# What are the characteristics of plants?

## All plants are multicellular, which means their bodies are made up of more than one cell.

1. Plants are eukaryotes, which means their cells contain membrane-bound organelles, including a nucleus with the cell’s DNA
2. All plants have a life cycle made up of two stages: *sporophyte* and *gametophyte*.
3. In the sporophyte stage, plants make spores that are genetically identical to the parent plant.
4. In the gametophyte stage, plants produce gametes. Female gametophytes produce eggs and male gametophytes produce sperm.
5. Eggs and sperm are sex cells.
6. For a new plant to be produced, a sperm cell must fuse with, or fertilize, an egg. This is called sexual reproduction.
7. The fertilized egg can grow into a sporophyte, and the cycle can begin again.
8. Plant cells are surrounded by a rigid cell wall that lies outside the cell membrane. The cell wall supports and protects the plant cell.
9. The cell wall determines the size and shape of a plant cell. A carbohydrate called *cellulose* is the main component of plant cell walls.
10. The strength of a cell wall helps plants stand upright. *Secondary cell walls* form in some plant cells after the cells are mature. These secondary cell walls give wood its strength.
11. Inside a plant cell is a large central vacuole, a membrane-bound organelle that stores water and helps to keep the plant upright.
12. If the vacuole loses water, the plant begins to wilt
13. Almost all plants are **producers**. Producers make their own food by using energy from their surroundings.
14. The process that plants and other organisms use to convert solar energy to chemical energy is called **photosynthesis**.
15. In plants, photosynthesis occurs in an organelle called a chloroplast. Chloroplasts contain special pigments called chlorophyll.
16. **Chlorophyll** is a green pigment that captures energy from sunlight.
17. Chloroplasts use this energy, along with carbon dioxide and water, to make food in the form of a sugar called *glucose*.
18. **What are the two main groups of plants?**
19. Plants can be grouped into two categories: nonvascular and vascular.
20. A **vascular system** has tube-like tissues that transport water, nutrients, and other materials from one part of an organism to another.
21. Nonvascular plants do not have a vascular system
22. Mosses and their relatives, such as liverworts and hornworts, are nonvascular plants.
23. In nonvascular plants, water moves from the environment and throughout the plant by *diffusion*.
24. Nonvascular plants are fairly small because cells of the plants that are far from the ground do not get enough water.
25. Vascular plants have a vascular system that transports water and nutrients throughout the plant’s body.
26. The vascular system allows these plants to grow large and still move water and materials effectively.
27. The body of a vascular plant is divided into two systems: the root system and the shoot system
28. The root system is made of roots and other underground structures.
29. The above-ground structures, such as stems, leaves, and flowers, make up the shoot system.
30. The three major organs of vascular plants are roots, stems, and leaves.
31. Vascular tissue transports water and materials between roots and shoots.
32. **How are seedless nonvascular plants classified?**
33. Mosses grow on moist soil or rocks and have leafy stalks and rhizoids.
34. A *rhizoid* is a nonvascular, rootlike structure that helps mosses attach to surfaces and helps plants get water and nutrients.
35. Liverworts and hornworts are small nonvascular plants that can be leafy and mosslike or broad and flattened. Rhizoids hold them in place
36. Ferns have roots and rhizomes that help them spread. *Rhizomes* are underground stems from which new leaves and roots grow.
37. Ferns have leaves, called *fronds*, on stems that uncurl as they grow.
38. Whisk ferns have rhizoids instead of roots; instead of leaves, they have small growths that look like buttons.
39. Horsetails have cane-like stems that are hollow and contain silica, which gives them a gritty, rough texture.
40. Club mosses have vascular tissue, roots, stems, and tiny leaves. They grow in woodlands and near streams and marshes.
41. **How are seed plants classified?**
42. Seed plants are vascular plants that reproduce by making seeds. A **seed** is a plant embryo enclosed in a protective coating.
43. Seed plants produce **pollen**, a tiny structure in which sperm forms. The sperm cell fertilizes an egg cell, which develops into an embryo inside a seed.
44. Seed plants are classified based on whether or not their seeds are enclosed in a fruit.
45. **Gymnosperms** are plants that produce seeds that are not enclosed in a fruit. This includes cyads, ginkgoes, and conifers.
46. Cyads produce seeds in large, woody structures called *cones* that grow in a thick trunk.
47. Ginkgoes produce round, grape-like seeds not covered by a cone.
48. Conifers, such as pine trees, also produce cones.
49. **Angiosperms** are vascular plants that produce flowers and fruits that surround and protect seeds. Flowers are reproductive structures of angiosperms.
50. Sepals cover and protect the flower while it is budding. Petals attract pollinators.
51. A stamen is the male reproductive structure. The stamen is made up of an anther, which produces pollen, attached to a filament.
52. A pistil is the female reproductive structure. The seed develops in the ovary at the base of the pistil. The ovary matures into a fruit covering the seed.