

Chapter 30: Plant Diversity II: The Evolution of Seed Plants

30.1 Explain how seeds and pollen grains were key adaptations for plants.

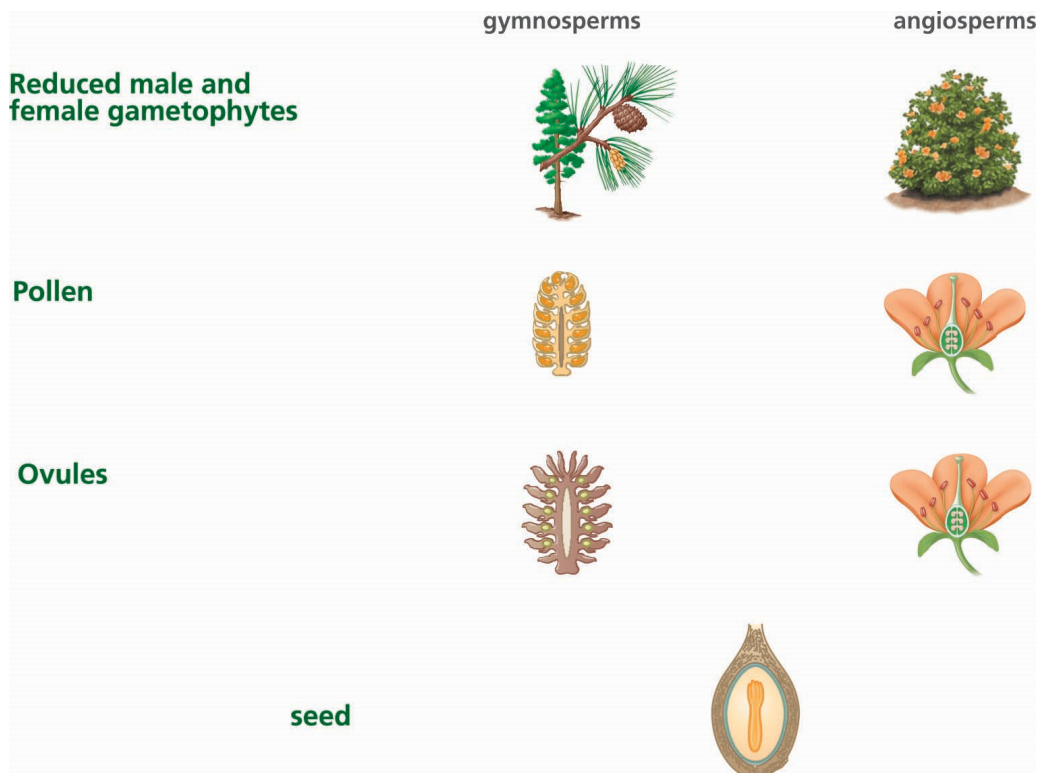
30.2 Characterize gymnosperms and their life cycles.

30.3 Describe the structure and function of flowers and fruits.

30.4 Give examples of human interactions with plants.

In this second chapter on the evolution of plants it is important to know enough terminology to understand the major evolutionary trends. As you work through this chapter, keep looking for the big picture and try not to get lost in a forest of new terms. The questions we ask focus primarily on the essential knowledge a student should have regarding seed plants and their evolution.

Study Tip: Four key evolutionary breakthroughs enabled seed plants to dominate plant diversity. Label these figures and explain how each of the adaptations shown here provides an evolutionary advantage.



Concept 30.1 *Seeds and pollen grains are key adaptations for life on land*

LO 30.1: *Explain how seeds and pollen grains were key adaptations for plants.*

1. What are the three components of a seed?
2. List five characteristics common to all seed plants.
3. Why is the production of pollen and seeds important adaptations for life on land?
4. A trend in the evolution of plants is reduction of the gametophyte, and this continues in seed plants. Study Figure 30.2 in your text to review these relationships in different plant groups as you complete the following chart.

	PLANT GROUP		
	Mosses and other nonvascular plants	Ferns and other seedless vascular plants	Seed plants (gymnosperms and angiosperms)
Gametophyte			
Sporophyte			
Example			

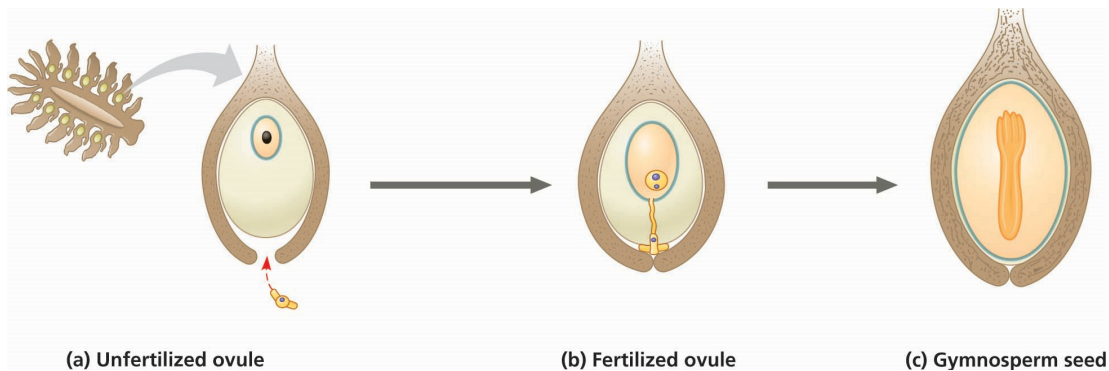
5. List four advantages the plant gains by the miniaturization of the gametophyte.
6. *Heterospory* indicates that the plant produces two kinds of spores: *megaspores* and *microspores*. Explain what each type of spore forms as it develops.

megaspore

microspore

7. Inside each _____, a female _____ develops from a megaspore and produces one or more _____.

8. A microspore develops into a _____ that consists of a male _____ enclosed within the pollen wall.
9. What is the purpose of *pollination*?
10. Pollen and seeds are important adaptations for life on land. What are two advantages of pollen over free-swimming sperm?
11. Using Figure 30.3 in your text as a guide, label all the parts of the following figure. Then, below each of the three drawings, explain what is occurring.



12. What are three advantages of seeds over spores?

Study Tip

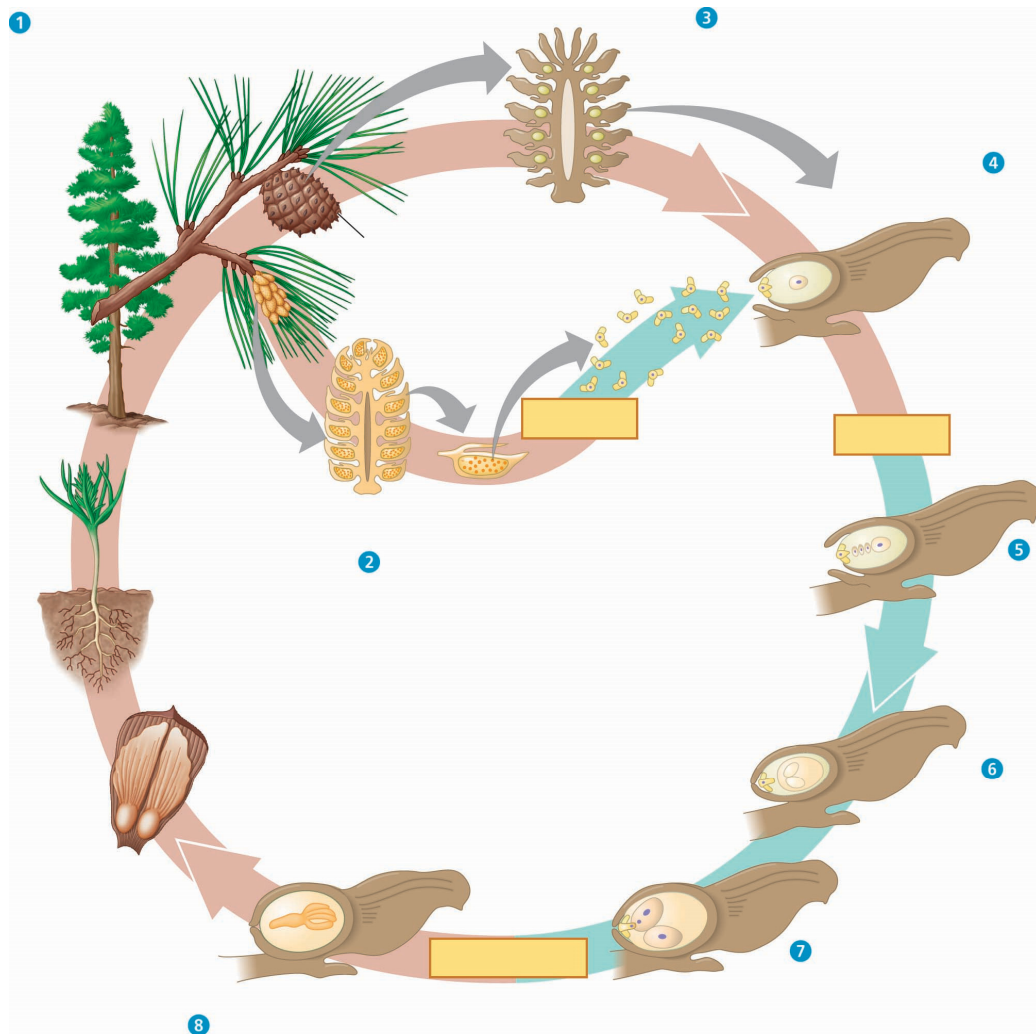
Continue to look for the big picture. Microspores will eventually produce pollen that will contain sperm nuclei. Megaspores will eventually produce archegonia that will contain eggs. The sperm and egg will unite to form a diploid embryo. The basics are the same as with any sexually reproducing organism.

Concept 30.2 *Gymnosperms bear “naked” seeds, typically on cones*

LO 30.2: *Characterize gymnosperms and their life cycles.*

12. Figure 30.7 in your text shows the four phyla of gymnosperms. The phylum *Coniferophyta* will likely be most familiar to you. What are five examples of the *Coniferophyta*?

13. Understanding the life cycle of the pine should bring together the essential characteristics of gymnosperms. Following Figure 30.4 in your text, label and give eight brief explanations of the key features of the pine life cycle.



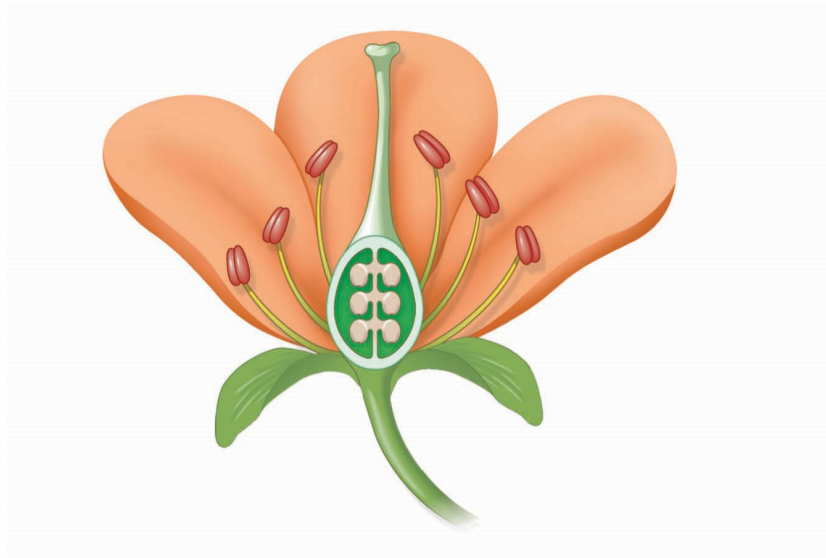
14. Explain why gymnosperm seeds are said to be “naked.”

Concept 30.3 *The reproductive adaptations of angiosperms include flowers and fruits*

LO 30.3: *Describe the structure and function of flowers and fruits.*

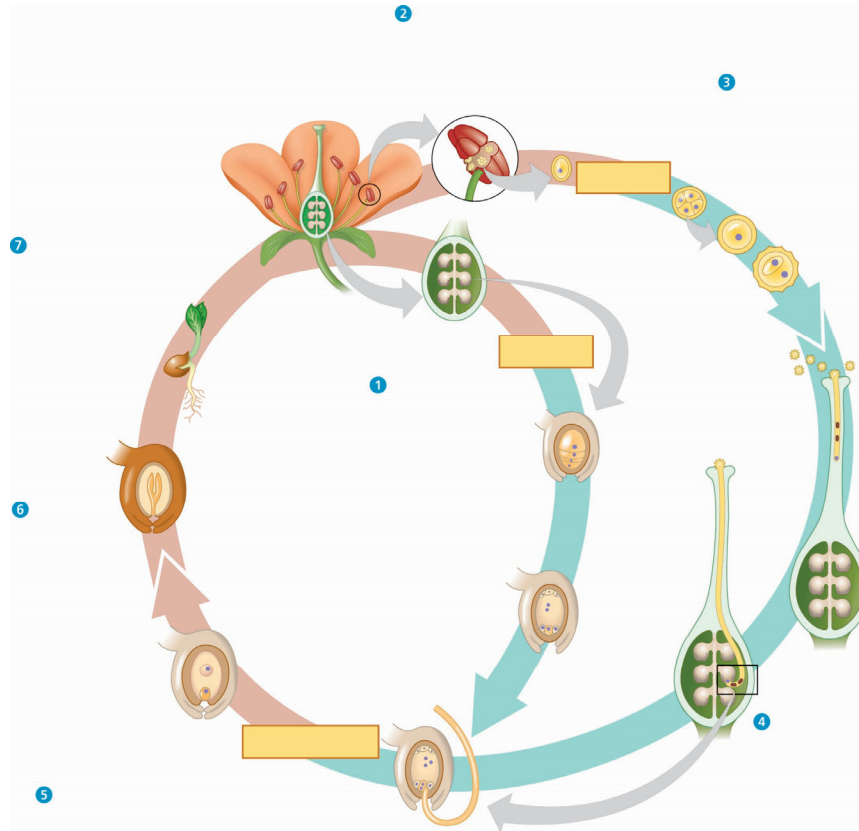
15. What “covers” angiosperm seeds?
16. What is the specialized function of the *flower*?

17. Label the 10 structures on the flower diagram (omit receptacle for now). Briefly give the function of each labeled part.



18. What is the botanical definition of a fruit?
19. List the two functions of fruits.
20. What is the difference between *cross-pollination* and *self-pollination*?
21. What is the evolutionary advantage of cross-pollination?
22. What two events occur during *double fertilization*?
23. Let's check for three key things concerning double fertilization:
- What does the ovule become?
 - What does the zygote form?
 - What tissue nourishes the embryo?

24. Using Figure 30.12 in your text, label the following diagram of the life cycle of an angiosperm. To simplify, label only the terms used to describe the life cycle. After labeling, use your own phrasing to explain the process in seven concise steps.



25. The two largest groups of angiosperms are *monocots* and *eudicots*. Flowering plants can often be placed in one of these two categories by easy-to-observe characteristics. Use Figure 30.16 from your text to label the key differences between the two groups.

	Embryos	Leaf venation	Stems	Roots	Pollen	Flowers
Monocot Characteristics						
Eudicot Characteristics						

Concept 30.4 *Human welfare depends on seed plants*

LO 30.4: *Give examples of human interactions with plants.*

26. Explain the importance of seed plants to humans in the following areas:

food

wood

medicines

27. Why should threats to plant diversity be taken seriously?

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1. _____ 2. _____ 3. _____ 4. _____ 5. _____

6. Use the letters a–d to label where on the phylogenetic tree each of the following derived characters appears.

a. flowers b. embryos c. seeds d. vascular tissue

