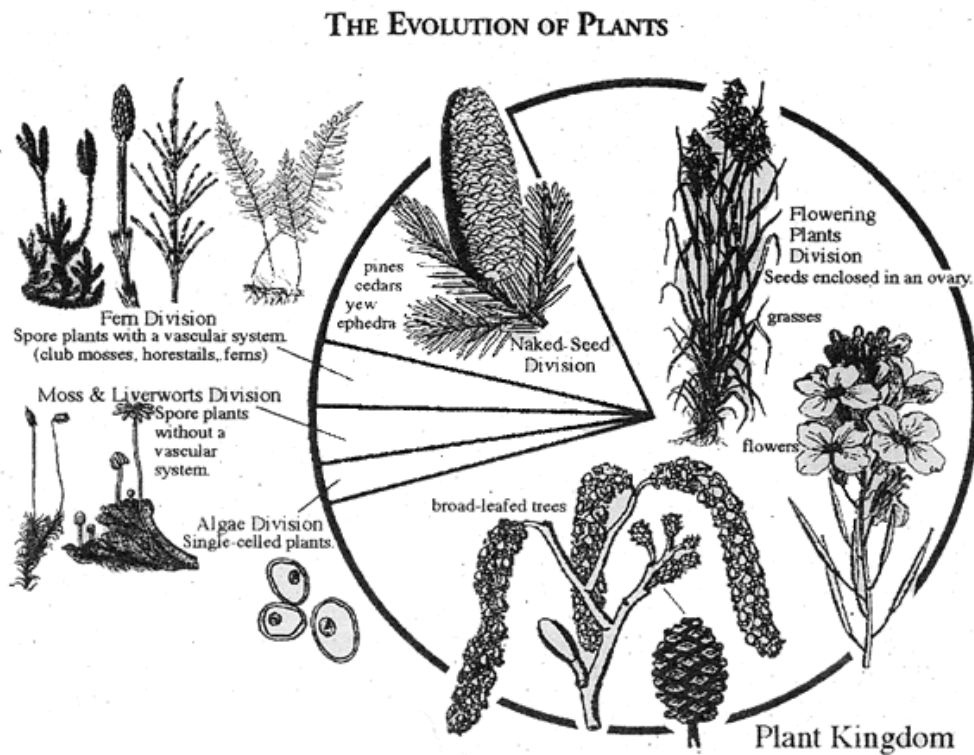


CHAPTER 8



PLANTS

Chapter 8 Objectives

Section 1: The Plant Kingdom

1. Identify the characteristics all plants share
2. Name the things that a plant needs to live successfully on land
3. Compare vascular and nonvascular plants
4. Describe the stages of a plant's life cycle

Section 2: Plants Without Seeds

1. Name some nonvascular plants and list the characteristics they share
2. Name some seedless vascular plants and list the characteristics they share

Section 3: The Characteristics of Seed Plants

1. Identify the characteristics that seed plants have
2. Explain how seeds become new plants
3. Describe the functions of roots, stems, and leaves

Section 4: Gymnosperms and Angiosperms

1. Identify the characteristics of gymnosperms and describe how they reproduce
2. Describe the characteristics of angiosperms and their flowers
3. Explain how angiosperms reproduce
4. Describe the two types of angiosperms
5. List the products from seed plants

Section 5: Plant Responses and Growth

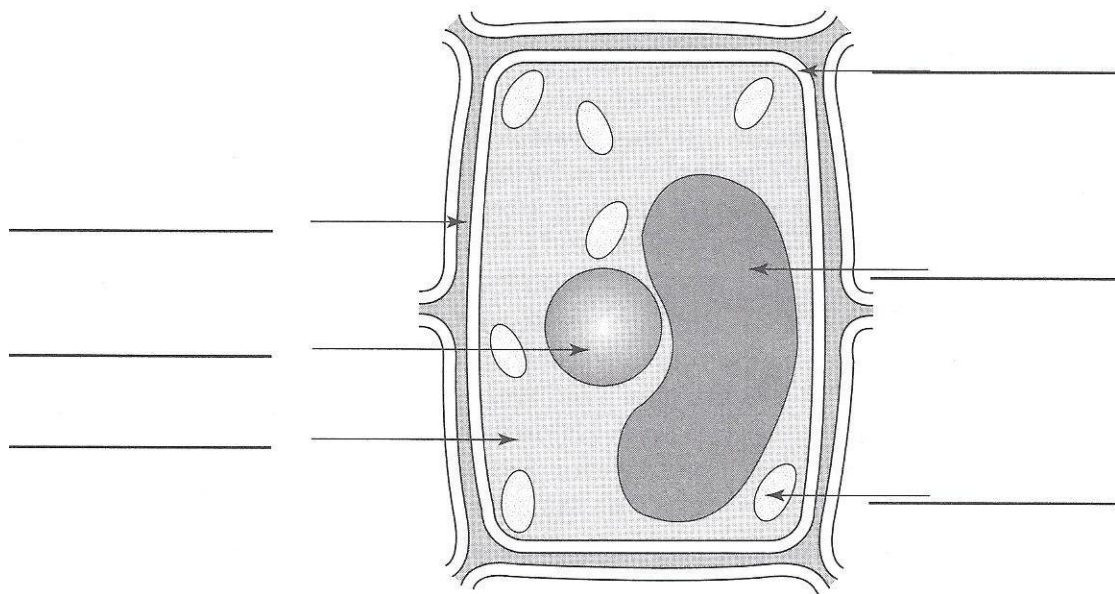
1. Identify three stimuli that produce plant responses
2. Describe how plants respond to seasonal changes
3. State how long different angiosperms live

The Plant Kingdom

Directions: Fill in the blank

1. The internal transporting system through which water, minerals, and food move inside a plant is called _____.
2. In the _____ stage, the plant produces two kinds of sex cells.
3. A plant that does not have a well-developed system of tubes for transporting water and other materials is called a(n) _____.
4. A(n) _____ is a waxy, waterproof layer that covers the leaves and stems of most plants.
5. In the _____ stage, the plant produces spores.
6. A plant with true vascular tissue is called a(n) _____.
7. A fertilized egg is called a(n) _____.

Directions: Label the diagram of a plant cell below.

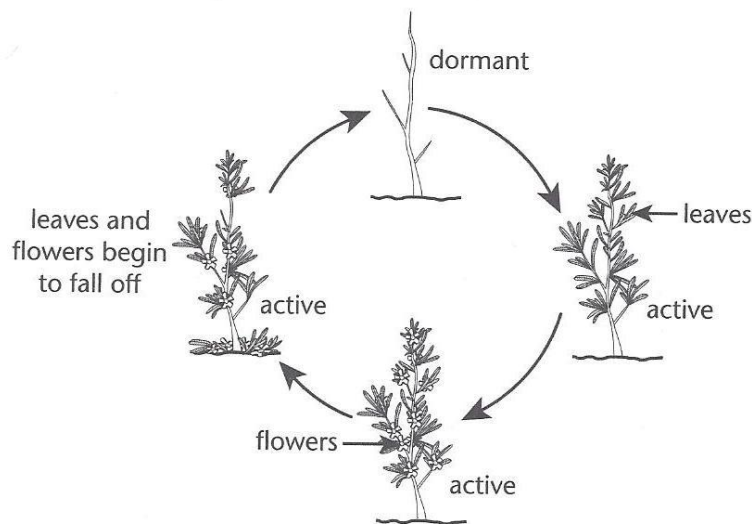


DESERT SURVIVAL

You learned that all plants much have adaptations for obtaining and retaining water. This is especially true of plants that live in the desert. To obtain water, some desert plants have very deep root systems that can absorb moisture far underground. Others have shallow, horizontal root systems that can quickly absorb a large amount of water when it rains.

The aboveground surfaces of many desert plants are covered with spines. These spines help to shade the plant from the sun and keep it from getting too hot. They also help to reduce water loss from the plant by shielding it from dry winds. Some plants in the desert have thick, fleshy stems that can store water for long periods of time.

Many plants, such as the one shown below, survive dry periods by becoming *dormant* or inactive. When a plant is dormant, it needs very little water.



Directions: Answer the following questions.

1. What do you think causes the plant in the figure above to come out of dormancy and become active?
2. Why do you think the plant loses its leaves and flowers when it becomes dormant?
3. Do you think that the plant shown above is more likely to have deep roots or shallow horizontal roots? Explain.
4. A desert plant called the creosote bush has a double root system: it has both shallow horizontal roots and deep vertical roots. Why would this type of root system be an advantage to a desert plant?
5. Do you think a desert plant is more likely to have a thin cuticle or a thick cuticle? Explain.

The Plant Kingdom

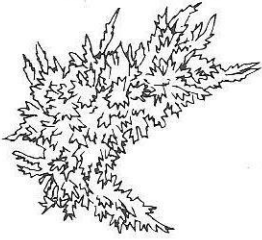
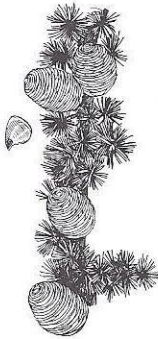
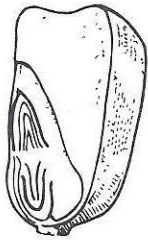
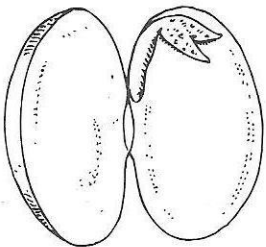
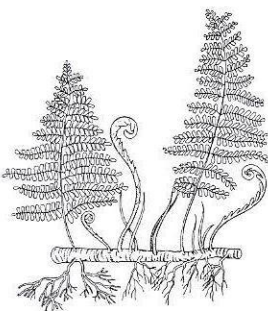
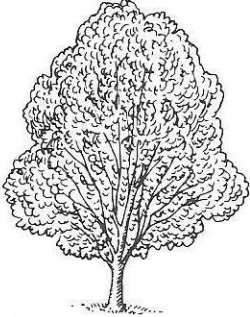
Directions: Determine the appropriate term for the following definitions. Find the term in the word search.

P	L	A	N	T	S	S	A	R	E	A	E
E	U	R	E	H	E	T	O	T	R	T	N
T	O	A	T	P	T	P	H	I	O	C	O
Y	E	L	Y	O	O	U	K	G	A	R	N
H	Y	U	H	R	Y	O	Y	T	E	S	V
P	C	C	P	T	R	Z	M	J	M	P	A
O	U	S	O	O	A	T	G	L	P	L	S
R	T	A	T	T	K	R	B	K	C	F	C
O	I	V	E	U	U	K	T	J	R	M	U
P	C	Q	M	A	E	D	K	M	W	H	L
S	L	R	A	K	K	D	L	X	N	M	A
R	E	J	G	K	R	C	G	R	W	J	R

- | | |
|----------|---|
| 1. _____ | Organism that is able to make its own food |
| 2. _____ | Waxy, waterproof layer that covers leaves and stems |
| 3. _____ | Organisms that contain cells that have nuclei |
| 4. _____ | Stage of life cycle in plant when sex cells are formed |
| 5. _____ | Stage of life cycle in plant when spores are produced |
| 6. _____ | Plants that are low-growing and do not contain tube-like tissue for transport |
| 7. _____ | Plants that can live in dry area and contain tube-like tissue for transport |
| 8. _____ | A fertilized egg |

The World of Plants

The plant kingdom is made up of organisms that contain chlorophyll and have rigid cell walls made of cellulose. Use the definitions below to label each type of plant shown in the illustrations.

 <p>1 _____</p>	 <p>2 _____</p>	 <p>3 _____</p>
 <p>4 _____</p>	 <p>5 _____</p>	 <p>6 _____</p>

Monocot: A flowering plant with seeds that have only one cotyledon, flower parts that occur in threes, and leaves that are generally parallel-veined.

Deciduous Tree: A tree that loses its leaves at a particular season.

Dicot: A flowering plant with seeds that have two cotyledons, flower parts that occur in fours or fives, and leaves that are net-veined.

Moss: A small, green plant that is nonvascular, meaning it lacks a system of tubes through which water is transported through the plant.

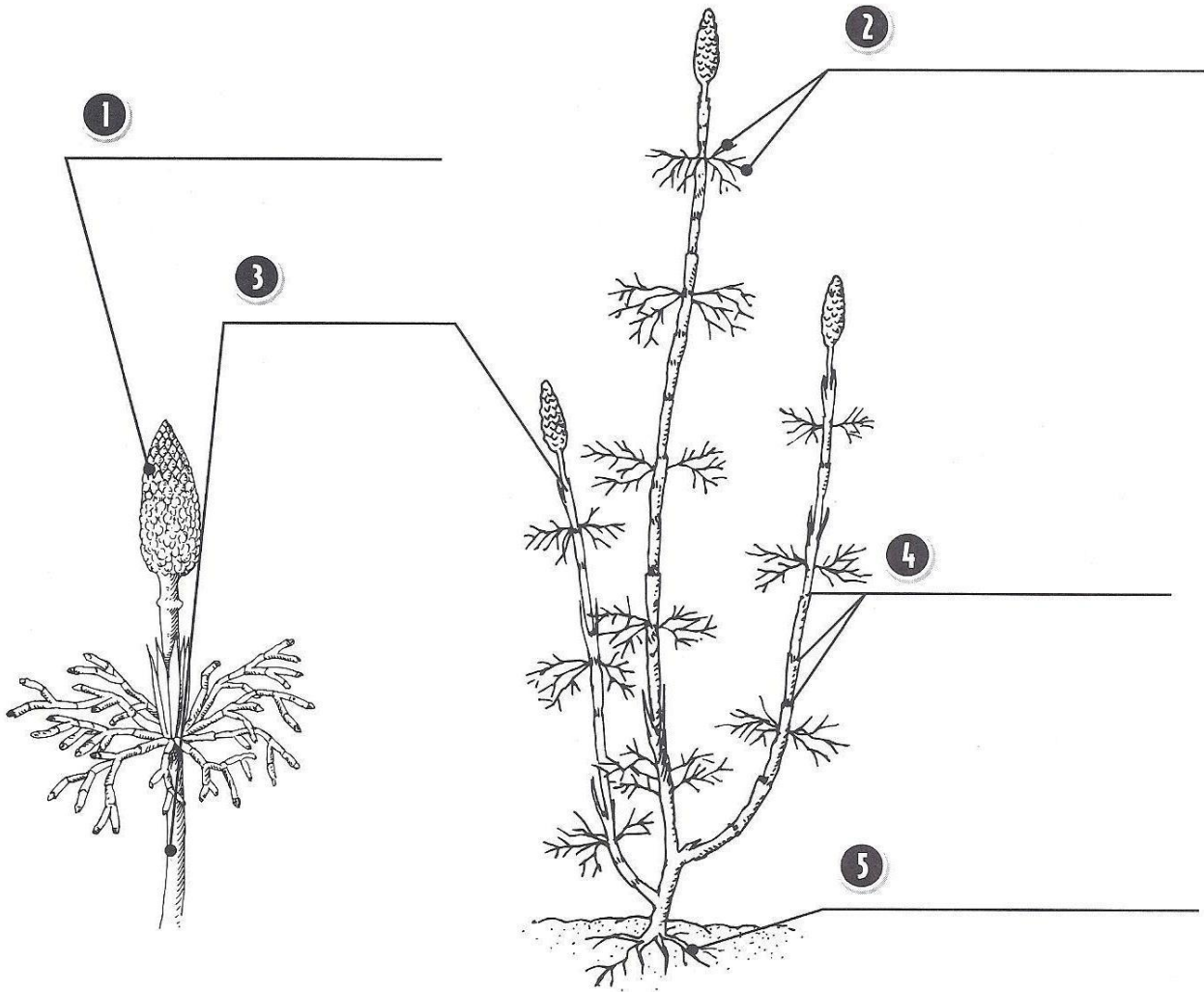
Conifer: A mostly evergreen tree or shrub with needlelike leaves and seeds in cones.

Fern: A vascular plant that lacks flowers or seeds but reproduces with spores.

Horsetails

Of all existing plants, the horsetails may be the oldest. By examining fossil records of these plants, it appears that they have changed very little since they first appeared on Earth. Their stems are reinforced with ribs of silica, giving them a sandpaper feel. Pioneers of the American West gathered horsetails to use as pot scrubbers. Use the terms in the word box to label the diagram.

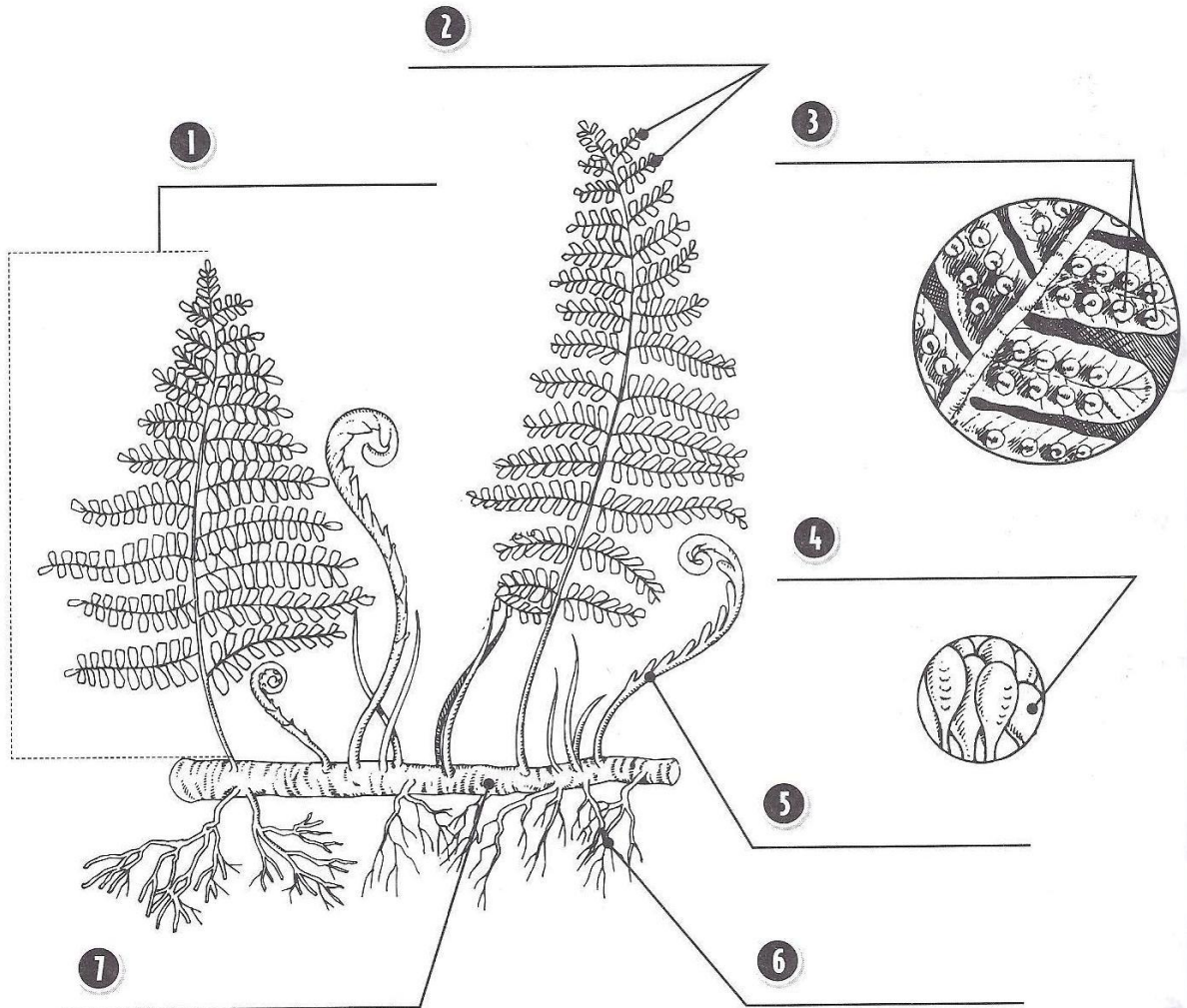
hollow stems scalelike leaves rhizomes ribs spore-bearing structures



Ferns

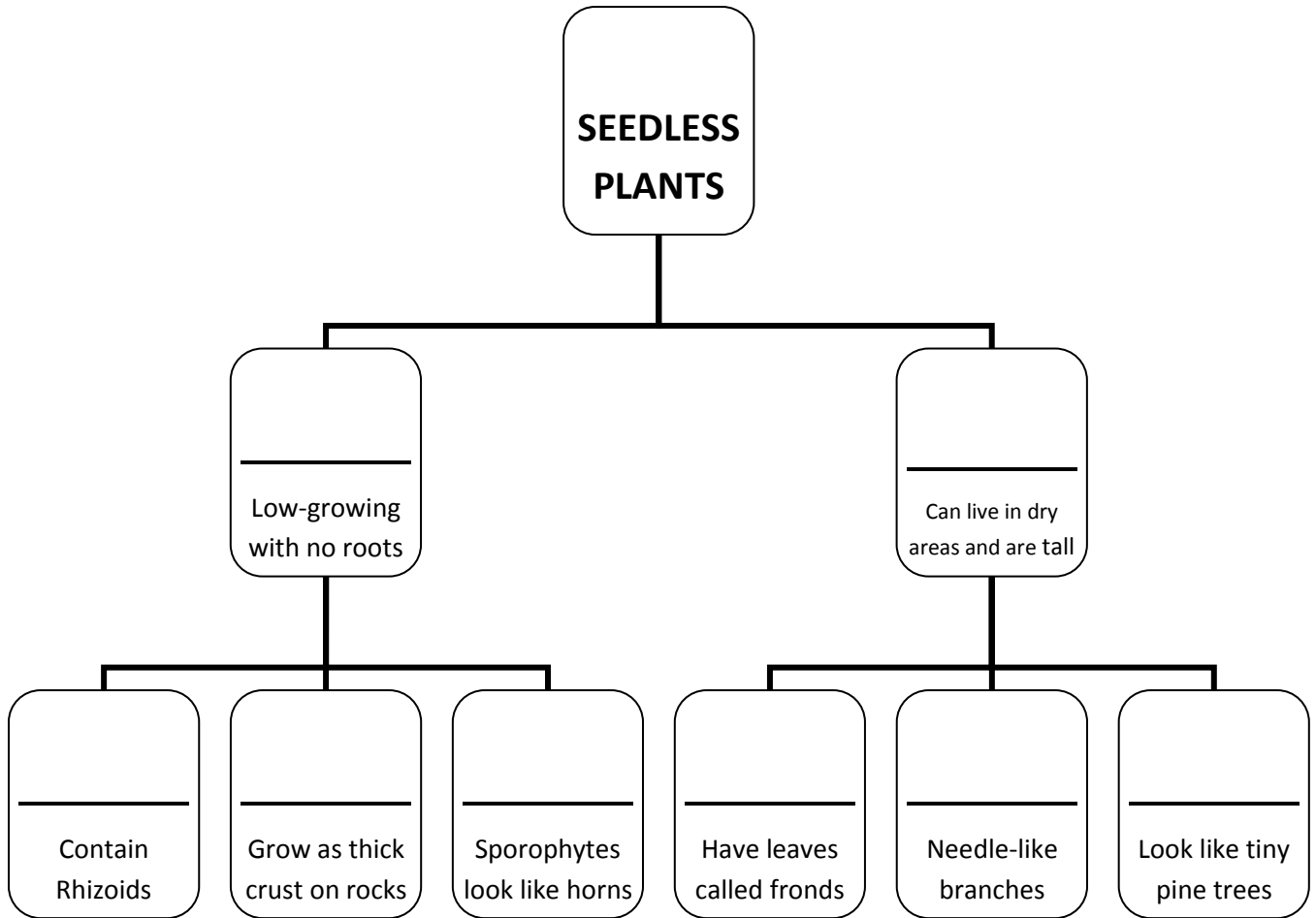
Ferns are flowerless, seedless plants that reproduce by forming spores. The spores grow in structures located on the underside of the fronds. Ferns are vascular plants, meaning that a series of tubes within the stems and leaves carry nutrients and water throughout the plant. Use the terms in the word box to label the diagram.

frond	fiddlehead	rhizome	root
spores	leaflets	sorus	



PRACTICE: Seedless Plants

Directions: Fill in the following concept map



Directions: Fill in the following chart.

Characteristic	MOSSES	LIVERWORTS	HORNWORTS
Vascular tissue (Y/N?)			
Height			
Size			
Moisture Needs			
Where they grow			

PLANTS WITHOUT SEEDS

Directions: Determine the appropriate term for the following definitions. Find the term in the word search.

W	Y	L	K	J	R	S	Z	R	L	H	K
S	D	T	L	F	D	C	N	V	V	C	N
T	B	S	H	N	K	D	D	H	R	L	C
R	N	T	O	R	Q	M	L	G	D	U	T
O	K	R	R	H	K	S	W	Z	R	B	H
W	F	O	S	I	Z	E	K	R	R	M	N
R	Z	W	E	Z	X	S	G	W	X	O	H
E	P	N	T	O	L	S	Z	V	R	S	C
V	W	R	A	I	Z	O	L	L	Y	S	D
I	K	O	I	D	H	M	L	H	D	E	T
L	D	H	L	S	N	L	B	T	Q	S	H
N	Y	M	S	Q	Y	F	E	R	M	S	M

- | | | |
|----|--|--|
| 1. | | Seedless vascular plant that looks like a tiny pine tree |
| 2. | | Seedless vascular plant that has leaves called fronds |
| 3. | | Type of leaf found on ferns with spores on underside |
| 4. | | Seedless non-vascular plant with sporophytes that look like horns |
| 5. | | Seedless vascular plant that has needle-like branches around the stem |
| 6. | | Seedless non-vascular plant that grows as thick crust on moist rocks |
| 7. | | Seedless non-vascular plant that have rhizoids and a capsule containing spores |
| 8. | | Thin roots that anchor moss and absorb water and nutrients |

REPRODUCTIVE CYCLES OF SEEDLESS PLANTS

DOMINANT STAGE- GAMETOPHYTE
MICROSCOPIC STAGE- SPORES

Figure 6 Moss Life Cycle

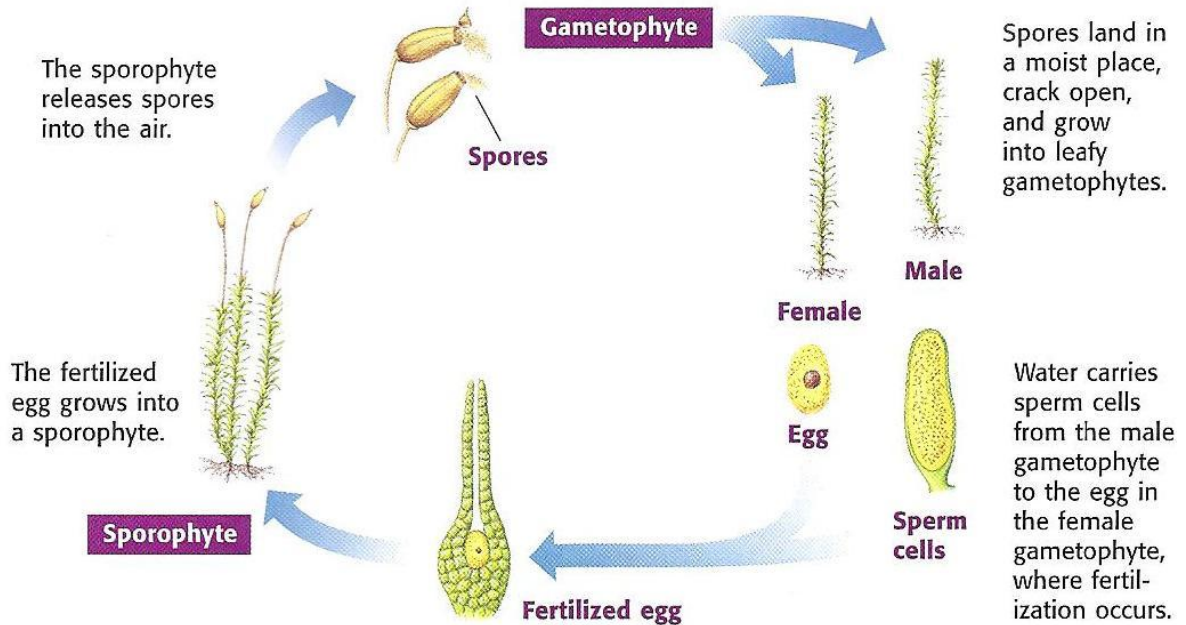
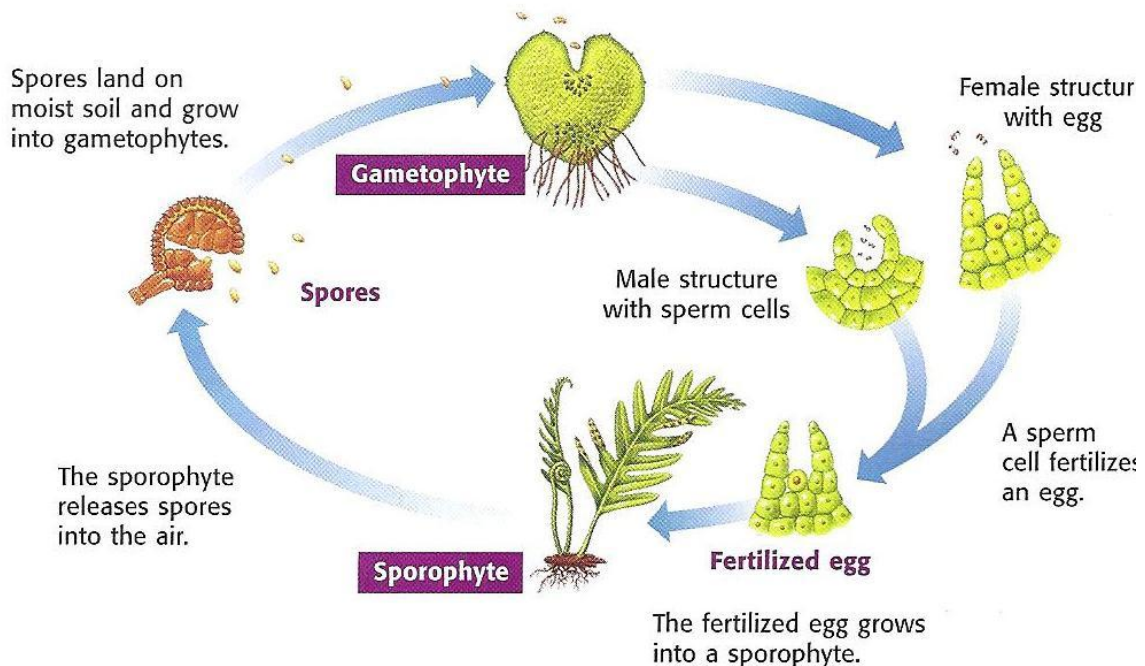


Figure 10 Fern Life Cycle

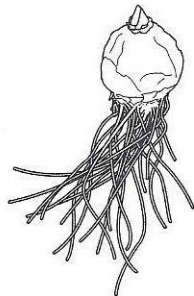


CHARACTERISTICS OF SEED PLANTS

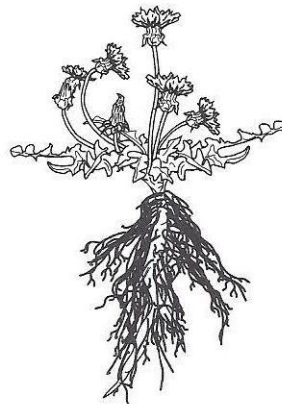
Directions: Match the structure to the function

- | | |
|---------------------------|---|
| 1. ____ Embryo | a. seed leaf that sometimes stores food |
| 2. ____ Cotyledon | b. widely spaced cells allow CO ₂ and O ₂ to pass and out of leaf |
| 3. ____ Seed Coat | c. increase the amount of water and minerals absorbed by the root |
| 4. ____ Root Cap | d. moves water and minerals to the stems and leaves |
| 5. ____ Root Hairs | e. contain the most chloroplasts |
| 6. ____ Phloem | f. moves food to the roots and other parts of the plant |
| 7. ____ Xylem | g. tiny pores that open and close to let CO ₂ in and H ₂ O and O ₂ out |
| 8. ____ Cuticle | h. waxy, waterproof coating that covers a leaf's surface |
| 9. ____ Stomata | i. keeps the seed from drying out |
| 10. ____ Cambium | j. protects the root from injury during growth |
| 11. ____ lower leaf cells | k. cell layer that produces new phloem and xylem |
| 12. ____ upper leaf cells | l. young plant that develops from the fertilized egg |

Directions: Determine what type of root system is illustrated in the pictures below.



a. _____



b. _____

SEED PLANTS

Directions: Determine the appropriate term for the following definitions. Find the term in the word search.

N O I T A R I P S N A R T
 P D C N M M R O O T C A P
 N R P Z B E G M B L R H A
 O O F R O O T H A I R S N
 D K I R Z L P O L L E N N
 E C F T R H W L G M S J U
 L L A D A P K N N T Z M A
 Y R H M M N I C O N E N L
 T F D W B L I M M L Q W R
 O C X W D I A M Y R L T I
 C Z C E D T U X R T Z H N
 M R E J A K Y M Q E T N G
 L S F K P M R H R M G L S

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

1. A seed leaf that sometimes stores food
2. Protects the root from injury during growth
3. Increase the amount of water and minerals absorbed by the root
4. Cell layer that produces new phloem and xylem
5. Moves food to the roots and other parts of plant
6. Moves water and minerals absorbed by the root
7. Tiny pores that open and close to let CO₂ in and H₂O and O₂ out
8. Stage in plant life cycle when leaves are first present
9. Process by which leaves lose H₂O via evaporation
10. Bands that represent one year of growth
11. Sprouting of embryo from a seed
12. Tiny particle that delivers sperm to egg cells

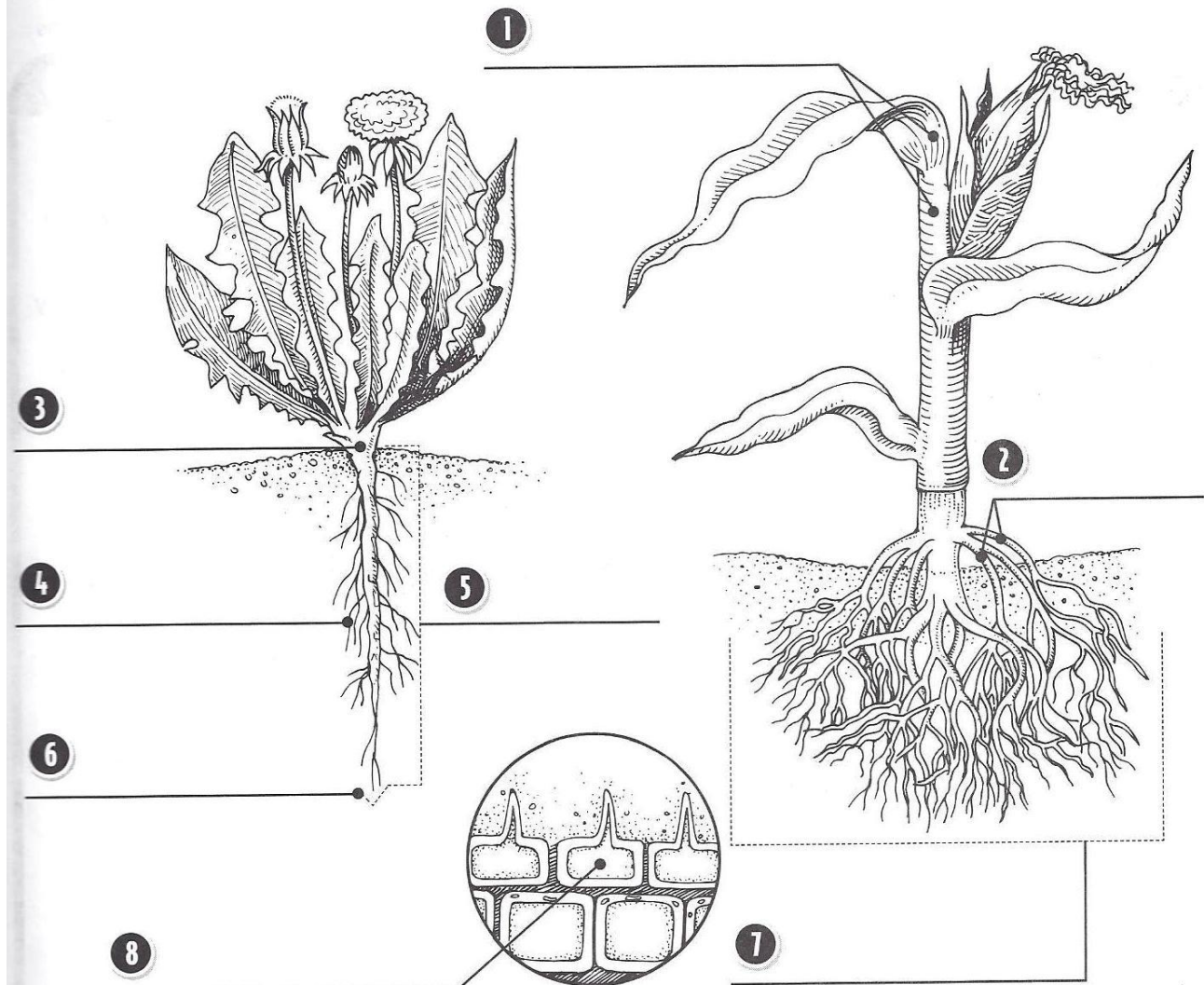
Root Systems

Two types of root systems are found in flowering plants. Use the terms in the word box to label the diagrams.

fibrous roots
lateral root
stems and leaves

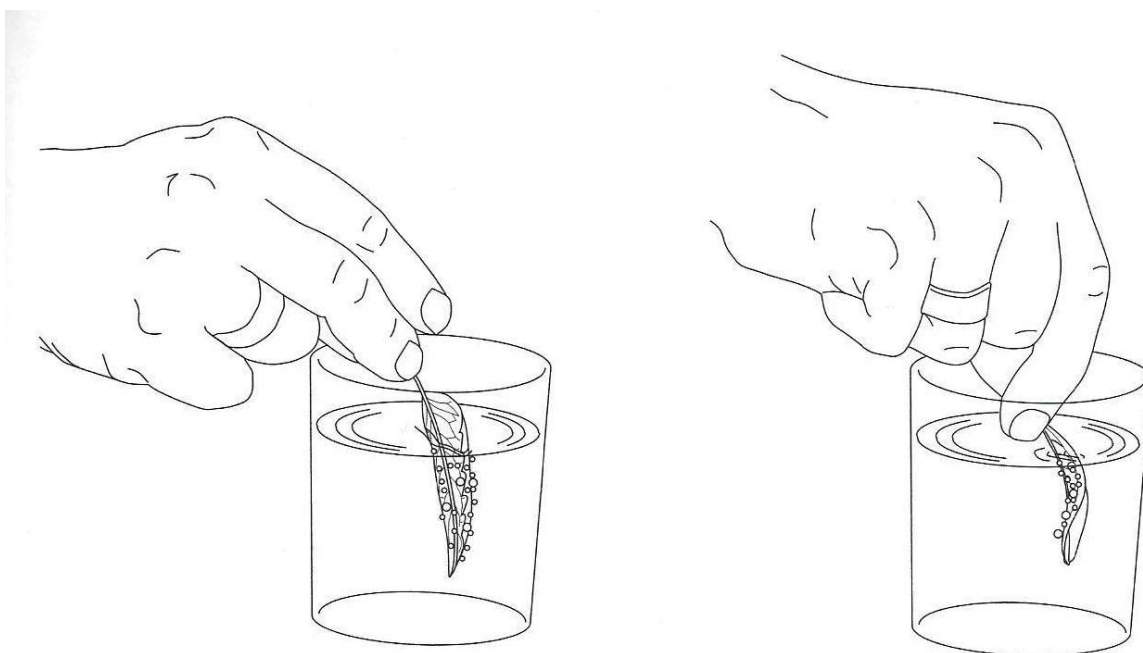
root hair cell
prop roots
root tip

taproot system
crown



Bubbling Leaves

Carbon Dioxide enters the leaves through stomata. Oxygen, produced during photosynthesis, passes out of leaves through stomata. April designed an experiment to find out more about these tiny pores on a leaf. She picked a few fresh leaves from the trees near her house. Then, while pinching the stalk of one of the leaves, she dipped the leaf in a glass of hot water. After observing what happened, she did the same thing with the rest of the leaves, one at a time. The diagram below shows what April saw when she dipped two different leaves into the glass of hot water.



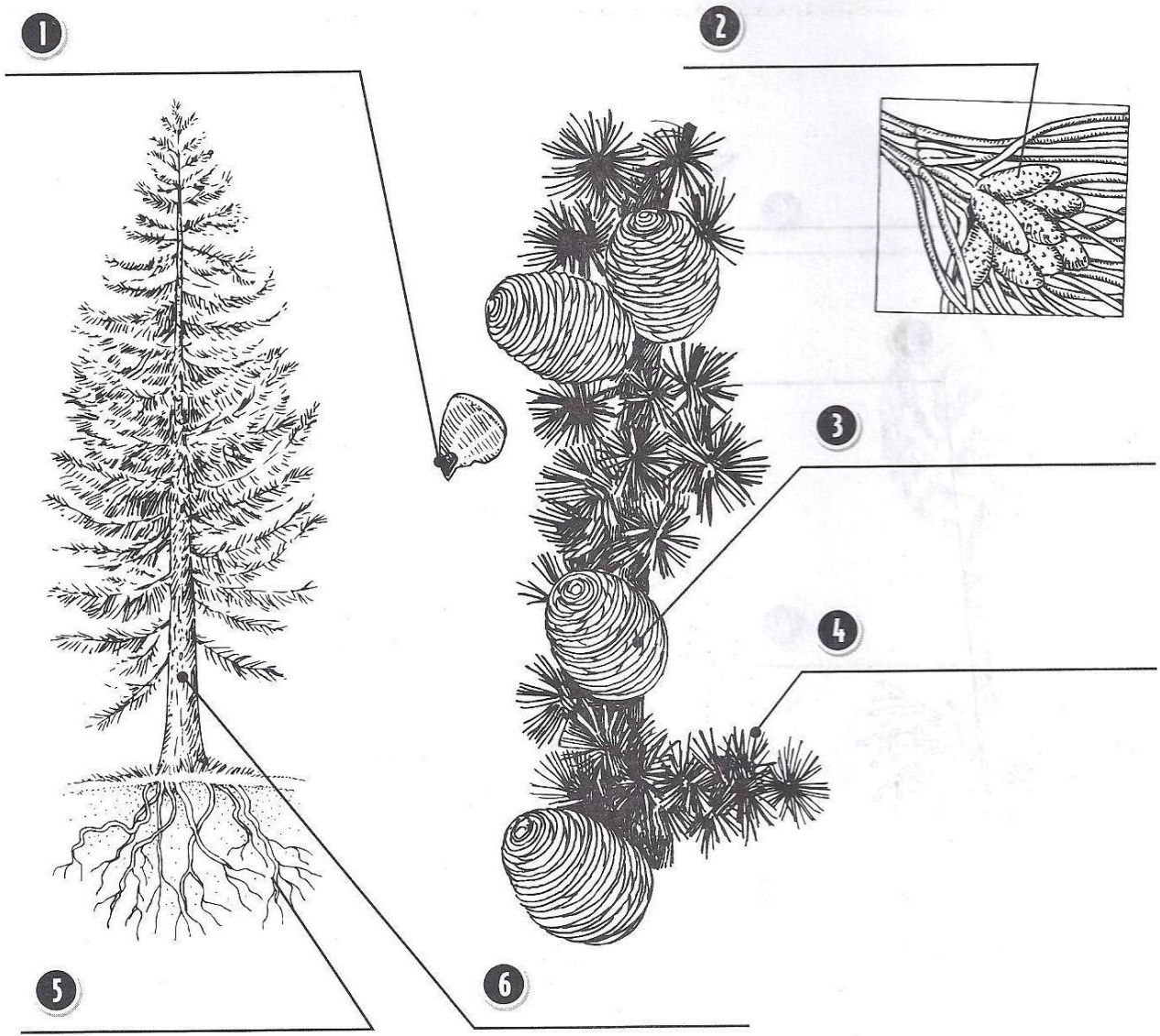
Directions: Answer the following questions about the experiment

1. What did April observe coming out of the stomata of each leaf?
2. In the figure, bubbles are coming out of both sides of one leaf, while bubbles are coming out of only one side of the other leaf. What does this tell you about the location of the stomata on these two leaves?
3. What do you think would happen if April did not pinch the stalk of the leaf before dipping it into the hot water?
4. In most plants, most of the stomata are located on the lower surface of the leaves. Explain how this adaptation helps control water loss.
5. Would you expect to find the stomata on a lily pad on the top or on the bottom? Explain your answer

Gymnosperms

Gymnosperm means "naked seed." Gymnosperms are plants that make their seeds on exposed parts like cones. Conifers such as the pine tree or the giant sequoia are gymnosperms. So are ginkgo trees and sago palms. Use the terms in the word box to label the diagram.

cone seed needles
spores trunk roots



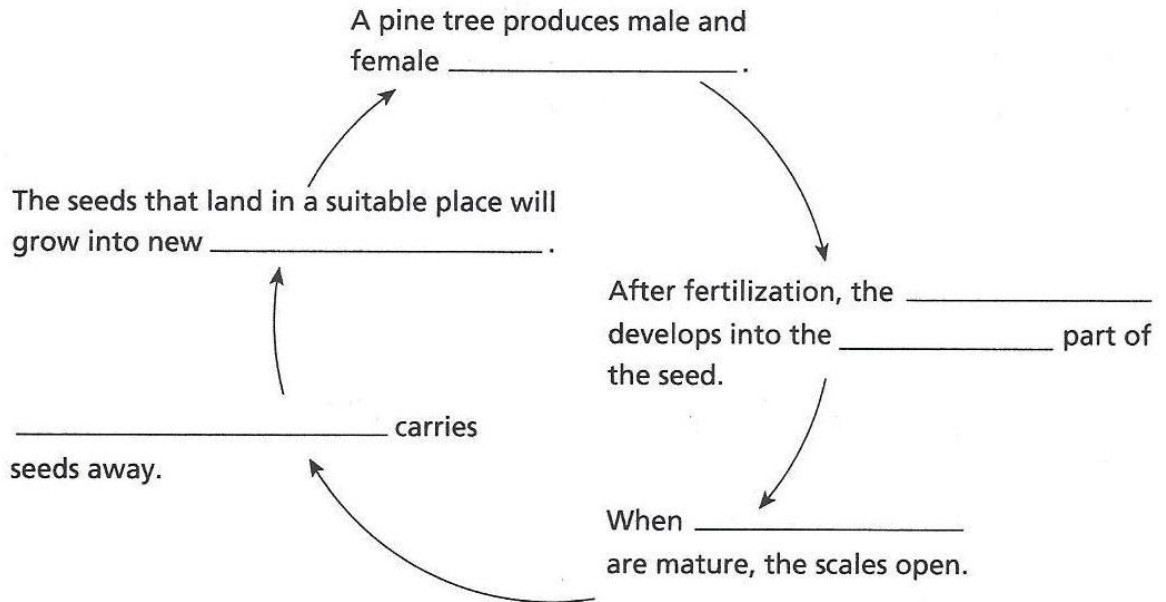
GYMNOSPERM FEATURES

Directions: Match the type of gymnosperms with its appropriate feature. You may use choices more than once.

- a. Cycads b. Ginkgoes c. Gnetophytes d. Conifers

1. ____ Only one species exists today
2. ____ They are the largest group of gymnosperms
3. ____ These plants live in hot deserts and in tropical rain forests
4. ____ They grow in tropical and subtropical areas
5. ____ Most keep their needles year round
6. ____ These plants look like palm trees with giant cones
7. ____ Often planted along city streets because they tolerate air pollution

Directions: Complete the cycle diagram showing the steps in the reproduction of gymnosperms.



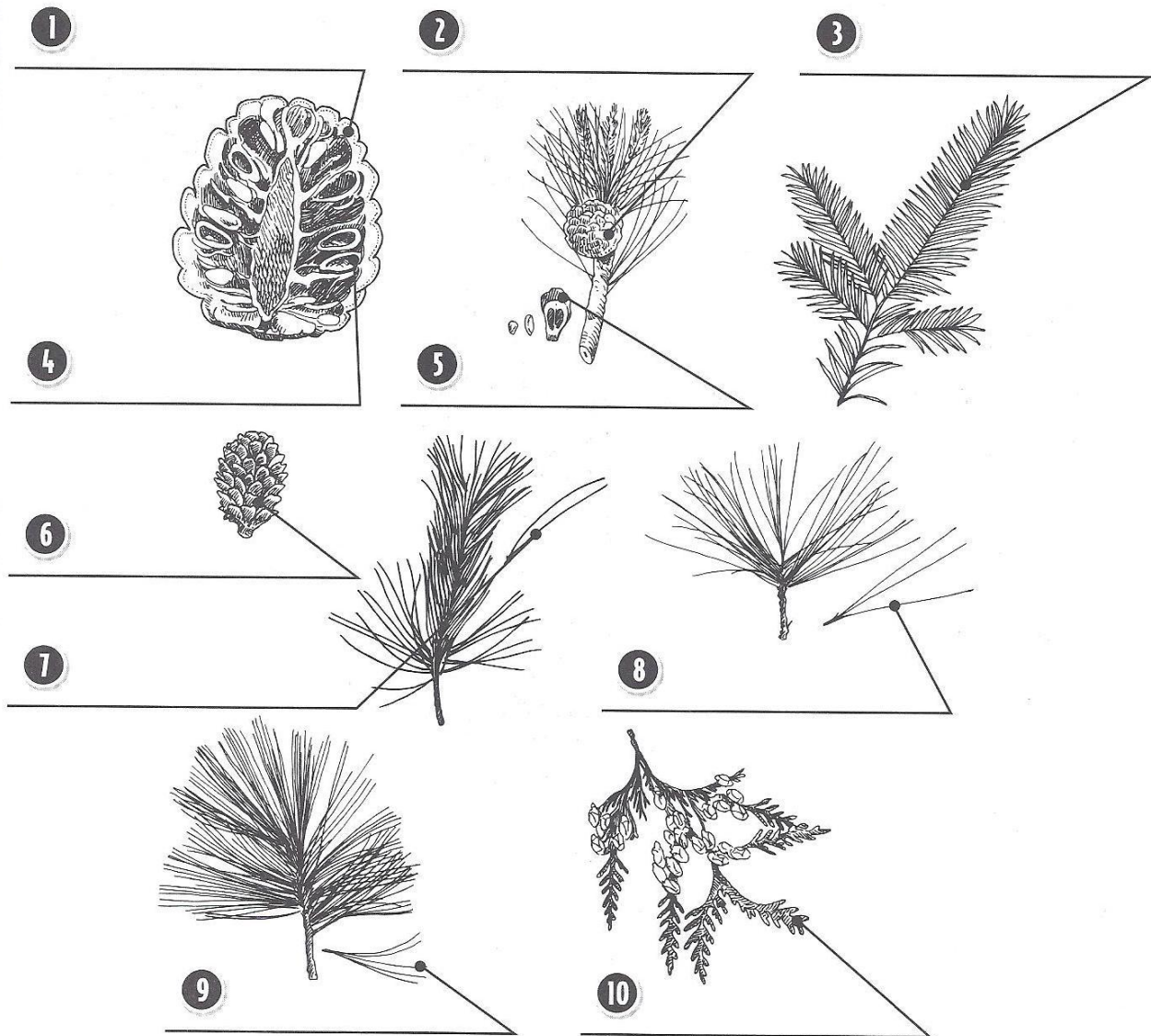
Conifer Needles, Scales, and Cones

Conifers are also known as evergreens because most often these trees stay green year-round. The leaves on conifers are known as needles or scales. Thin and sharp, the leathery surface allows them to weather the elements. The seeds of conifers are protected by hard cones. The scales of a cone loosen as the seeds ripen. Use the terms in the word box to label the diagrams.

cone scale
shell around seed kernel
needles in threes
scalelike needles

mature cone
seed kernel
needles in fives

young cone
needles in pairs
flat needles



Life Cycle of a Conifer

Conifers are woody trees and shrubs with needlelike or scalelike leaves. Most are evergreen. Conifers include redwoods, junipers, spruces, pines, and firs. The reproductive cycle of a conifer uses cones. Match each term in the word box to its description.

pollen grains	male cones	cone	fertilization	embryo
female cones	gametophyte	seedling	pollination	wind currents

1 _____ This is a cluster of modified leaves where the spore-producing parts of the plant develop.

2 _____ This is the phase of a plant's life cycle in which either sperm or eggs are produced.

3 _____ Every spring, millions of these drift off of male cones and some land on female cones.

4 _____ This is the term used for the young conifer plant.

5 _____ Conifers reproduce by means of seeds that contain food tissue and this, which will grow into a plant.

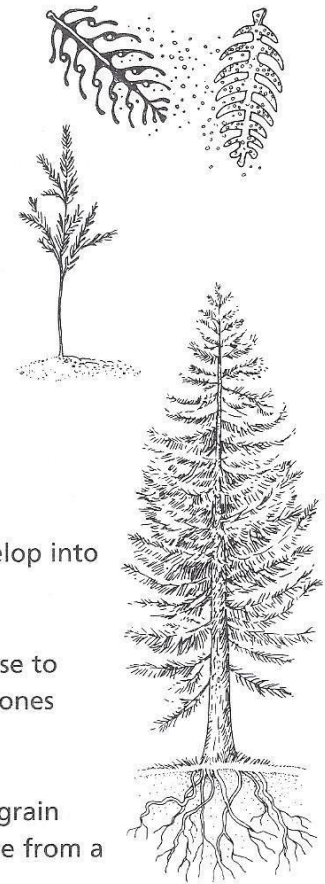
6 _____ Microspores form in these and will develop into pollen grains.

7 _____ Conifer pollination is dependent on these to blow the yellow pollen from the male cones to the female cones.

8 _____ This describes the joining of the pollen grain with an egg cell and can occur anywhere from a month to a year after pollination.

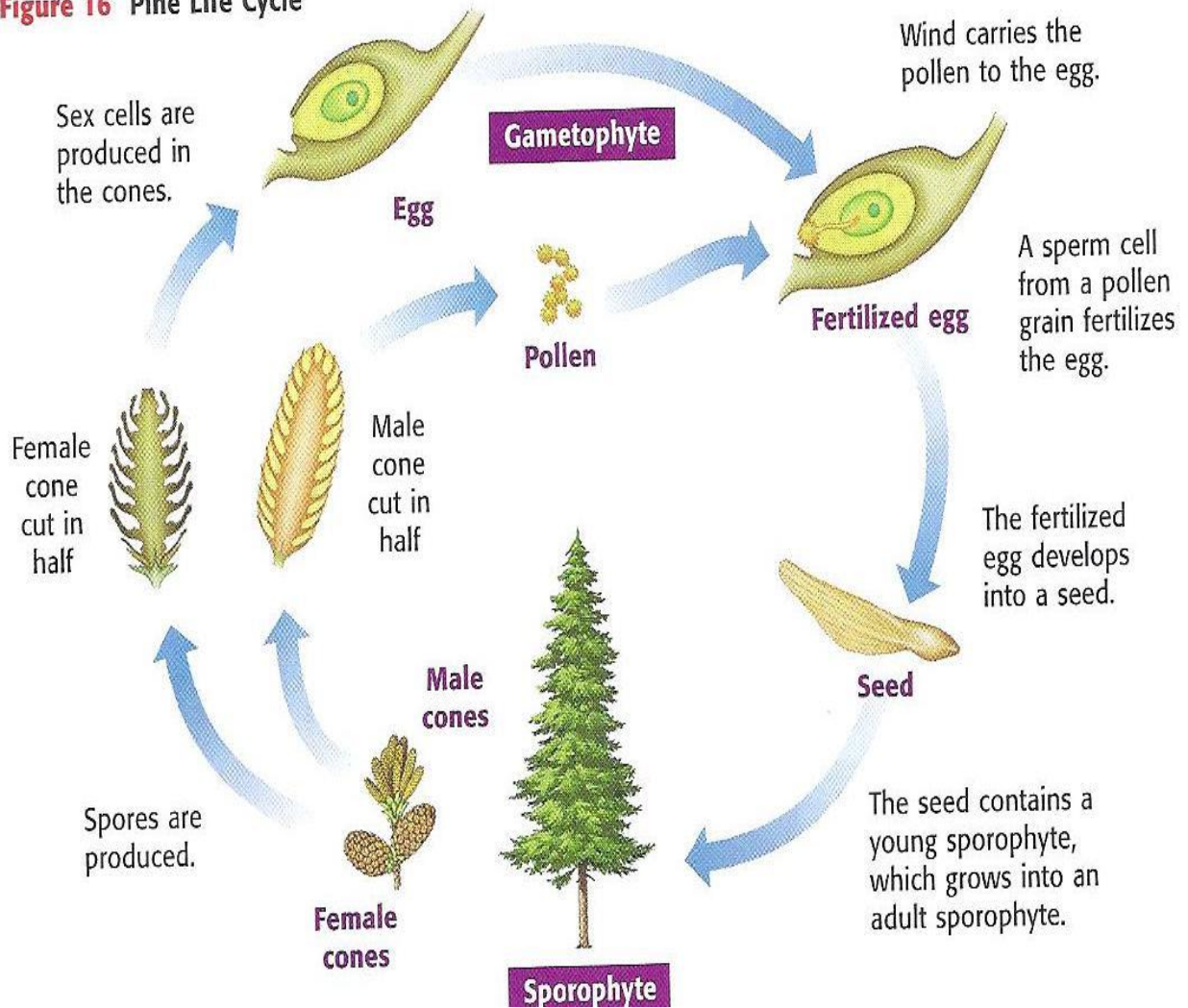
9 _____ This describes the arrival of the pollen grains onto the ovules of female cones.

10 _____ Megaspores form in the shelflike scales of these and will develop into gametophytes.



REPRODUCTIVE CYCLE OF A GYMNOSPERM
DOMINANT STAGE- SPOROPHYTE
MICROSCOPIC STAGE- GAMETOPHYTE

Figure 16 Pine Life Cycle



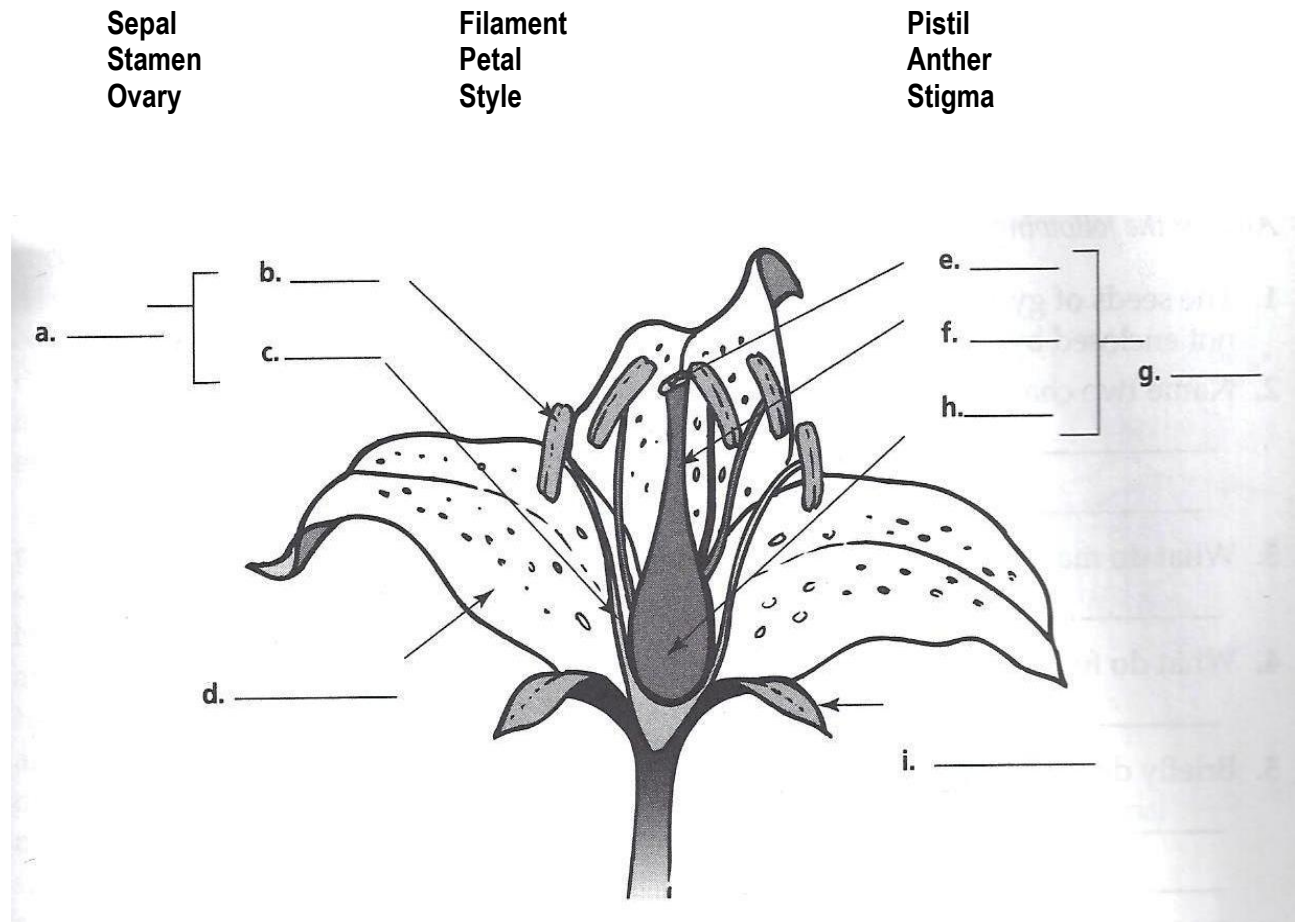
ANGIOSPERM FEATURES

Directions: Answer the following questions about angiosperms

1. A plant produces seeds that are enclosed in a fruit is called a(n) _____.
2. List two characteristics of angiosperms. _____

3. When a flower is pollinated, a grain of pollen falls on a(n) _____.
4. In what part of the flower do the sperm cell and the eggs cell join together? _____
5. **True or False?**
All angiosperms rely on the wind for pollination. _____
6. **True or False?**
Angiosperms are an important source of food for other organisms. _____

Directions: Label the parts of the flower in the diagram



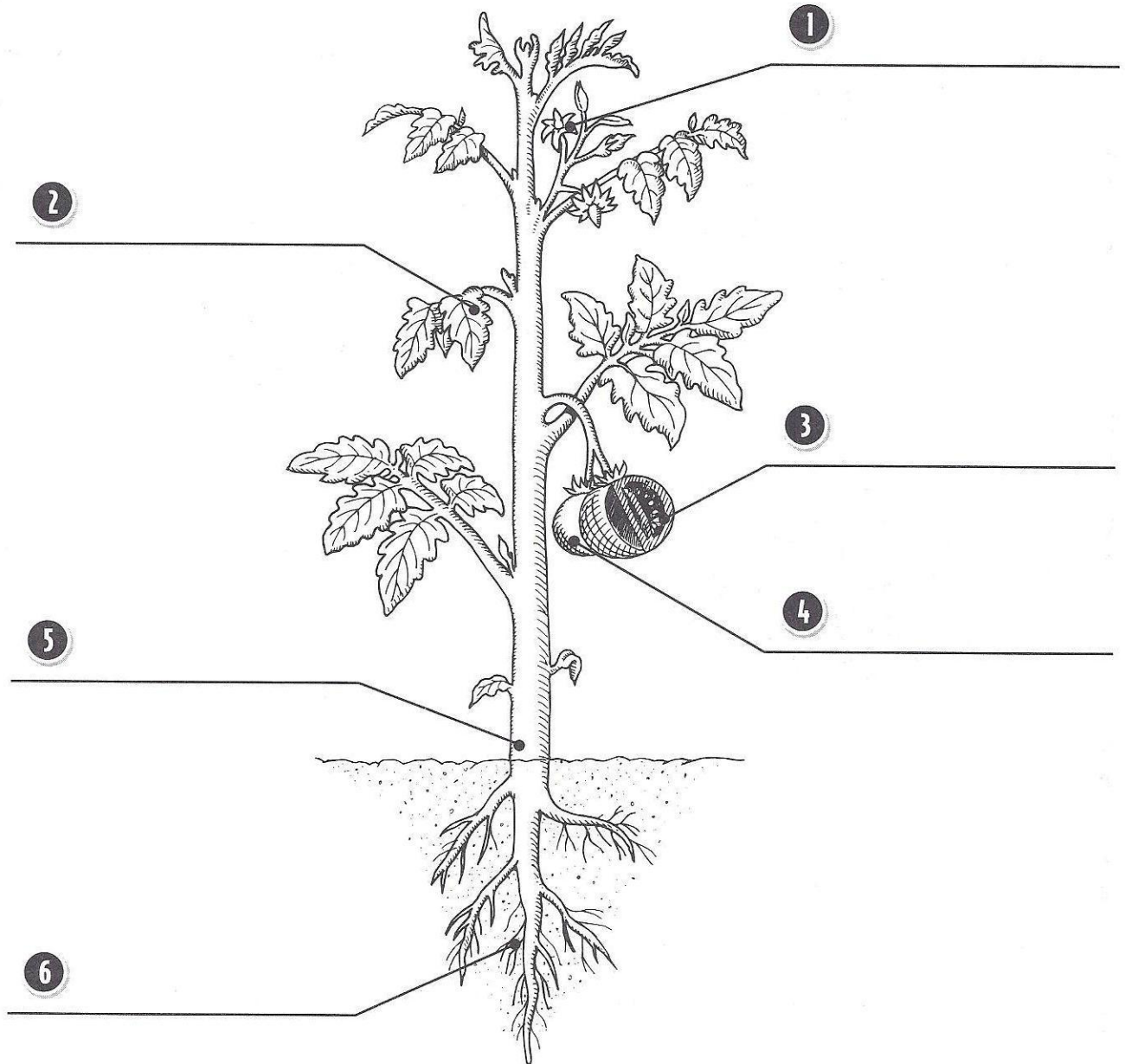
The Angiosperms

Angiosperms are flowering, seed-bearing plants. Most of the plants we see every day are angiosperms. Some have flowers so small we do not know they are flowers, such as in grass or on an oak tree. Others have flowers in a wide range of colors, sizes, and shapes. Use the terms in the word box to label the diagram.

flower
leaf

fruit
stem

seeds
root



Flowering Plant Parts

All angiosperms have the same basic parts, even though these parts might look very different. The parts of a flowering plant assist in pollination, the process by which pollen and the eggs of plants are joined to produce new seeds. Match each term in the word box to its definition.

petal
leaf
ovule
pollen

sepal
stem
fruit
pollinator

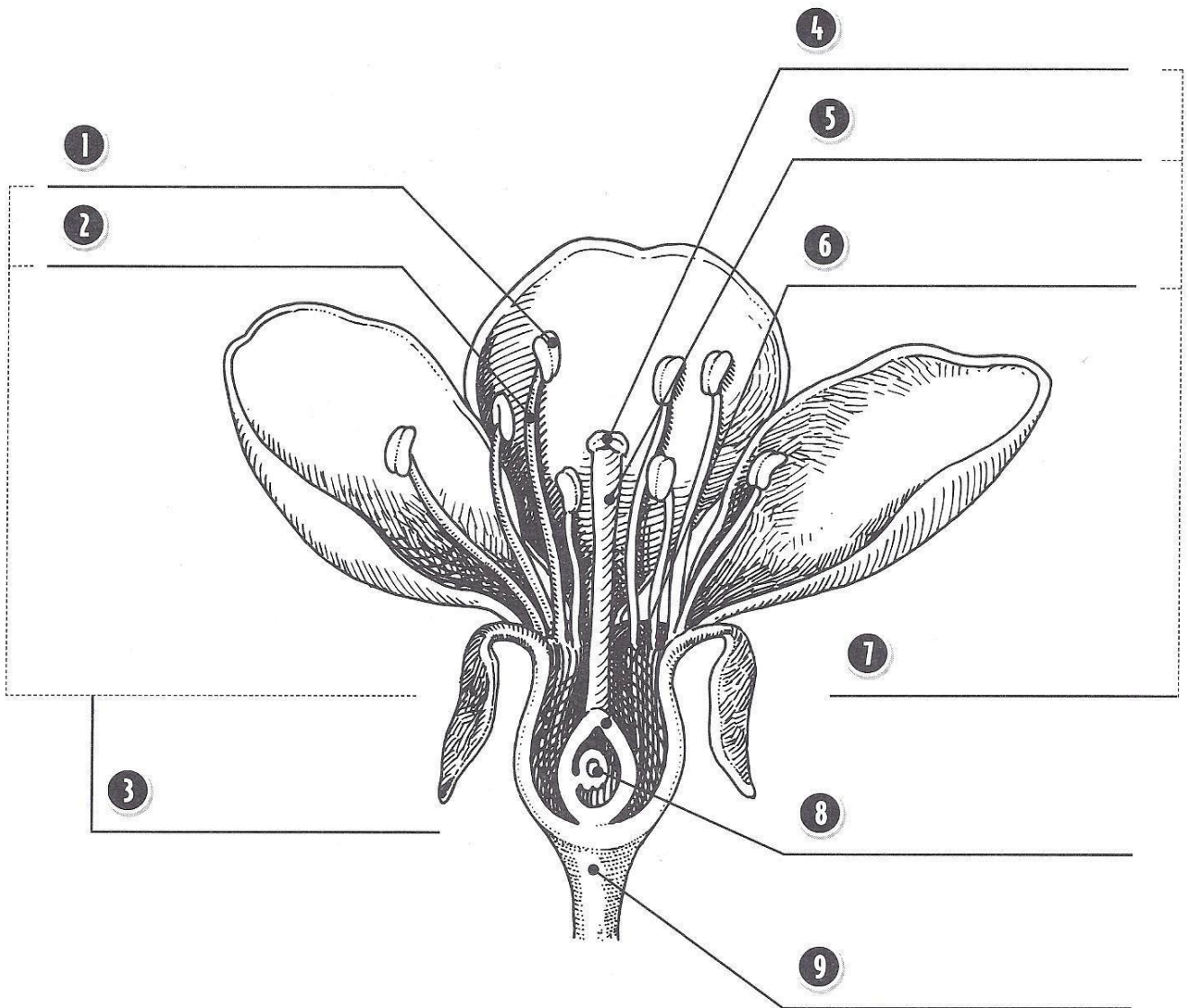
bud
root
seed
calyx

- 1 _____ This is an air current, water current, insect, bird, or animal that makes the transfer of pollen.
- 2 _____ This is a structure within the ovary that holds a plant egg cell. After fertilization, it will become a seed.
- 3 _____ This is the name given to the expanded and ripened ovary of a plant.
- 4 _____ This is one of the often brightly colored parts of a flower immediately surrounding the reproductive organs.
- 5 _____ This refers to an undeveloped plant part, either a leaf or a flower.
- 6 _____ These are the fine powderlike grains that contain sperm-bearing cells of a plant.
- 7 _____ This plant structure contains chlorophyll and is the major region of photosynthesis.
- 8 _____ This is a fully mature ovule which contains the plant embryo and supporting parts.
- 9 _____ This descending part of a plant anchors the above ground parts and usually stores food.
- 10 _____ This is one of the usually green parts formed at the base of a petal.
- 11 _____ This is another name for the stalk that supports the various aboveground parts of a plant.
- 12 _____ This is the name for all the sepals of a flower.

Seed-Producing Parts of a Flower

As pretty as flowers can be, their main function is to attract pollinators in order to produce seeds. Use the terms in the word box to label the diagram.

stamen	receptacle	stigma
ovary	carpel	anther
style	filament	ovule

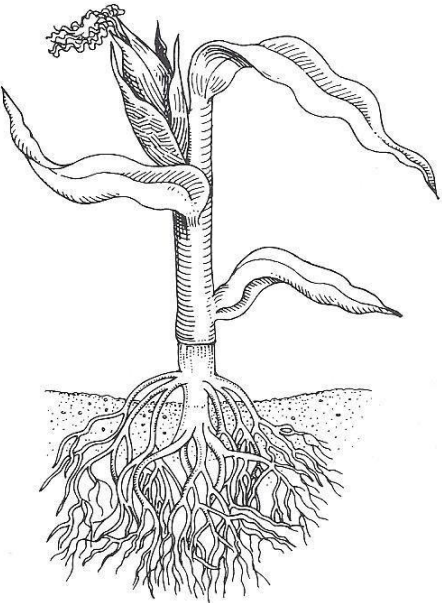


Monocots and Dicots

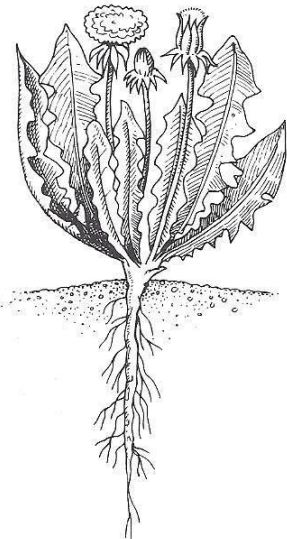
The angiosperms can be divided into two groups: the monocots and the dicots. *Monocot* refers to the fact that these plants have seeds with only one cotyledon or seed coat. Corn, wheat, and rice are monocots. *Dicot* refers to two cotyledons. Beans, roses, and dandelions are examples of dicots. Use the phrases in the word box to classify the characteristics of monocots and dicots.

- one seed leaf
- netlike leaf veins
- flower parts in fours or fives
- central taproot
- two seed leaves
- flower parts in threes
- bundles in a ring
- parallel leaf veins
- scattered bundles
- branching fibrous roots

Monocot



Dicot



Counting Pollen

Millions of people suffer from allergies when they breathe in air containing certain kinds of pollen. They can develop allergic reactions similar to cold symptoms or even more severe. Pollen counts and pollen forecasts are issued to help people know what to expect from their pollen allergies.

One method used to count pollen is placing a greased microscope slide on the roof of a tall building and leaving it there for a certain amount of time, usually 24 hours. After this time, the slide is examined under a microscope and the various kinds of pollen that have fallen on the slide are counted. Pollen levels under 10 are usually not considered a problem for people with allergies. Levels above 60 can cause mild reactions, and a severe reaction can happen when levels go into the hundreds. A pollen forecast is different from a pollen count because it predicts what the pollen levels will be in the future, while a pollen count tells you the actual conditions on a specific day in the past.

Ragweed is an angiosperm found in nearly every region of the United States. It is a very hardy plant that likes hot weather. Ragweed plants release their pollen between 6am and 10am. The figure is a map showing a ragweed pollen forecast for fall in the United States. The pollen count is for a specific fall day in a U.S. city.

Ragweed Pollen Forecast



Legend:

MA = Much above normal
A = Above normal
N = Near normal
B = Below normal
MB = Much below normal
NS = No ragweed season

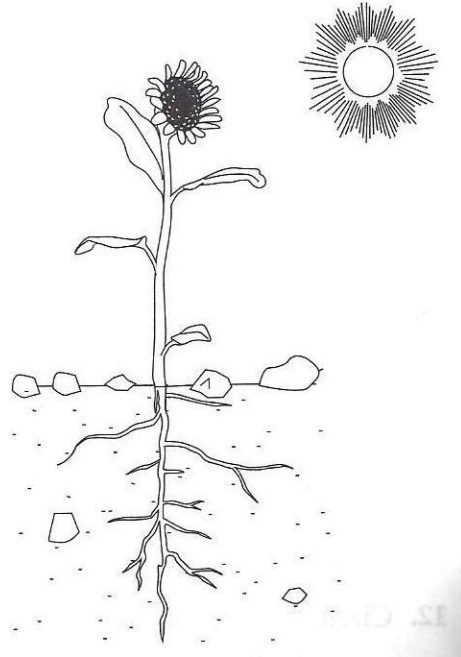
Directions: Study the figure and answer the following questions.

1. What type of reaction could most people allergic to ragweed pollen expect on the day the pollen count was taken?
2. If you suffered from ragweed allergies, in which area of the country would your allergies both you the least?
3. According to the map, which are of the country (north, south, east, west) is forecasted to have the highest levels of ragweed pollen. Why do you think this occurs?
4. If you live in an area of high ragweed pollen, would it be helpful to keep your windows closed during the mornings? Explain your answer.

Plant Responses and Growth

Directions: Study the diagram and then answer the following questions.

1. The plant in the figure is responding to what two types of stimulus?
2. What is the growth response shown in the figure called?
3. Are the plant's roots showing positive or negative response?
4. Is the plant's flower showing a positive or negative response?



Directions: Answer the following questions about plant responses and growth.

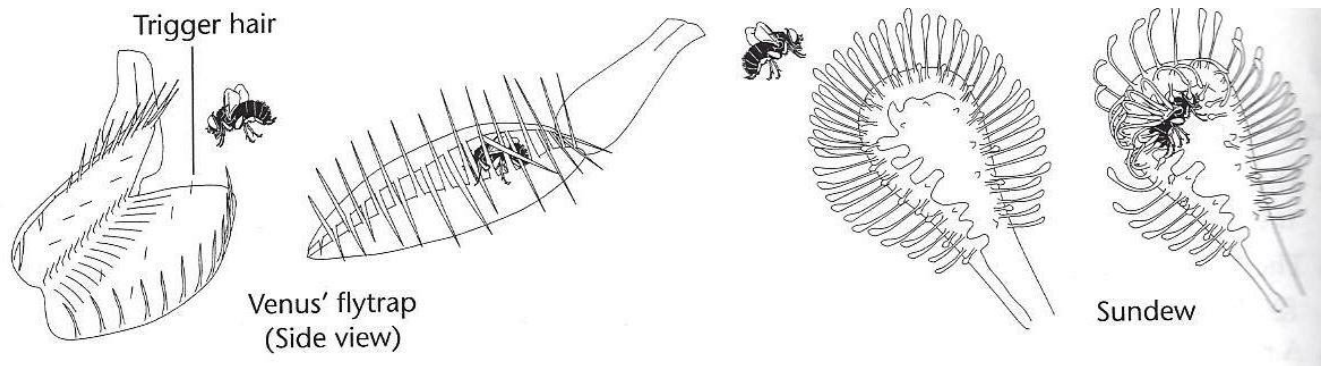
1. A chemical that affects how a plant grows and develops is a(n) _____.
2. Auxin is a plant hormone that _____ the rate at which a plant's cells grow.
3. A flowering plant that completes its life cycle within one growing season is called a(n) _____.
4. Most _____ have woody stems.
5. Which of the following is true about biennials?
 - a. They complete their life cycle in two years
 - b. In the first year, they produce seeds and flowers
 - c. In the second year, they germinate and grow roots
 - d. Once the flower produces seeds, the biennial dies
6. Which of the following plants are considered to be perennials?
 - a. Parsley
 - b. Cucumber
 - c. Peony
 - d. Petunia

Carnivorous Plants

A **bladderwort** is a carnivorous plant. This means that it traps and then digests insects and other small animals, obtaining their nitrogen. The Venus' flytrap is another example of the almost 400 species of carnivorous plants. Most carnivorous plants grow in marshy areas such as swamps and bogs where the soil is low in nitrogen. Because carnivorous plants do not have to rely on nitrogen absorbed from the soil by their roots, they are well suited to their environments.

Carnivorous plants respond to the stimulus of touch to trap insects and other small animals. For example, when an insect touches a hair on the leaf of a **Venus' flytrap**, this triggers a specific response. Water moves from cells on the inside of the flytrap to cells on the outside of the trap. This causes the leaf of the flytrap to snap quickly shut, catching the insect.

Carnivorous plants called **sundews** use another method to trap and digest insects. Sundews have small leaves that produce a sweet, sticky liquid at their tips. Insects fly into the stalks and stick to them. This triggers a different response. Other leaves begin to curl inward toward a trapped insect by using cell growth. The cells on one side of the stalks grow faster than the cells on the other side. This causes the leaves to bend. The leaves then produce a chemical that digests the insect, so it can be used to nourish the plant.

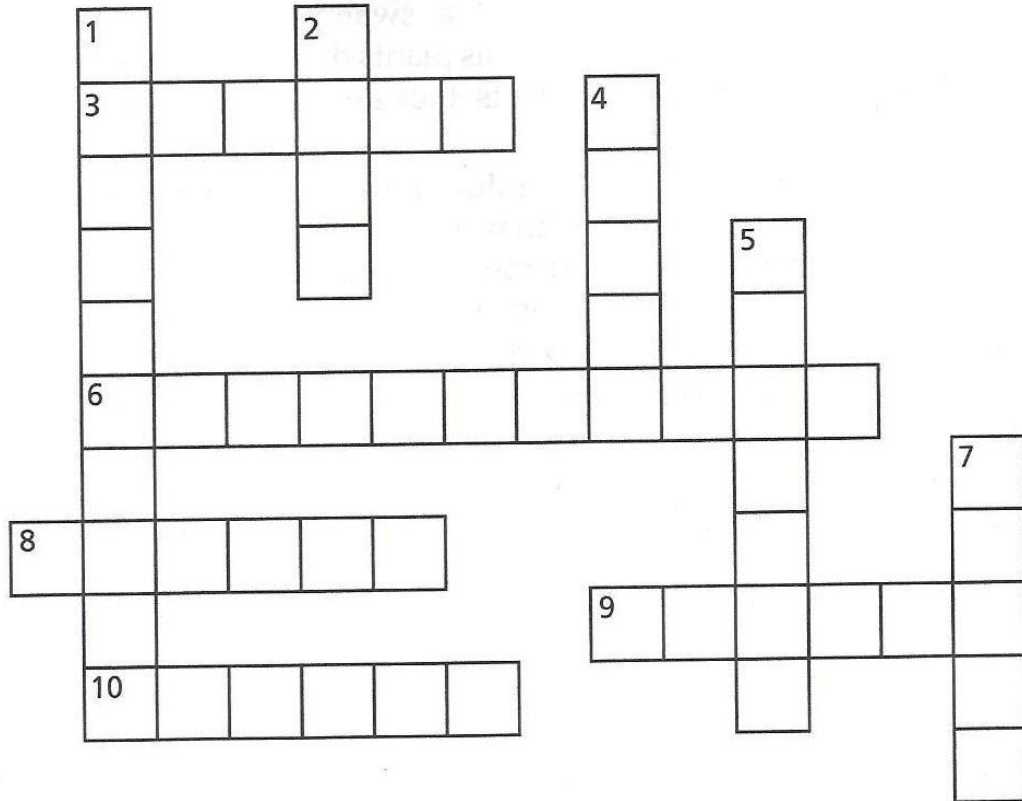


Directions: Answer the following questions.

1. How do carnivorous plants get the nitrogen they need?
2. Why is it helpful to a sundew to produce the sweet, sticky liquid?
3. Do you think carnivorous plants also produce food by photosynthesis? Explain your answer.
4. What is one advantage that quick movement gives to a Venus' flytrap?
5. Why doesn't the sundew have to move as quickly as the Venus' flytrap to imprison an insect?

CROSSWORD REVIEW: PLANTS

Directions: Complete the following crossword.



DOWN

- 1) The stage in the life cycle of a plant in which the plant produces spores
- 2) The reproductive structure in gymnosperms
- 4) A ripened ovary that encloses one or more seeds
- 5) A plant's growth response
- 7) Vascular tissue through which water and minerals travel

ACROSS

- 3) Vascular tissue through which food moves in some plants
- 6) The transfer of pollen from a male structure to a female structure
- 8) A fertilized egg
- 9) The female part of a flower
- 10) The young organism that develops from a zygote