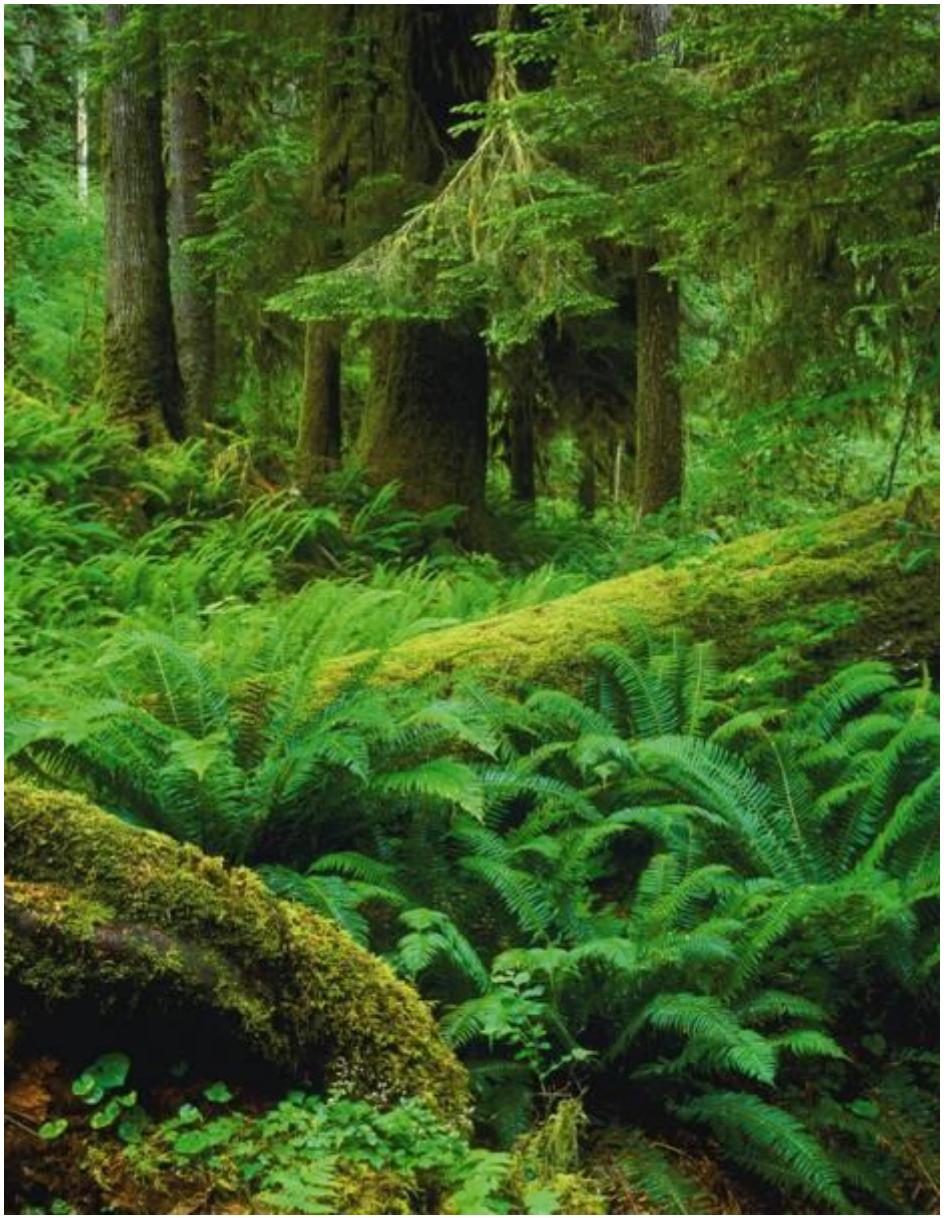
22–1 Introduction to Plants



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*.

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.

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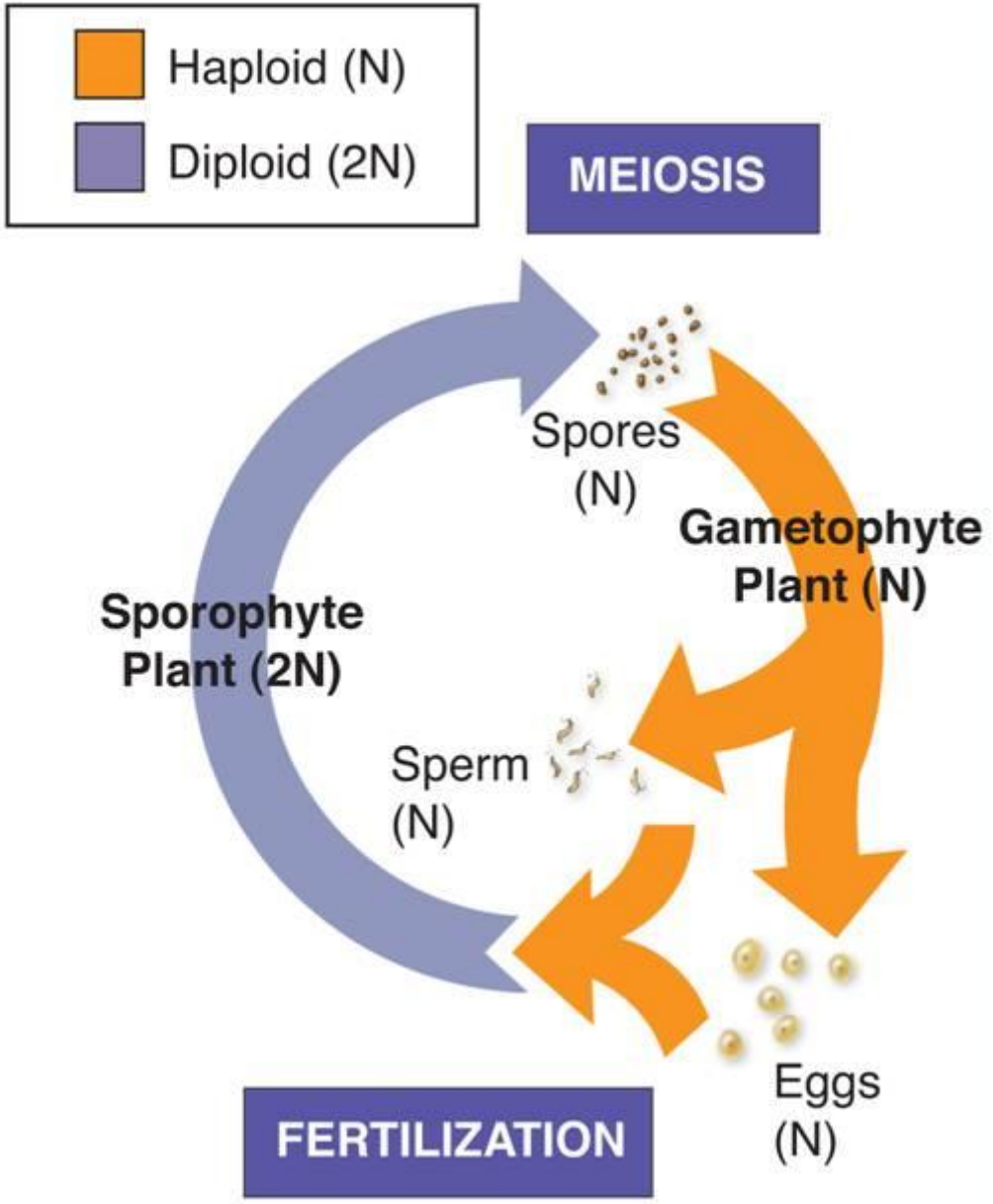
Alternation of Generations



During the two phases of the life cycle, mitosis and meiosis alternate to produce the two types of reproductive cells—gametes and spores.

The diploid (2N) phase is called the **sporophyte**, or spore-producing plant.

The haploid (N) phase is called the **gametophyte**, or gamete-producing plant.

Plant spores are haploid (N) reproductive cells formed in the sporophyte by meiosis.

The spores can grow into new organisms called gametophytes.

A gamete is a reproductive cell produced by mitosis, and it can fuse with another gamete to produce the sporophyte.

What 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.

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.

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.

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 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.

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.

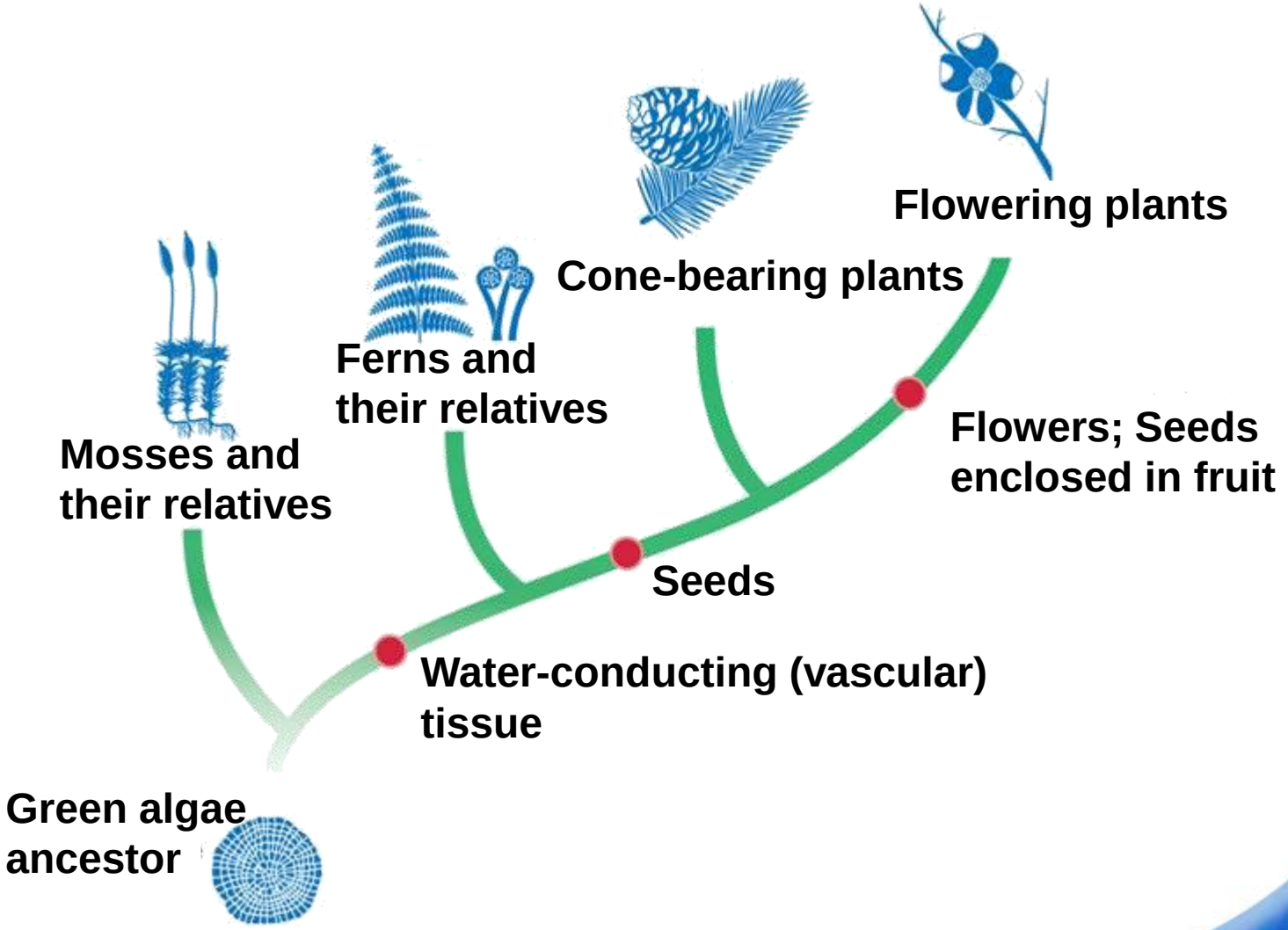
Overview of the Plant Kingdom

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



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22–1 Section QUIZ

1 Most plants alive today are

a. cone-bearing.

A b. flowering.

c. ferns.

d. mosses.

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.

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.

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