. It can be divided into four parts:



The petals are coloured leaves which are used to attract insects and are grouped together in the corolla.

The pistil is the female part of the flower. Plant ovules are found inside the ovary, a part of the pistil. The tip of the pistil, the stigma, receives the pollen.

The stamens are the male reproductive organs. The male gametes, pollen, are produced in the anther of the stamens.

The sepals are the green leaves that protect other flower parts. The sepals together make up the calyx.

When a flower is pollinated, each pollen grain passes along a tube from the stigma through the style to the ovary, where they fertilise the ovules to make seeds. After fertilisation, the ovary swells and develops into fruit.

What types of plants have fruit?

Angiosperms are vascular plants which have flowers, fruits and seeds. Angiosperms include herbs, shrubs and trees. Most angiosperm trees lose their leaves in autumn and they don't grow new leaves until spring. These trees are **deciduous**. Other trees lose only a few of their leaves and produce new leaves all year round. These trees are called **evergreens**.

Gymnosperms are vascular plants with small insignificant flowers grouped into male cones, called **inflorescences** which contain the pollen, and into female cones that contain the seeds. Gymnosperms include all the conifers, evergreen trees and shrubs.

Activities

1. Tick (✓) the sentences T (true) or F (false). Then correct the false sentences.

- Angiosperms and gymnosperms have vascular tissue.
- Photosynthesis occurs in the stem.
- The female part of a flower is called the pistil.
- An inflorescence is a group of flowers.
- Angiosperms have flowers and seeds but no fruits.

T	F
<input type="checkbox"/>	<input type="checkbox"/>

2. Place each plant in the correct column.

cypress ◯ orchid ◯ cedar ◯ pine ◯ rose ◯ orange tree
rosemary ◯ palm tree ◯ fir ◯ sunflower ◯ spruce

Angiosperms	Gymnosperms



Working With the Web

Go to the web and learn more about the parts of the plant. What part of the plant is each of the vegetables listed below? Write the correct word – leaf, stem, fruit, root or flower – next to each vegetable.

- | | | | |
|--------------|-------|----------------|-------|
| 1. carrot | | 5. broccoli | |
| 2. tomato | | 6. onion | |
| 3. lettuce | | 7. cauliflower | |
| 4. asparagus | | 8. rhubarb | |

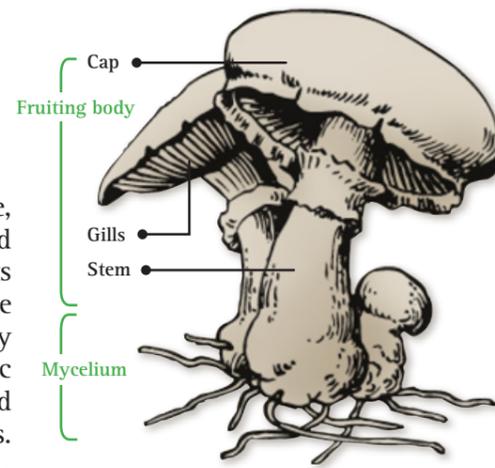
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►►► Fungi, Protista and Monera

○ How are the other kingdoms classified?

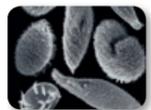
For many years, scientists recognised only two kingdoms of life, **Plantae** and **Animalia**. Plants were characterised as autotrophs and animals as heterotrophs. This system was accepted until scientists had to classify mushrooms. They aren't green and they don't make their own food, so they aren't plants. They don't eat or move, so they cannot be animals. Mushrooms are classified as **fungi**, heterotrophic organisms of two types: **saprotrophs** that absorb nutrients from dead plants and animals, and **parasites** that feed from other living things.

Fungi include both unicellular organisms like yeasts and multicellular organisms like moulds and mushrooms. Fungi have eukaryotic cells with a true nucleus and with a cell wall made of **chitin** instead of cellulose. Multicellular fungi have different parts: their bodies are made up of **hyphae**, microscopic filaments which form the **mycelium**. They have a **fruiting body** which grows above the soil and produces spores for reproduction.

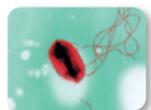


Scientists then tried to classify algae. These aren't animals, because they don't feed on plants or other animals. They aren't plants, because they haven't got true roots, rhizoids or leaves. They aren't fungi, because they are green, have chlorophyll and make their own food through photosynthesis. Therefore, algae are classified in their own kingdom, the **Protista**, which includes both unicellular and multicellular organisms with eukaryotic cells, but without tissues or organs. Many different living things belong to this kingdom, since all the organisms that don't fit into the other kingdoms are classified into this group.

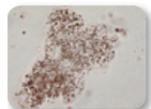
Kingdom **Protista** includes protozoa and algae. Protozoa are single-celled heterotrophic organisms that live in a liquid environment. They are classified according to their motility:



- Ciliates, which have cilia, for example paramecium.



- Flagellates, with one or more flagella, for example euglena.



- Amoebae, with pseudopodia, for example amoebae.



- Sporozoa, which don't move, for example plasmodium. They are parasites which live on other living organisms, causing infectious diseases such as malaria.

Algae are all photosynthetic autotrophs which contain chlorophyll or other pigments. According to their pigments, algae are classified into green algae, red algae and brown algae.

Microscopic organisms like bacteria are very different from the organisms classified in the other kingdoms. Bacteria are always made up of one single prokaryotic cell with a cell wall, but without a nucleus. Bacteria belong to the simplest kingdom called **Monera**, which comes from the Greek word *moneres*, meaning single. Organisms in this kingdom were the first living things to appear on Earth.

Kingdom **Monera** includes blue-green algae or cyanobacteria. These are autotrophs that make their own food by photosynthesis, and other bacteria that are heterotrophs, which act as **saprophytes**, **parasites** or **symbionts** – organisms that live on other living things, but to their mutual benefit. We can classify bacteria into four different groups by their shape:



- Cocci are spherically shaped.



- Bacilli are rod-shaped.



- Spirilla are spiral-shaped.



- Vibrios are curved and rod-shaped.

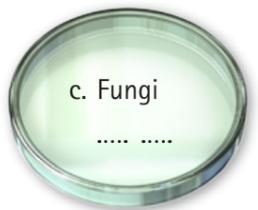
► Activities

1. Complete the table.

	Animalia	Plantae	Fungi	Protista	Monera
1. Type of cell					prokaryotic
2. Number of cells	multicellular				
3. Type of nutrition		autotrophic			
4. Classification				protozoa, algae	
5. Example					

2. In which group would you classify these living things?

1. cocci
2. red algae
3. blue-green algae
4. mushroom
5. yeast
6. amoebae



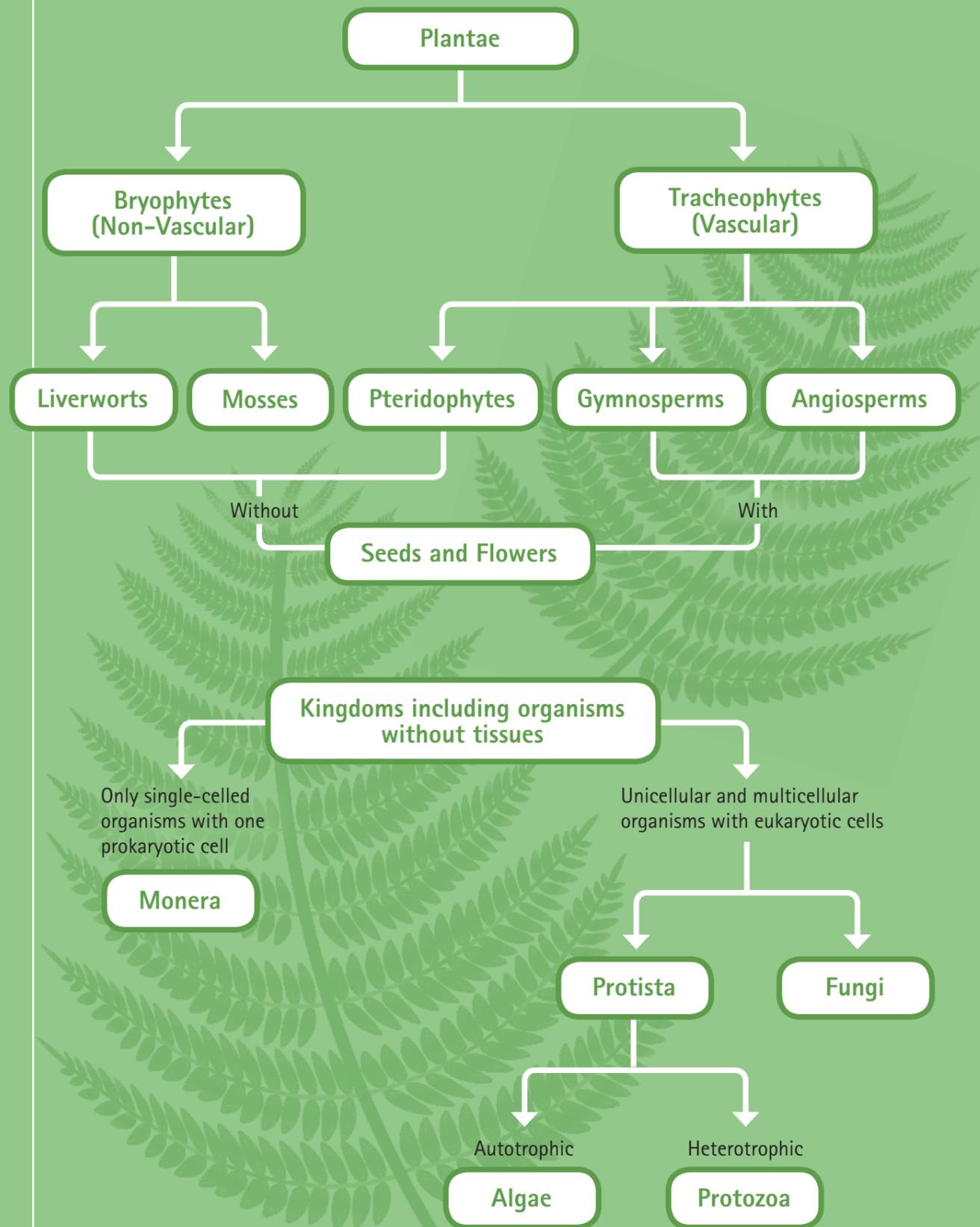
► Working With the Web Project: Dichotomous Classification

Go to the web to learn about and to see examples of a dichotomous classification. Then do the project below.

Work in groups. Make your own dichotomous key to classify five different organisms, including pictures of each one. You can create a PowerPoint presentation with one slide for each characteristic, or a poster showing a flowchart with all the questions. You can use the following characteristics in your dichotomous key:

- unicellular or multicellular
- prokaryotic or eukaryotic
- autotrophic or heterotrophic
- reproduce by spores or seeds
- vascular tissue
- flowers
- seeds in flowers or seeds in cones

Website suggestions at www.burlingtonbooks.es/natural1



Choose the correct answer.

- The part of the plant that absorbs water and minerals is the
a. root
b. stem
c. leaf
- The part of the plant that makes food for the plant is the
a. root
b. stem
c. leaf
- Bryophytes reproduce by means of
a. spores
b. seeds
c. conifers
- Algae are
a. autotrophic protists
b. heterotrophic protists
c. plants
- Protozoa are
a. autotrophic protists
b. heterotrophic protists
c. plants
- Conifers are
a. gymnosperms
b. angiosperms
c. bryophytes
- An apple tree is a(n)
a. gymnosperm
b. angiosperm
c. bryophyte
- Mosses are
a. gymnosperms
b. angiosperms
c. bryophytes
- Monerans are
a. unicellular and multicellular
b. only unicellular
c. only pluricellular
- Fungi are
a. unicellular and multicellular
b. only unicellular
c. only multicellular

