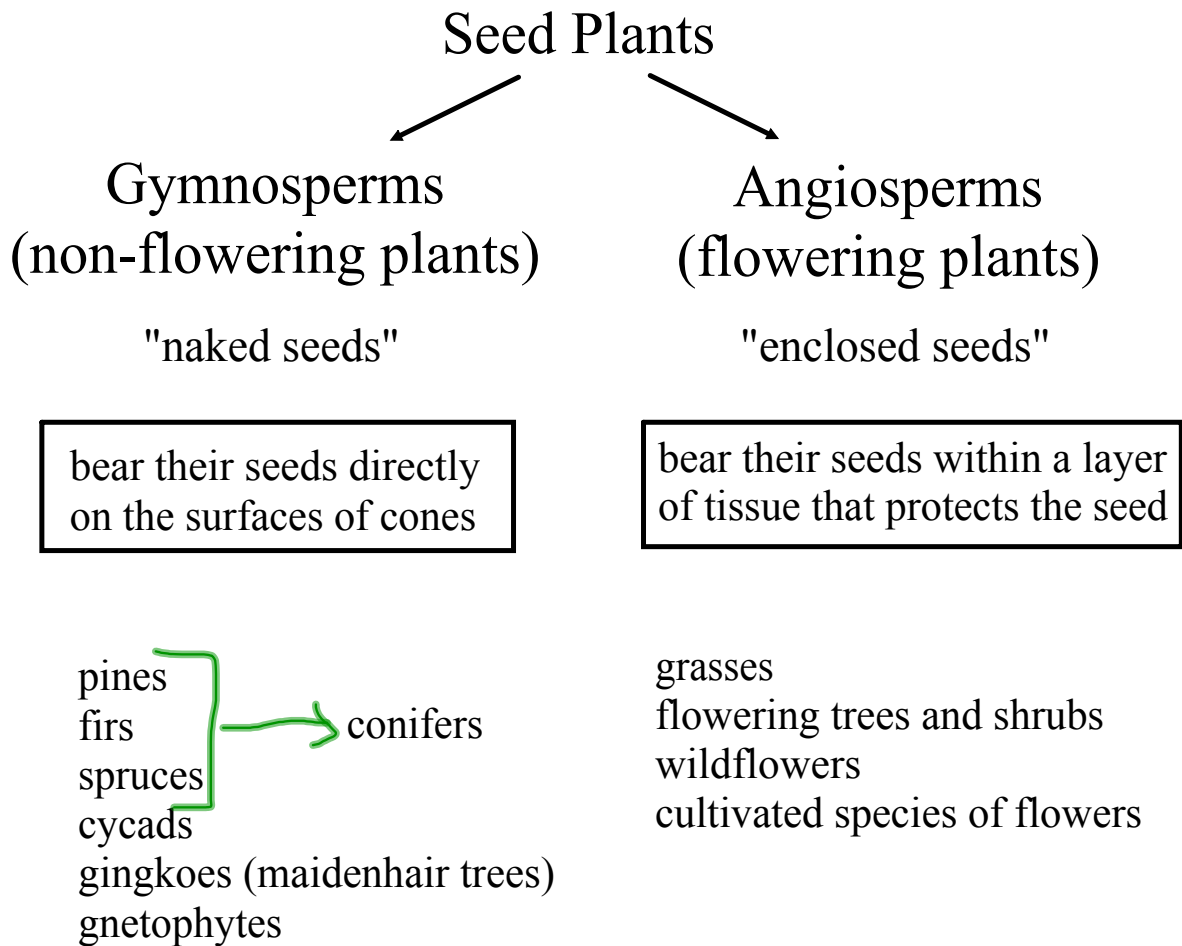


Seed Plants

(Page 564)

Seed plants are divided into two groups.



Seed plants have life cycles that alternate between a gametophyte stage and sporophyte stage like mosses and ferns.

Unlike mosses and ferns, seed plants do not require water for the fertilization of gametes.

Adaptations that allow seed plants to reproduce without water include:

- flowers or cones (sporophyte structures that bear seeds)
- the transfer of sperm by pollination
- the protection of embryos in seeds

Gymnosperms



pine

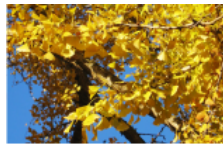


spruce



Living cycads, Hilo, Hawaii. Photo courtesy of Pamela Gore.

cycad



ginkgo



Wendy Smith

GENERIC NAME: GINKGO (*Ginkgo biloba*) - ORAL

[Medication Uses](#) | [How To Use](#) | [Side Effects](#) | [Precautions](#) | [Drug Interactions](#) | [Overdose](#) | [Notes](#) | [Missed Dose](#) | [Storage](#)

USES: Ginkgo leaves have been used for improving blood flow, memory loss due to certain brain problems (e.g., [Alzheimer's disease](#), [stroke](#)), as well as for relieving dizziness, and for ringing in the ears. Some herbal/diet supplement products have been found to contain possibly harmful impurities/additives. Check with your pharmacist for more details regarding the particular brand you use. The FDA has not reviewed this product for safety or effectiveness. Consult your doctor or pharmacist for more details.

ginkgo



Welwitschia mirabilis HOOK. f.
©Thomas Schoepke

Welwitschia mirabilis

gnetophyte

Life Cycle of Gymnosperms (Page 610)

Reproduction in gymnosperms takes place in cones which are produced by a mature diploid sporophyte plant (ie/ pine tree).

pollen cone (male cone)

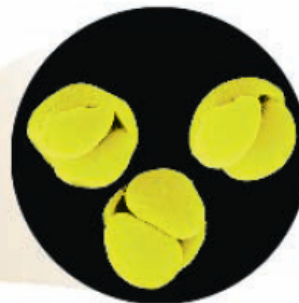
- produces male gametophytes which are called pollen grains
- one of the haploid nuclei in the pollen grain will divide to produce two sperm nuclei

seed cone (female cone)

- produces female gametophytes and are generally larger than the pollen cones.
- near the base of each scale are two ovules in which the female gametophytes develop



Figure 24-3 Pollen grains are male gametophytes. Pollen is carried by the wind until it reaches a female cone. **Inferring** Male and female cones are distributed on a plant such that pollen usually lands on a different plant from where it started. Why might this strategy have evolved?



Pollen Grains
(magnification: 750x)

Page 610

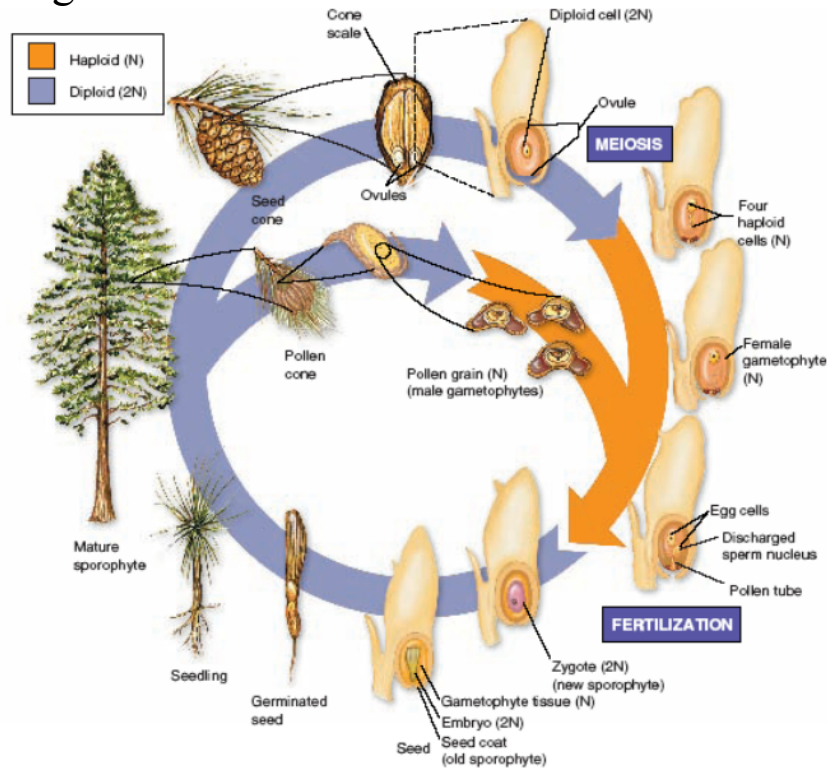
The gymnosperm life cycle typically takes two years to complete. It begins in the spring when the male cones release enormous numbers of pollen grains.

The transfer of pollen from the male reproductive structure to the female reproductive structure is called pollination.

Reproduction - Pine Tree

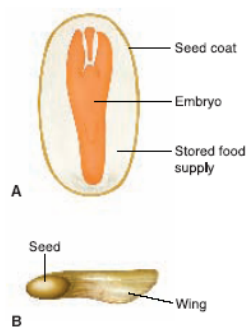


Page 611



If a pollen grain lands near an ovule, it splits open and begins to grow a structure called a pollen tube which contains two haploid sperm cells. Once the pollen tube reaches the female gametophyte, one sperm nucleus disintegrates and the other fertilizes the egg contained within the female gametophyte.

A seed is an embryo of a plant that is encased in a protective covering, the seed coat, and surrounded by a food supply.



Page 565

▲ **Figure 22-19** (A) This longitudinal section shows the internal structure of the seed of a pine tree. (B) The pine tree seed, found on the scale of a cone, is winged.

The embryo can stop growing when it is small and contained within the seed. It can remain in this condition for weeks, months, or years. When it starts to grow again, it uses nutrients from the stored food supply. Seeds can survive long periods of bitter cold, extreme heat or drought.

Angiosperms (Page 569) ✓

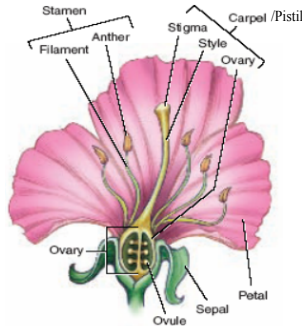
The vast majority of living plant species have a method of reproduction and development involving flowers and fruits.

Angiosperms develop unique reproductive organs known as flowers. They are an evolutionary advantage to plants because they attract animals such as bees, moths or hummingbirds, which then transport pollen from flower to flower. This is much more efficient than the wind pollination of most gymnosperms.

Flowers contain ovaries which surround and protect the seeds. After pollination, the ovary develops into a fruit - a wall of tissue that surrounds the seed and protects it and aids in its dispersal.

Biology 112
Structure of Flowers
 (Page 612)

Flowers are reproductive organs that are composed of four kinds of specialized leaves: sepals, petals, stamens and carpels.



sepals - outermost circle of flower parts that enclose the bud before it opens and protect the flower while it is developing
 - green and resemble ordinary leaves

petals - attract insects and other pollinators to the flower
 - found just inside the sepals
 - often brightly colored

sterile leaves - do not produce reproductive cells

Structures that produce male and female gametophytes are found within the ring of petals.

Male Parts

stamen -> filament and anther

filament - long thin stalk that supports an anther

anther - oval sac where meiosis takes place producing haploid male gametophytes (pollen grains)

- yellow-orange dust from anthers is pollen which consists of thousands of individual pollen grains

* Most angiosperms have several stamens.

Female Parts

carpel/pistil -> ovary, style and stigma

carpel/pistil - the innermost flower part

ovary - broad base of the carpel

- contains one or more ovules where female gametophytes are produced

style - stalk

stigma - sticky part at the top of the style

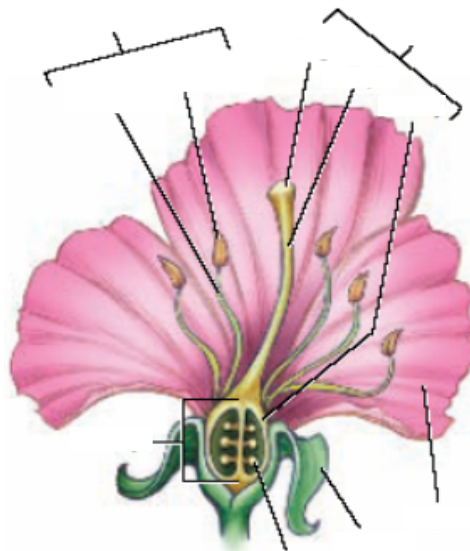
- where pollen grains often land

Typical flowers produce both male and female gametophytes. In some plants, male and female gametes are produced in separate flowers on the same plant.

Biology 112
Structure of Flowers
(Page 612)

Flowers are reproductive organs that are composed of four kinds of specialized leaves: sepals, petals, stamens and carpels.

1. Use Figure 24-5 on page 612 to label the parts of the flower shown below.



2. Define/describe the following: sepal, petal, stamen, filament, anther, carpel, ovary, ovule, style, stigma.

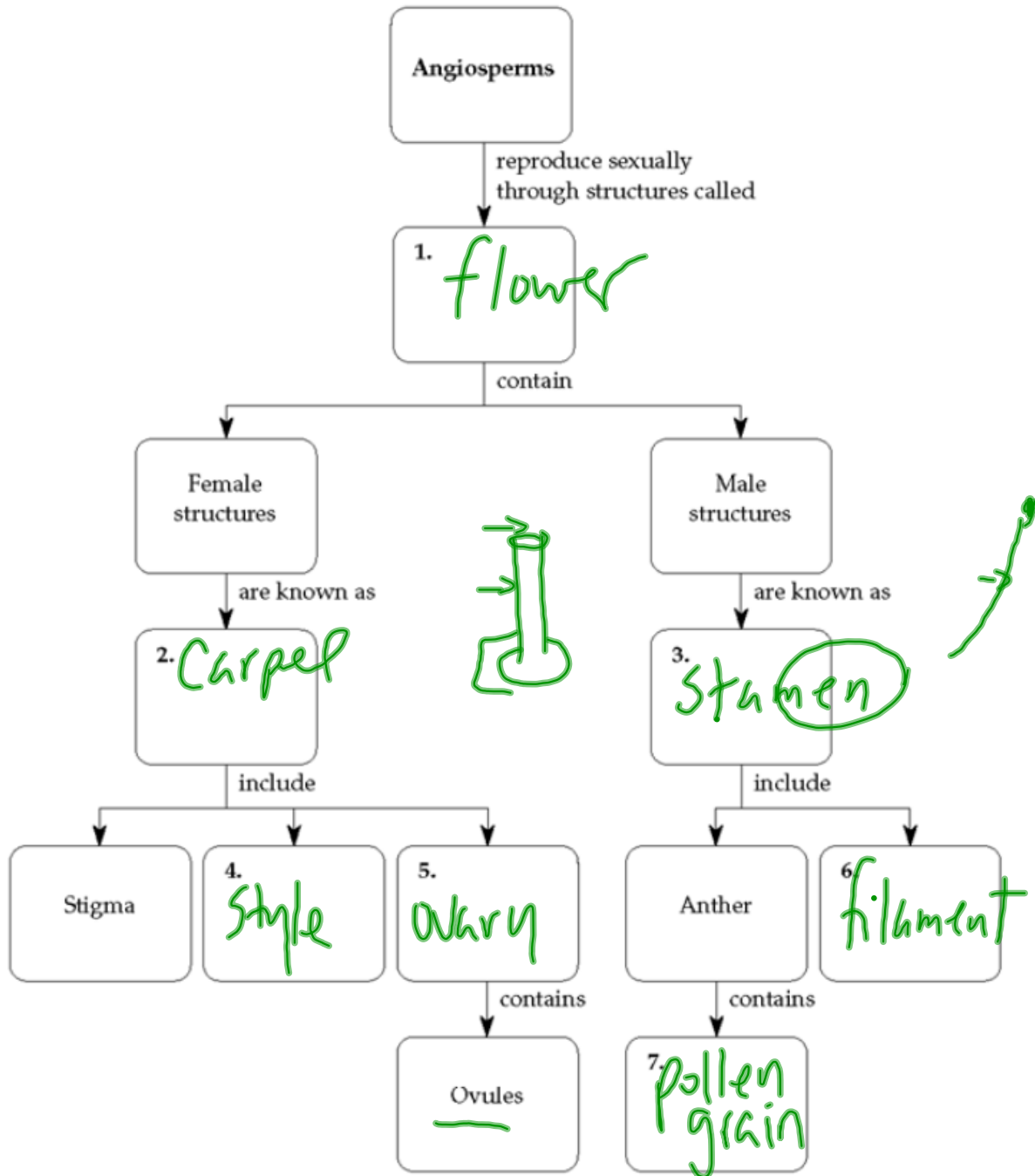
Name _____ Class _____ Date _____

Chapter 24 Reproduction of Seed Plants

Graphic Organizer

Concept Map

Using information from the chapter, complete the information in the concept map below. If there is not enough room in the concept map to write your answers, write them on a separate sheet of paper.



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Page 613

Quick Lab

What is the structure of a flower?

Materials flower, forceps, scalpel, microscope slide, dropper pipette, coverslips, microscope

Procedure



1. Examine a flower carefully. Make a detailed drawing of the flower and label as many parts as you can. Note whether the anthers are above or below the stigma.
2. Remove an anther and place it on a slide. While holding the anther with forceps, use the scalpel to cut one or more thin slices across the anther.
CAUTION: *Be careful with sharp tools.*
3. Lay the slices flat on the microscope slide and add a drop of water and a coverslip. Observe the slices with the microscope at low power. Make a labeled drawing of your observations.
4. Repeat steps 2 and 3 with the ovary.



Analyze and Conclude

1. **Observing** Are the anthers in this flower located above or below the stigma? How could this affect what happens to the pollen produced by the anthers? Explain your answer.
2. **Applying Concepts** What structures did you identify in the anther? What is the function of these structures?
3. **Applying Concepts** What structures did you identify in the ovary? What is the function of these structures?
4. **Drawing Conclusions** Which parts of the flower will become the seeds? The fruit?

Quick Lab

Objective Students will be able to observe the structures of a flower and conclude which structures become seeds and which structures become the fruit. **L2**

Skills Focus **Observing, Applying Concepts, Drawing Conclusions**

Materials flower, forceps, scalpel, microscope slide, dropper pipette, coverslips, microscope

Time 20 minutes

Strategy Before students cut their flower, make sure they have noted whether the anthers are above or below the stigma.

Analyze and Conclude

1. Self-pollinated flowers typically have anthers higher than the stigma, and pollen falls directly from the anthers onto the stigma. Many cross-pollinated plants have taller stigmas that receive windblown or animal-borne pollen from other flowers.

2. Students may be able to observe mature or immature pollen in the anthers. The pollen grains form male gametophytes that can fertilize female gametophytes and form zygotes that will grow into new plants.

3. Students may be able to observe mature or immature ovules in the ovary. The ovules produce female gametophytes that can be fertilized by male gametophytes.

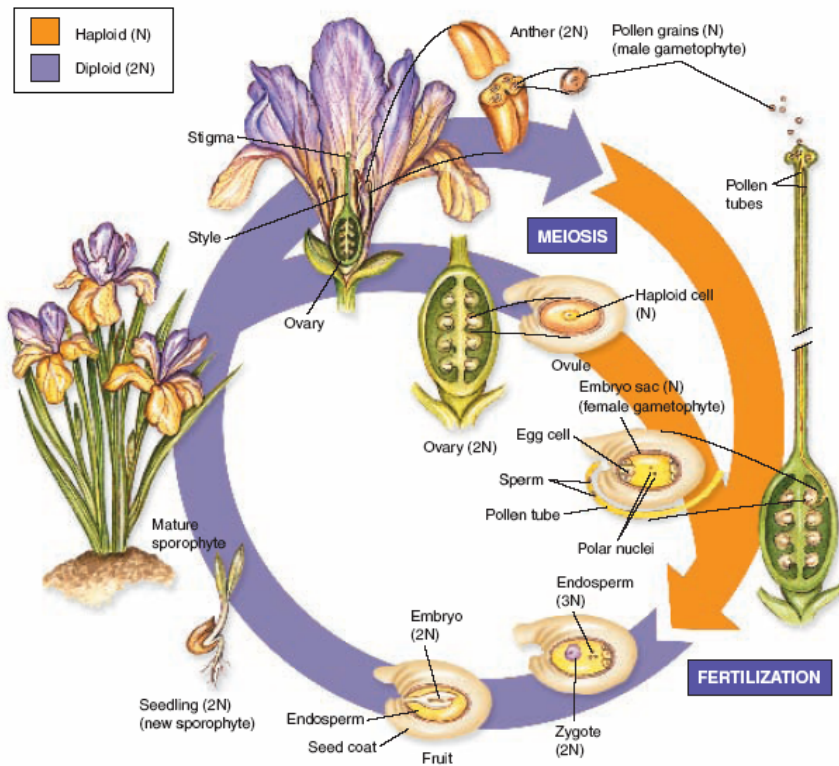
4. The ovules will become the seeds. Generally, the ovary becomes the fruit, although other parts of the flower may also contribute to fruit formation.

Life Cycle of Angiosperms

(Page 614)

Reproduction in angiosperms takes place within the flower. Following pollination and fertilization, the seeds develop inside protective structures.

Figure 24-7
Page 614



Apple Blossom to Apple

