

A lush green forest with tall trees and ferns. The scene is filled with vibrant green foliage, including ferns in the foreground and tall, thin trees in the background. The lighting is soft, creating a serene and natural atmosphere.

# **Chapter 22.1**

## **What is a Plant?**

# Objectives

- 1. Describe the basic characteristics of life .**
- 2. Describe what plants need to survive.**
- 3. Describe the life cycle of plants.**
- 4. Describe how the first plants evolved.**

# What Is a Plant?



**Plants are multicellular eukaryotes that have cell walls made of cellulose.**

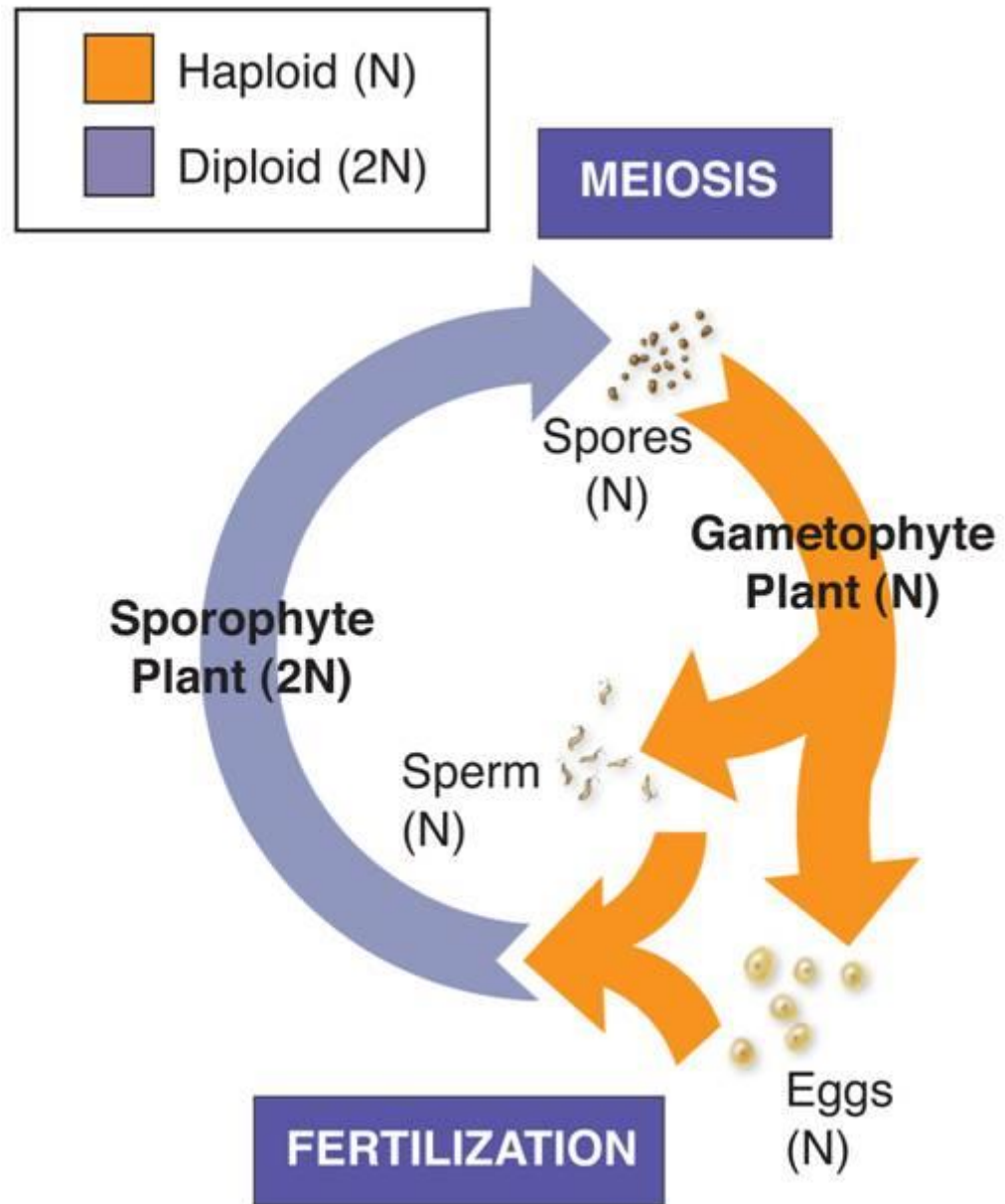
**Plants develop from multicellular embryos and carry out photosynthesis using the green pigments chlorophyll *a* and *b*.**

- Plants include trees, shrubs, and grasses, as well as other organisms, such as mosses and ferns.
- Most plants are autotrophs, although a few are parasites or saprobes that live on decaying materials.

## The Plant Life Cycle

- Plant life cycles have **two alternating phases**, a diploid ( $2N$ ) phase and a haploid ( $N$ ) phase, known as alternation of generations.

- Alternation of Generations





## What do plants need to survive?



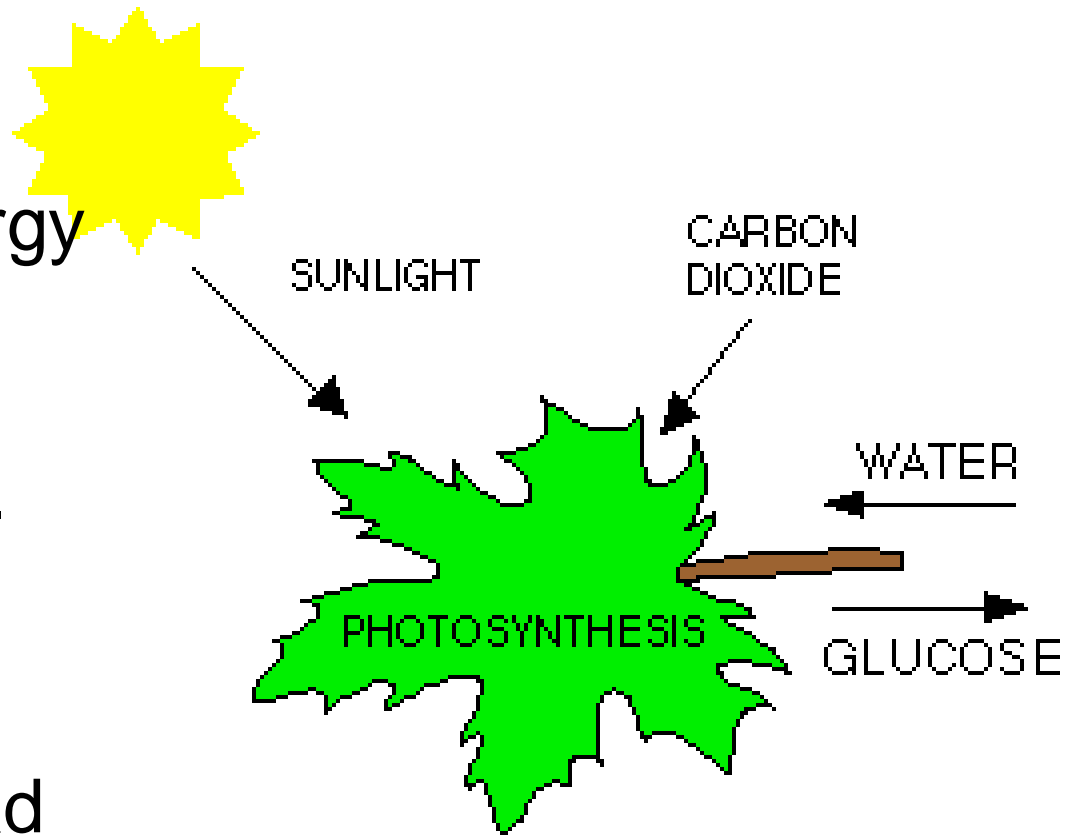
**In order to survive, plants need:**

- **sunlight**
- **water and minerals**
- **gas exchange**
- **transport of water and nutrients throughout the plant body**



## Sunlight

- Plants use energy from sunlight to carry out photosynthesis.
- Photosynthetic organs such as leaves are broad and flat to maximize light absorption.



## Water and Minerals

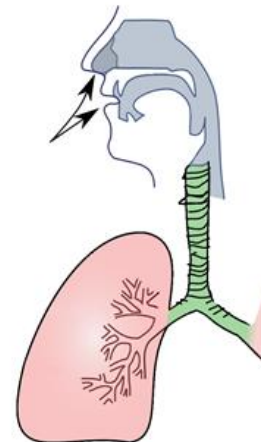
- All cells require a constant supply of water.
- Water is used up quickly when the sun is shining. As a result, plants have structures that limit water loss.

- As they absorb water, plants also absorb minerals.
- Minerals are nutrients in the soil needed for plant growth.

## Gas Exchange

- Plants require oxygen to support cellular respiration as well as carbon dioxide to carry out photosynthesis.
- They must **exchange these gases** with the atmosphere without losing excessive amounts of water through evaporation.

Is like your lungs,  
nose and mouth



## Movement of Water and Nutrients

- Plants take up water and minerals through their roots, but they make food in their leaves.
- Most plants have specialized tissues that carry water and nutrients from the soil and distribute products of photosynthesis throughout the plant body.
- Simpler plants carry out these functions by diffusion.

## Early Plants

- When plants first appeared, life on Earth changed.
- As plants colonized the land, they changed the environment so other organisms could develop.
- New ecosystems arose, and organic matter began to form soil.



## How did the first plants evolve?



**The first plants evolved from an organism similar to the multicellular green algae living today.**



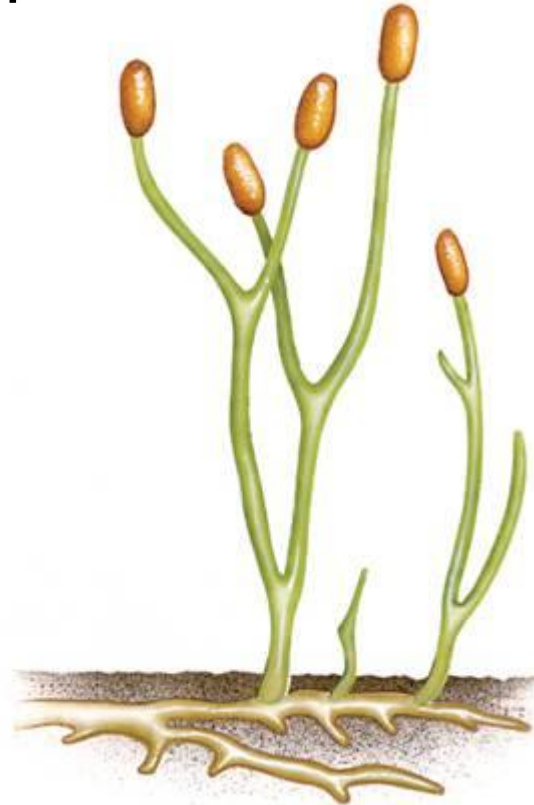


- Multicellular green algae have the size, color, and appearance of plants.
- They have reproductive cycles similar to those of plants.
- Green algae also have
  - cell walls made of cellulose
  - and photosynthetic pigments that are identical to those of plants.

## The First Plants

- DNA sequences confirm that plants are closely related to certain groups of green algae, suggesting that the ancestors of the first plants were indeed algae.

- The oldest known plant fossils, about 450 million years old, are similar to today's mosses.
- They had a simple structure and grew close to the ground.



Fossils suggest that the first plants needed water to complete their life cycles.

The demands of life on land favored the evolution of plants that were:

- more resistant to the drying rays of the sun.
- more capable of conserving water.
- more capable of reproducing without water.

From these plants, several major groups of plants evolved.

- One group developed into the mosses and their relatives.
- Another group gave rise to all other plants.

All plants have evolved different adaptations for a variety of terrestrial environments.

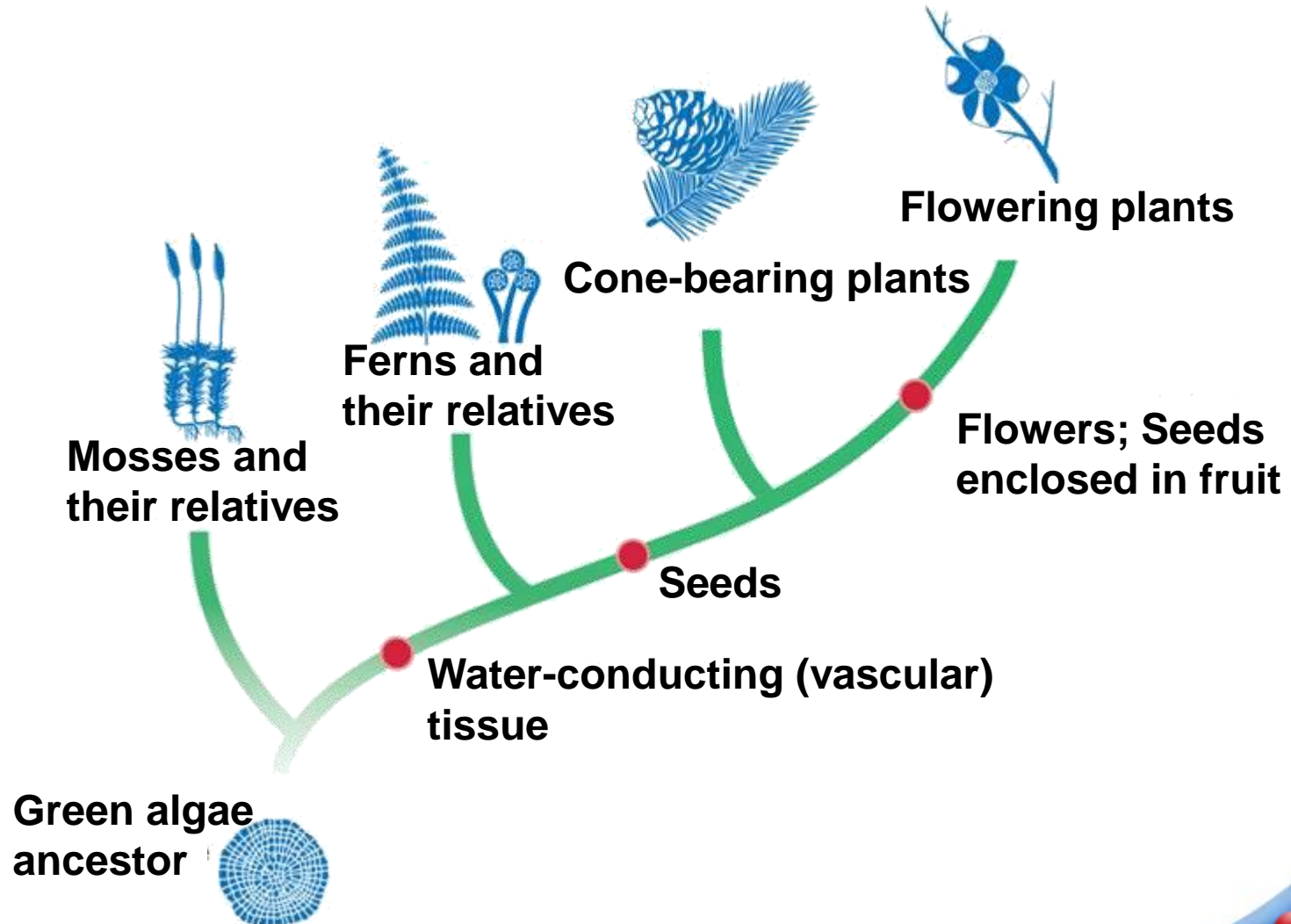
# Overview of the Plant Kingdom

Plants are divided into four groups based on these **features:**

- water-conducting tissues
- seeds
- flowers

Plants are also classified by other features, including reproductive structures and body plan.

# Evolutionary Relationships Among Plants



- Today, scientists can classify plants more precisely by comparing the DNA sequences of various species.



## 22-1 Section QUIZ

Continue to:

**Section QUIZ**

- or -

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## 22-1 Section QUIZ

1 Most plants alive today are

a. cone-bearing.

A b. flowering.

c. ferns.

d. mosses.

## 22-1 Section QUIZ

**2** The two phases of a plant's life cycle are referred to as

**A** a. alternation of generations.

b. spontaneous generation.

c. biogenesis.

d. sexual and asexual.

**3** Which statement accurately describes a way that plants meet their basic needs?

a. Plants take in carbon dioxide from soil through their roots.

**A** b. Plants obtain the energy for photosynthesis from sunlight.

c. Plants obtain minerals by exchanging gases with the atmosphere.

d. Plants absorb water through their broad, flat leaves.

## 22-1 Section QUIZ

**4** The first group of plants to evolve from green algae were the

- a. cone-bearing plants.
- b. ferns.

**A** c. mosses.

d. flowering plants.

## 22-1 Section QUIZ

**5** The diploid phase of the plant life cycle is known as the

- A**
- a. sporophyte.
  - b. gametophyte.
  - c. egg.
  - d. spore.

**END OF SECTION**