

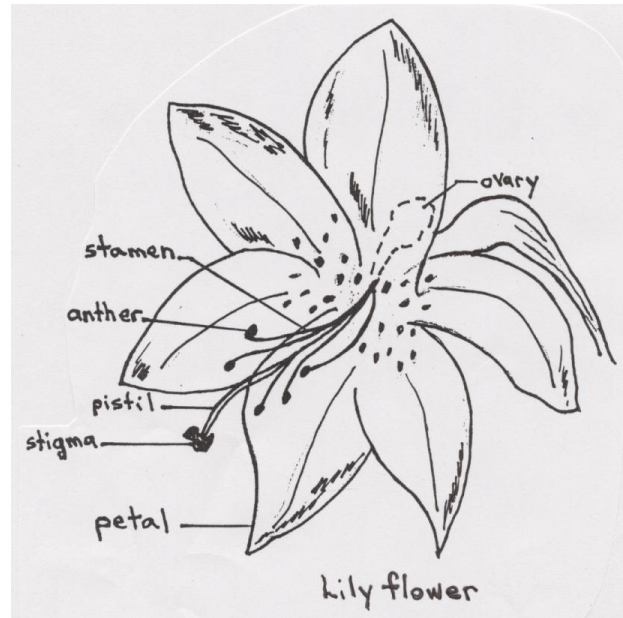
Lab 7: Flowers, Fruits, and Seeds

Purpose¹

The goals of this lab are to (I) explore flowers and identify various reproductive structures, (II) examine fruits to identify types and structures of fruits, and (III) dissect seeds for identification of seed type and embryonic plant structures.

I. Flowers

The flower is the reproductive unit of some plants (angiosperms). Parts of the flower include petals, sepals, one or more carpels in a single pistil (the female reproductive organs), and stamens (the male reproductive organs). Some flowers (called perfect flowers) have both male and female reproductive organs; some flowers (called imperfect flowers) have only male reproductive organs or only female reproductive organs. Some plants have both male and female flowers, while others have males on one plant and females on another. Complete flowers have stamens, a pistil, petals, and sepals. Incomplete flowers lack one of these parts.



The female reproductive organ is the pistil. The pistil is the collective term for the carpel(s). Each carpel includes an ovary (where the ovules are produced; ovules are the female reproductive cells, the eggs), a style (a tube on top of the ovary), and a stigma (which receives the pollen during fertilization).

The male reproductive parts of flowers are the stamens. A stamen consists of an anther (which produces pollen) and a filament. The pollen consists of the male reproductive cells; they fertilize ovules.

Procedure:

- A. Obtain a flower from the vase and observe the specimen. Use a magnifying glass to see greater details of flower structures. Do you know the identity of your flower?
- B. The diagram shown above is a typical flower. Your flower may be slightly different, but will have the same types of flower parts. Make a sketch of your flower and use the diagram to label each part of your flower.
- C. Using your forceps, carefully take the flower apart and set each structure on a sheet of paper towel.
 - a. Identify sepals and petals. How many of each does your flower have? Remove enough petals from the flower so that you can observe the inner parts.
 - b. Identify the male reproductive structures. Draw and label the following: stamen and anthers. Do you see pollen? Add a drop of sugar solution to a microscope slide. (The sugar solution will imitate the sugary surface of the stigma.) The pol-

¹ Portions of this lab have been adopted from www.lrsd2.org/files/.../10sSeedIdentificationDissectionLab.doc, <http://sols.unlv.edu/Schulte/BIO426/Lab13SeedsFruits.pdf>

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len tube uses the sugar to produce energy for growth. Place a yellow anther in the drop of solution and stir it around with a stirring rod. Remove the anther and add a cover slip over the drop of solution. Examine the pollen under a microscope immediately and after 30 minutes. Draw what you see at each time point.

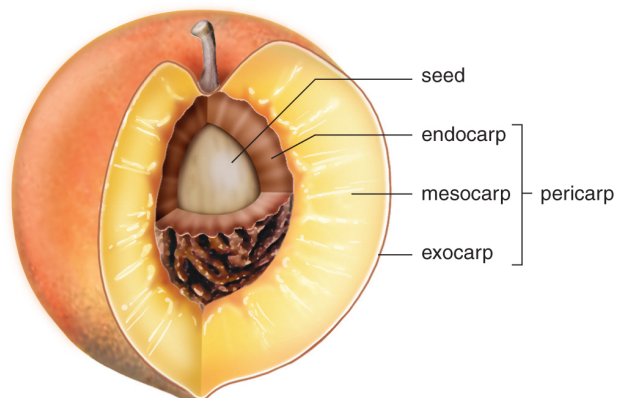
- c. Identify the female reproductive structures. Draw and label the following: stigma, pistil, and ovary. Use the razor blade to cut open the ovary of the flower using a longitudinal cut. Draw a diagram of what you see. If the ovary is mature, you may observe a number of chambers inside it. These chambers contain the seeds that are forming. Label your diagram to show the chambers and the seeds.

II. Fruits

A fruit is a part of a flowering plant that derives from specific tissues of the flower. It contains the mature ovary with seeds. Fruits can be classified as simple, multiple or aggregate. *Simple fruits* can be either dry or fleshy, depending on the water content at maturity. They result from the ripening of a simple or compound ovary in a flower with only one pistil. Dry fruits may be either dehiscent (opening to discharge seeds), or indehiscent (not opening to discharge seeds). Refer to the panel below for types of simple fleshy and simple dry fruits. *Multiple fruits* derive from several to many individual flowers in a single inflorescence, while *aggregate fruits* develop from a single flower having several to many pistils.

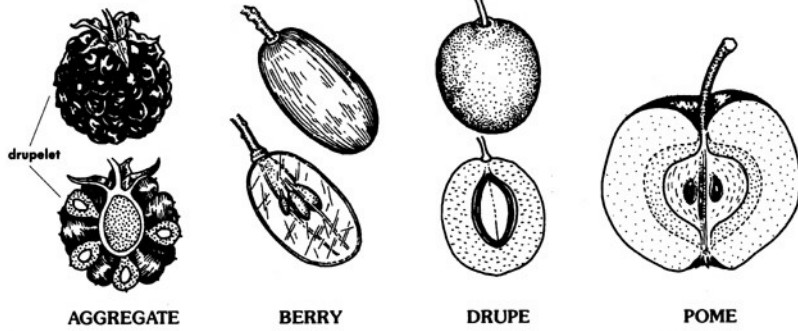
Procedure:

- A. Obtain a simple fleshy fruit from the container at the front: apple, grape, cherry, peach (pictured at right), or lemon. Section your fruit. Draw and identify the following tissues:
 - a. Pericarp - derived from the ovary wall; try to find exocarp, mesocarp, and endocarp layers.
 - b. Seed and seed coat - these tissues are extremely variable in size and in hardness, so look at each fruit individually.
 - c. Left over flower parts at either end. Can you identify these parts?
- B. Use the key below and identify your fruit as to its type (drupe, pome...).
- C. Obtain a dry fruit from the container at the front. Section each fruit and observe with a dissecting microscope. Draw and identify the same tissues as above.
- D. Compare what you see with the fruit key and determine the fruit type (achene, silique...). Is your fruit an example of a dehiscent or indehiscent fruit?
- E. Obtain one example of an aggregate fruit and one of a multiple fruit from the containers in the front. Examine each and explain why each are considered aggregate or multiple fruits?

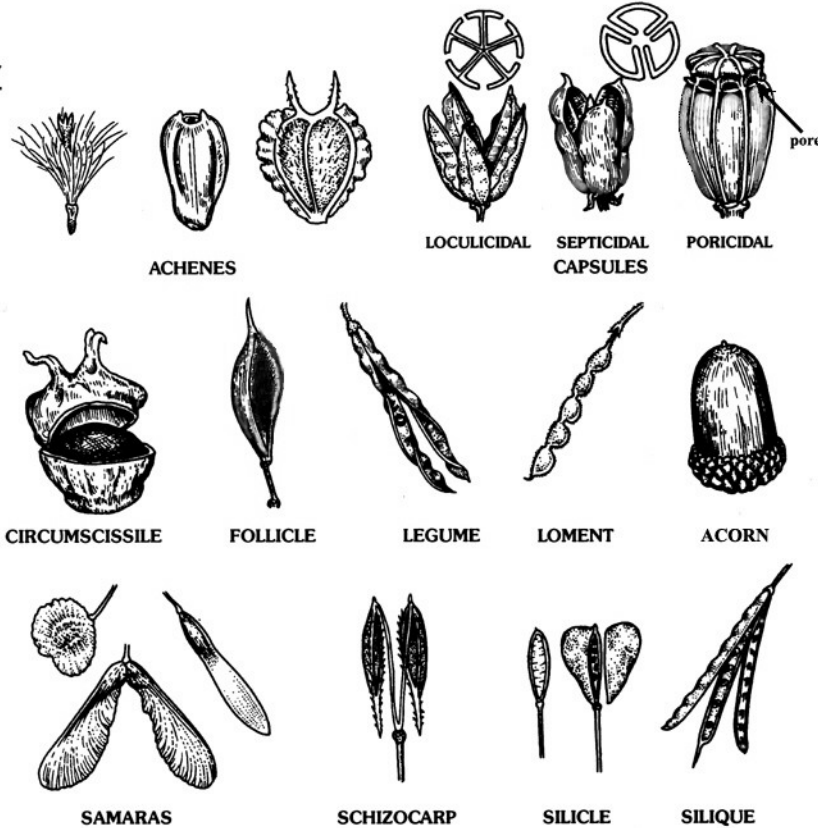


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FLESHY



DRY



III. Seeds

There are two kinds of seed-bearing plants: the flowering plants are called “angiosperms”, and the non-flowering plants are called “gymnosperms”. Most seed plants are the flowering kind. There are over 250,000 species of flowering plants, and only about 600 non-flowering plants. Corn and beans are angiosperm seeds.

A seed is a tiny life-support package. All seeds have three parts: a tough covering (**seed coat**), an embryonic plant consisting of the **plumule** (embryonic leaves), **epicotyl** (upper stem), **hypocotyls** (stem of adult plant), and **radical** (roots), and a food supply (**cotyledon or endosperm**). The **hilum** is the site of attachment to the ovary. In black eyed peas, the “black eye” is the hilum.

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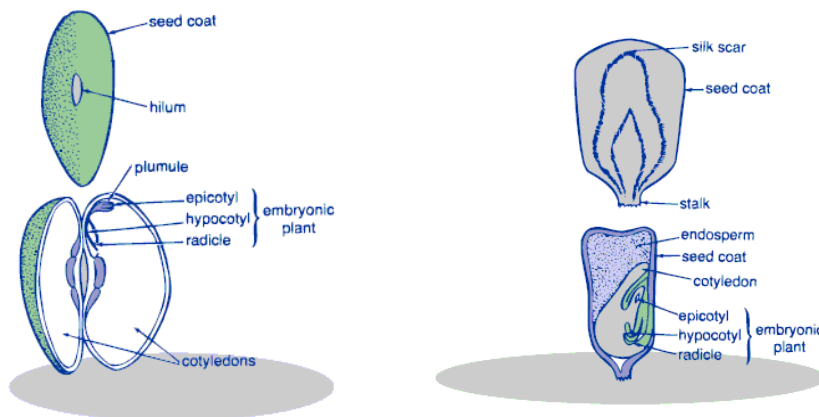
The outer covering of the seed is called the seed coat. The seed coat helps protect the inside of the seed from insects, disease, and damage. Sometimes the seed coat is smooth and paper-thin like that of a pinto bean. A coconut's seed coat, however, is rough, thick, and hard. A seed cannot develop into a plant until the seed coat is broken.

The embryo is the tiny plant inside the seed. The embryo is the source of the root, stem and leaf structures. Surrounding the embryo is the food supply. The food supply is the seed's only source of nourishment as it pushes up through the soil and grows into a young plant. When the food supply is gone, a green plant begins to manufacture its own food through photosynthesis. The food supply for a bean is used up in about two weeks.

Once a seed reaches its sprouting spot, it begins to grow. Various environmental conditions trigger germination, including moisture level, light level, and temperature. Germination is the process through which the embryo inside the seed begins to grow. As the seed germinates, it develops roots, a stem, and then leaves. If a seed is not allowed to germinate within a certain length of time, the embryo inside the seed dies. Each kind of species of plant/seed has a different amount of time that it can survive before it uses up all of its stored food. The food supply is very important to the seed as it germinates. A bean seed without its food supply grows poorly, if at all. A seed with half of its food supply grows better, but a seed with both halves does the best of all. Some species of seeds need to sprout within two weeks while others can wait as long as two thousand years. Seeds germinate at different rates depending on how much food they have stored.

Procedure:

- A. Obtain 5 different dried bean seeds from the bag of 15-bean soup. Use the “**Bean Identification Dichotomous Key**” shown below to identify each of the 5 beans.
- B. Obtain 1 bean seed and one corn seed that have been soaking in water overnight.
 - a. Place the seeds on a paper towel or dissecting tray. Using the probes, gently separate the cotyledons of the bean seeds or cut the corn seed in half, longitudinally. Draw what you see and label the following parts of the seeds: **hilum (bean only), endosperm (corn only), seed coat, cotyledon, plumule/epicotyl, hypocotyl, radicle**. (see diagrams below)
 - b. Place the seed under a dissecting microscope. Illustrate what you see now.



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Bean Identification Dichotomous Key

- 1A. Is your bean round? If yes, go to 2.
- 1B. Is your bean bean-shaped? If yes, go to 4.

- 2A. Does your bean have a flat side and a round side? If yes, go to 3.
- 2B. Does your bean have two flat sides? If yes, it is a lentil.

- 3A. Is your bean green? If yes, it is a green pea.
- 3B. Is your bean yellow? If yes, it is a yellow pea.

- 4A. Is your bean one color? If yes, go to 5.
- 4B. Is your bean more than one color? If yes, go to 11.

- 5A. Does your bean have flat sides? If yes, go to 6.
- 5B. Does your bean have rounded sides? If yes, go to 7.

- 6A. Is your bean longer than 20mm? If yes, it is a lima bean.
- 6B. Is your bean shorter than 20mm? If yes, it is a small lima bean.

- 7A. Is your bean shorter than 11 mm? If yes, go to 8.
- 7B. Is your bean longer than 11 mm? If yes, go to 9.

- 8A. Is your bean white? If yes, it is a small northern bean.
- 8B. Is your bean black? If yes, it is a black bean.

- 9A. Is your bean shorter than 16mm? If yes, go to 10.
- 9B. Is your bean longer than 16mm? If yes, it is a kidney bean.

- 10A. Is your bean white? If yes, it is a large northern bean.
- 10B. Is your bean dark red? If yes, it is a red bean.
- 10C. Is your bean pinkish tan? If yes, it is a pink bean.

- 11A. Does your bean have stripes and spots? If yes, go to 12.
- 11B. Does your bean have one black circle? If yes, it is a black-eyed pea.

- 12A. Is your bean tan and brown? If yes, it is a pinto bean.
- 12B. Is your bean tan and dark red? If yes, it is a cranberry bean.

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Name and Lab Section _____

Flowers

1. Please attach with these lab questions ALL diagrams and drawings for the flower parts and structures (whole flower, male and female reproductive parts, pollen at 2 time points, and dissected ovary). Clearly label each as indicated in the lab.
2. Is the flower that you chose to dissect a perfect flower? Why or why not?
3. Is the flower that you chose to dissect a complete flower? Why or why not?
4. Is the flower that you chose a monocot or dicot? What data supports this answer?

Fruits

5. Which fleshy fruit did you dissect? What type of fruit is it? Include your drawing with appropriate labels?
6. Which dry fruit did you dissect? What type of fruit is it? Include your drawing with appropriate labels.
7. Explain the difference between an aggregate fruit and a multiple fruit?

Seeds

8. Why were the bean seeds soaked in water overnight, prior to beginning the dissection?
9. Are the seeds you are dissecting monocots or dicots? How can you tell?

