

Chapter 22

Plant Diversity

Section 22-1 Introduction to Plants (pages 551-555)

This section explains what a plant is and describes what plants need to survive. It also explains how the first plants evolved.

What Is a Plant? (page 551)

1. Circle the letter of each sentence that is true about plants.
 - a. Plants are multicellular prokaryotes.
 - b. Plants carry out photosynthesis.
 - c. Plants have cell walls made of cellulose.
 - d. Plants develop from multicellular embryos.
2. What pigments do plants use to carry out photosynthesis? _____
3. Is the following sentence true or false? All plants are autotrophs. _____

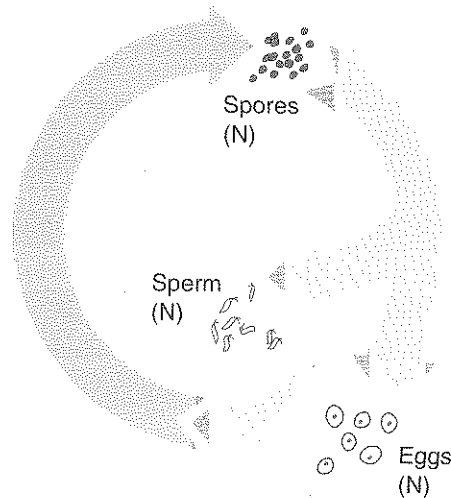
The Plant Life Cycle (page 552)

4. All plants have a life cycle that is characterized by alternation of _____.
5. Complete the table about plant generations.

PLANT GENERATIONS

Generation	Description	Haploid or Diploid?
	Gamete-producing plant	
	Spore-producing plant	

6. Complete the diagram of the plant life cycle by writing the name of the plant generation in the correct place. For each generation, indicate whether it is haploid or diploid by writing either N or $2N$.



Chapter 22, Plant Diversity (continued)

7. Seed plants have evolved reproductive cycles that are carried out independently of _____.

What Plants Need to Survive (page 552)

8. What are the four basic needs of plants? _____

9. Why are plant leaves typically broad and flat? _____

10. Circle the letter of each sentence that is true about the basic needs of plants.
- a. Plants require oxygen to support respiration.
 - b. Plants must get rid of water as quickly as possible.
 - c. Water is one of the raw materials of photosynthesis.
 - d. Plants have specialized tissues to carry nutrients upward.

Early Plants (pages 553–554)

11. The history of plants can be understood in terms of the evolution of what kinds of structures? _____

12. What did the first plants evolve from? _____

13. Circle the letter of each sentence that is true about multicellular green algae.
- a. They have the same photosynthetic pigments as plants.
 - b. They have the size, color, and appearance of plants.
 - c. They are classified as early plants.
 - d. They have reproductive cycles that are similar to early plants.
14. How were early plants similar to today's mosses? _____

15. From the first plants, at least two major groups of plants evolved. What did those groups develop into? _____

Overview of the Plant Kingdom (page 555)

16. Circle the letter of each of the important features that botanists use to divide the plant kingdom into four groups.
- a. seeds
 - b. water-conducting tissue
 - c. stems
 - d. flowers

17. What are the four main groups of living plants?

- a. _____ c. _____
b. _____ d. _____

18. The great majority of plants alive today are _____
_____.

Reading Skill Practice

Finding the main ideas of a section can help you organize the important points you need to remember. Skim Section 22-1 to find the main ideas. Write them on the left-hand side of a separate sheet of paper. Then make a list of supporting details for each main idea on the right-hand side of the sheet.

Section 22-2 Bryophytes (pages 556-559)

This section identifies the adaptations that enable bryophytes—mosses and their relatives—to live on land. It also identifies three groups of bryophytes and describes how bryophytes reproduce.

Introduction (page 556)

1. Mosses and their relatives are generally called _____.
2. Circle the letter of the substance that bryophyte life cycles are highly dependent on.
a. carbon dioxide b. soil c. oxygen d. water
3. How does the lack of vascular tissue keep bryophytes small? _____

4. Why must bryophytes live in places where there is standing water for at least part of the year? _____

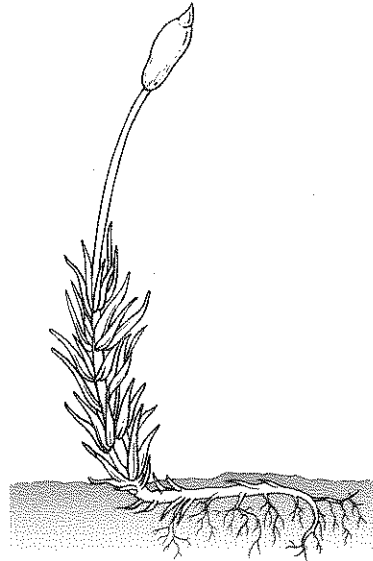
Groups of Bryophytes (pages 556-557)

5. What are the three groups of plants that bryophytes include?
a. _____ b. _____ c. _____
6. Where would you expect to find mosses growing? _____

7. Why are mosses the most abundant plants in polar regions? _____

Chapter 22, Plant Diversity (continued)

8. Why is the thin, upright shoot of a moss plant not considered to be a true stem? _____
9. Complete the illustration by identifying which part of a typical moss plant is the gametophyte and which part is the sporophyte.



10. What do the mature gametophytes of liverworts look like? _____

11. What are gemmae? _____

12. How do liverworts reproduce asexually? _____

13. What does the hornwort sporophyte look like? _____

14. In what sort of soil would liverworts and hornworts be expected to be found? _____

Life Cycle of Bryophytes (pages 558–559)

15. In bryophytes, which stage of the life cycle carries out most of the plant's photosynthesis? _____
16. What fact of reproduction limits the distribution of bryophytes to habitats near water? _____

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17. When a moss spore germinates, what does it grow into? _____

18. Complete the table about bryophyte reproductive structures.

BRYOPHYTE REPRODUCTIVE STRUCTURES

Structure	Description	Structure Produces
	Male reproductive structure	
	Female reproductive structure	

19. What does the zygote depend on for water and nutrients? _____

Human Use of Mosses (page 559)

20. In certain environments, the dead remains of sphagnum accumulate to form thick deposits of _____.

21. Why do gardeners add peat moss to soil? _____

Section 22-3 Seedless Vascular Plants (pages 560-563)

This section explains how vascular tissue is important to ferns and their relatives. It also describes the characteristics of three phyla of spore-bearing plants and describes the stages in the life cycle of ferns.

Introduction (page 560)

1. What is vascular tissue? _____

Evolution of Vascular Tissue (page 560)

2. What kind of cells did the first vascular plants have that were specialized to conduct water? _____

3. Circle the letter of each sentence that is true about tracheids.

a. They are hollow cells. c. Their thick cell walls resist pressure.

b. They are connected end to end. d. They are the key cells of phloem.

4. Complete the table about vascular tissue.

VASCULAR TISSUE

Type of Tissue	Function
Xylem	
Phloem	

Chapter 22, Plant Diversity (continued)

5. Is the following sentence true or false? Phloem and xylem cannot move water and nutrients against the force of gravity.

Ferns and Their Relatives (pages 561–562)

6. Spore-bearing vascular plants include what three types of plants?
a. _____ b. _____ c. _____
7. Is the following sentence true or false? Vascular plants have true roots and stems. _____
8. Complete the table about plant structures.

PLANT STRUCTURES

Structure	Description
Roots	
Leaves	
Stems	

9. The fossilized remains of ancient forests of club mosses exist today as huge beds of _____.
10. Why is *Equisetum* called "horsetail"? _____

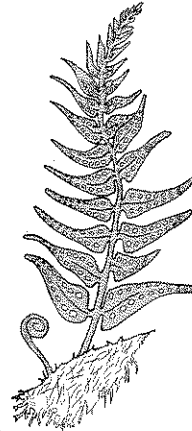
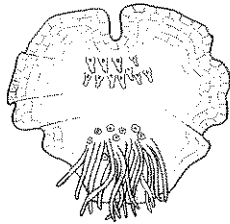
11. Circle the letter of each structure a horsetail has.
a. stems b. cones c. leaves d. roots
12. Ferns are members of phylum _____.
13. What are rhizomes? _____
14. The large leaves of ferns are called _____.
15. Fronds grow from what fern structures? _____
16. In what kind of habitats are ferns most abundant? _____

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Life Cycle of Ferns (pages 562–563)

17. What is the dominant stage in the life cycle of ferns and other spore-bearing vascular plants? _____

18. Fern sporophytes produce haploid spores on the underside of their fronds in tiny containers called _____.
19. What are sori? _____
20. Are the spores of ferns haploid or diploid? _____
21. Label each drawing of a fern as either the sporophyte or the gametophyte.



22. Where are the antheridia and archegonia found in ferns? _____
23. Why does fertilization in ferns require at least a thin film of water? _____
24. Circle the letter of each sentence that is true about the life cycle of ferns.
 - a. The zygote grows into a new gametophyte.
 - b. The sporophyte is a heart-shaped, green structure.
 - c. Fern sporophytes often live several years.
 - d. When spores germinate, they grow into haploid gametophytes.

Section 22-4 Seed Plants (pages 564-568)

This section explains what features allow seed plants to reproduce without standing water. It also describes the four groups of gymnosperms.

Introduction (page 564)

1. Complete the table about seed plants.

SEED PLANTS

Type	Description	Examples
	Seed plants that bear seeds directly on the surfaces of cones	
	Seed plants that bear their seeds within a layer of protective tissue	

Chapter 22, Plant Diversity (continued)

Reproduction Free From Water (pages 564–565)

2. What are three features that allow seed plants to reproduce without water?
 - a. _____
 - b. _____
 - c. _____
3. What are cones and flowers? _____

4. Why don't the gametophytes or the gametes of seed plants need standing water to function? _____

5. What is pollination? _____

Match the structure with its description.

Structure	Description
_____ 6. pollen grain	a. An embryo encased in a protective covering
_____ 7. seed	b. Structure that surrounds and protects the plant embryo
_____ 8. endosperm	c. Early developmental stage of sporophyte plant
_____ 9. embryo	d. Male gametophyte of seed plants
_____ 10. seed coat	e. Seed's food supply

11. What are examples of tissues or structures that seeds have that aid in their dispersal? _____

12. What is the strategy that allows seeds to survive long periods of bitter cold, extreme heat, or drought? _____

Evolution of Seed Plants (page 566)

13. How did conditions on Earth change during the Carboniferous and Devonian periods, and how did those changes affect plants? _____

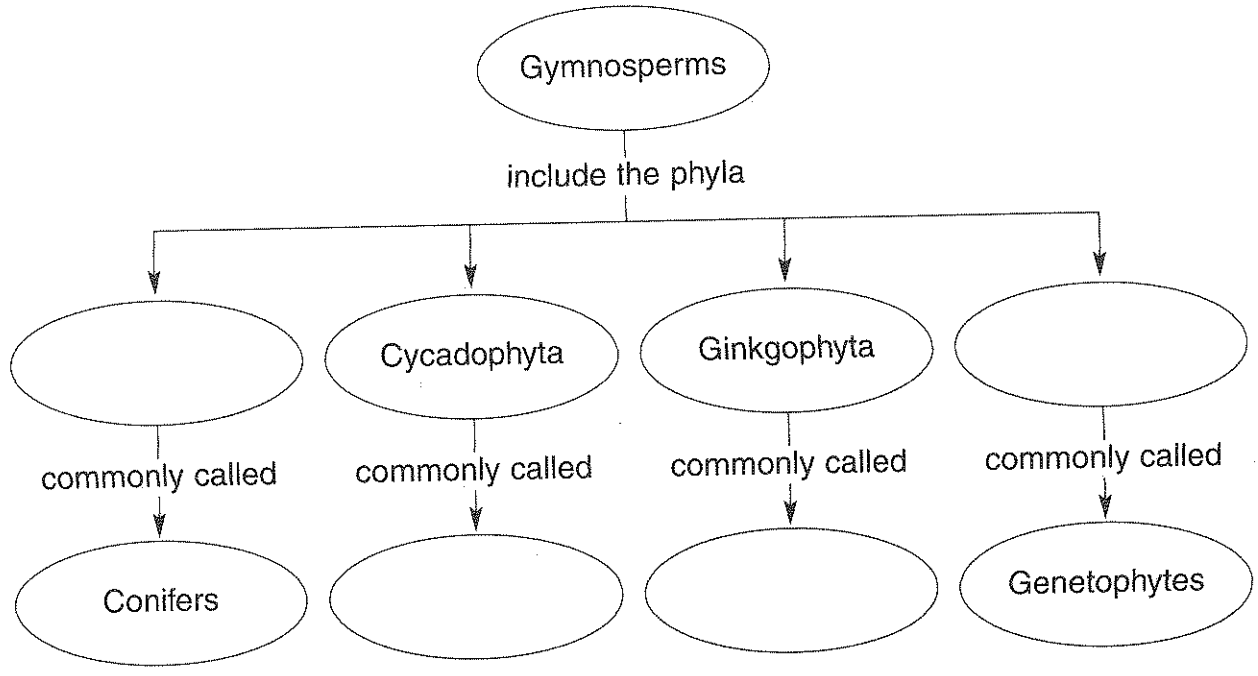
14. What link do seed ferns represent in the fossil record? _____

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15. What adaptations did seed plants have that allowed them to replace spore-bearing plants as continents became drier? _____

Gymnosperms—Cone Bearers (pages 566–568)

16. Complete the concept map about gymnosperms.



17. What kind of gymnosperm is *Ephedra*? _____
18. Where are the reproductive scales of gnetophytes found? _____
19. What do cycads look like? _____
20. In what kind of habitats can cycads be found growing naturally today? _____
21. Why is the ginkgo tree sometimes called a living fossil? _____
22. What kinds of plants do conifers include? _____
23. Why are the leaves of most conifers long and thin, such as pine needles? _____
24. In addition to the shape of the leaves, what are two other adaptations that help conifers conserve water?
- a. _____
- b. _____

Chapter 22, Plant Diversity *(continued)*

25. Circle the letter of the reason why most conifers never become bare.
 - a. They never lose their needles.
 - b. The gametophyte supplies needles to the sporophyte.
 - c. Older needles are gradually replaced by newer needles.
 - d. The needles conserve water throughout the year.
26. How are larches and bald cypresses different from most other conifers? _____

Section 22-5 Angiosperms—Flowering Plants (pages 569–572)

This section identifies the characteristics of angiosperms. It also explains what monocots and dicots are and describes the three categories of plant life spans.

Introduction (page 569)

1. Angiosperms are members of the phylum _____.
2. Angiosperms have unique reproductive organs known as _____.
3. During which geologic period did flowering plants first appear? _____

Flowers and Fruits (page 569)

4. In flowering plants, the seed is encased in a(an) _____.
5. What is a fruit? _____
6. Why is using fruit to attract animals one of the reasons for the success of flowering plants? _____

Diversity of Angiosperms (pages 570–572)

7. The seed leaves of plant embryos are called _____.
8. Complete the table about classes of angiosperms.

CLASSES OF ANGIOSPERMS

Class	Common Name	Number of Seed Leaves	Examples
Monocotyledonae			
Dicotyledonae			

9. Circle the letter of each plant feature that is characteristic of dicots.
 - a. Parallel leaf veins
 - b. Floral parts in multiples of 4 or 5
 - c. Roots include a taproot
 - d. Vascular bundles scattered throughout stem
10. Classify each of the following plants as either woody or herbaceous by writing the correct term on the line.
 - a. Rose shrubs _____
 - b. Oaks _____
 - c. Tomato plants _____
 - d. Sunflowers _____
 - e. Grape vines _____
 - f. Dandelions _____
11. Woody plants are made primarily of what kind of cells? _____

12. What characteristics do the stems of herbaceous plants have? _____

13. Complete the table about plant life spans.

PLANT LIFE SPANS

Category	Definition	Examples
Annuals		
Biennials		
Perennials		

14. What structures do biennials produce in their first year of growth? _____

15. What happens to biennials once their flowers produce seeds? _____

16. Is the following sentence true or false? Most perennials have herbaceous stems. _____

Chapter 22, Plant Diversity *(continued)*

WordWise

Use the clues below to identify vocabulary terms from Chapter 22. Write the terms on the lines, putting one letter in each blank. When you finish, the word enclosed in the diagonal will reveal an important term related to plants.

Clues

- | | |
|---|--|
| 1. Cluster of vascular tissue in a leaf | 8. Spore-producing plant |
| 2. Female reproductive structure in mosses | 9. Bryophyte structure where sperm are produced |
| 3. Supporting structure that connects roots and leaves | 10. A long, thin cell that anchors a moss to the ground |
| 4. Key cells in xylem | 11. Flowering plant |
| 5. A thick wall of tissue surrounding angiosperm seed | 12. An embryo of a living plant that is encased in a protective covering |
| 6. Process by which pollen is carried to the female gametophyte | 13. A cluster of sporangia |
| 7. Photosynthetic organ that contains vascular tissue | 14. Creeping or underground stem in ferns |

Vocabulary Terms

1.	_____
2.	_____
3.	_____
4.	_____
5.	_____
6.	_____
7.	_____
8.	_____
9.	_____
10.	_____
11.	_____
12.	_____
13.	_____
14.	_____