

Flower Dissection

Background

Angiosperms are seed-bearing plants that produce flowers. This group of flowering plants includes roses and sunflowers, as well as all fruit trees like apple and banana, but also contains all plants in the grass family like wheat, rice, corn, and bamboo. The seeds of those plants contain the plant's embryo, which is produced in the flower. All parts of the flower are specialized leaves that have important roles to play in the sexual reproduction of plants. The four main parts of a flower, called whorls, are – from the outermost to the innermost – sepals, petals, stamens, and pistils.

They are attached to the rest of the plant at the base of the flower called the receptacle.

Review the diagram (see *Figure 1*) as you read through the next part of the background.

Flower structures can be divided into two groups: the essential organs and the accessory organs. The essential organs include the reproductive structures, which are the stamens (male) and the pistils (female). The accessory organs are the sepals and petals, which surround and protect the essential organs. Some flowers don't have separate sepals and petals that are distinct from one another, but have combined structures called tepals instead.

The stamen is the flower's male reproductive organ and consists of two parts: the anther and the filament. The anther is the enlarged structure at the top of the stamen. Inside the anther are pollen sacs and special cells within them undergo meiosis to form pollen grains. Each pollen grain contains two sperm and when the pollen grains mature, the sacs split open to release the dust-like pollen. The filament is a thin stalk that supports and holds up the anther.

The pistil is the female reproductive organ and consists of three parts: the stigma, the style, and the ovary. The stigma is the enlarged portion at the top of the pistil that becomes somewhat sticky when it matures. The style is the middle portion that supports the stigma. The shape of the style can vary greatly from one species of angiosperm to another. The ovary is the enlarged structure at the bottom of the pistil. The ovary contains one or more hollow compartments called locules. Each locule contains one or more ovules. Special cells within the ovule undergo meiosis to form eggs.

Pollination occurs when pollen grains land on the sticky surface of the stigma and are trapped there. The pollen grain produces a tube that grows down through the style to the ovary, creating a passageway for the sperm cells to enter the ovule which contain the egg. Fertilization occurs when the sperm nuclei join the egg nucleus.

The fertilized egg becomes an embryo – the offspring of the parent plants. The ovule containing the embryo develops into a seed, and the ovary becomes the fruit that contains the seed(s). In some plants, such as peaches, the fruit will become fleshy and loaded with sugars, while in others, like walnuts, it becomes dry and hard. The odor and flavor of the fruits attract animals, which eat them along with the seeds, and help to disperse (spread out) the seeds.

Gregor Mendel, one of the first to study the patterns of heredity, studied flowering plants extensively over many years. He specifically used pea plants because they had certain characteristics – like flower color, pea color, and pea shape – that were easy to identify and the plants were easy to reproduce. First, he would carefully remove the stamens from some flowers to prevent accidental pollination from occurring. Then he

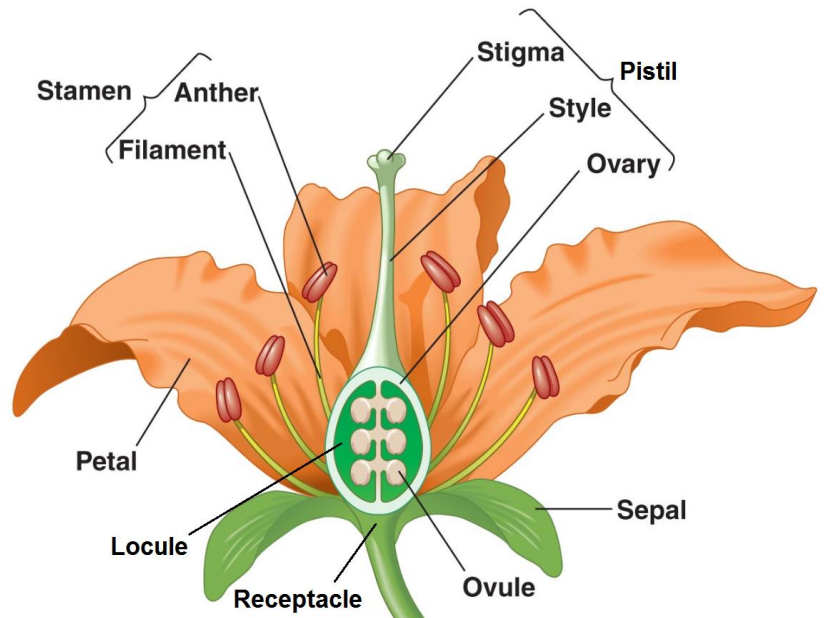


Figure 1

intentionally transferred pollen from one flower to the stigma of another flower, which he called the parental generation, to see what characteristics resulted in the offspring of those parent plants. Over many years, he worked with literally thousands of individual pea plants to develop what remains, even today, as our understanding of the patterns of inheritance for genetic traits.

In this activity, you will be carefully removing parts of a flower beginning with the outermost whorl working toward the pistil. You will arrange each whorl on a labeled worksheet by taping them in their respective locations.

Objective(s)

- ✓ to study the structure of a typical flower
- ✓ to study the male and female reproductive organs needed for sexual reproduction in flowering plants
- ✓ to understand the process behind Mendel's scientific experiments with pea plant flowers

Materials

- | | | |
|--------------------|-----------------------|-----------------------|
| • flower | • dissecting scissors | • “Parts of a Flower” |
| • dissecting tray | • forceps | worksheet |
| • scalpel | • metric ruler | • clear tape |
| • dissecting probe | • hand lens | |

Pre-Lab Questions

Answer the following questions below on a separate sheet of paper. You must either write out the questions, or include the questions in your responses. Be sure to use complete sentences.

1. What is the outermost whorl of a flower? What is the innermost whorl? What is a “tepala?”
2. What is the purpose of the color and odor of a flower's petals?
3. In angiosperms (flowering plants), what is the difference between pollination and fertilization?
4. What flower part results in the formation of a seed? What flower part develops into a fruit? What is the purpose of a fruit?

Safety



Sharp instrument
hazard



Eye & face
hazard

★ *Use extreme caution when using the dissecting equipment – it is very sharp!*

Procedure

1. Obtain a single flower and observe its parts carefully. Use the hand lens to make observations of its smaller parts. Identify each of the parts of the flower **before** dissecting it – this will make it much easier to identify the parts later as they are removed.
2. Read steps #3 and 4 and make careful observations of the flower. Does the flower appear to have distinctly different sepals and petals based on the descriptions of them in those steps? If so, proceed to steps #3 and 4 ... if not, skip to step #5.
3. The sepals form the outermost whorl of the flower. They are leaf-like structures that are usually green in color. Sometimes, sepals are the same color as the petals. The function of the sepals is to protect the flower as it develops, before it blooms. They form the outer layer of a flower bud.
 - a. Gently remove the sepals and tape them to the “Parts of a Flower” worksheet in the appropriate location.
4. The petals are found just inside the sepals. Their color and odor helps to attract birds and insects to the flower for pollination.
 - a. Gently remove the petals and tape them to the worksheet in the appropriate location.

5. Some species of flower possess tepals, a combination of sepals and petals. In those cases the color and/or patterns on the sepals and petals are practically identical and almost impossible to tell apart.
 - a. Gently remove the tepals and tape them to the worksheet in the locations labeled “SEPALS” and/or “PETALS.”
6. The stalk-like structures just inside the petals are the stamens. The enlarged portion at the top of the stamen is the anther, which produces pollen grains containing sperm cells.
 - a. Gently remove the stamens and tape all but one to the worksheet in the appropriate location.
 - b. For the remaining stamen, carefully separate the anther from the filament and tape them to the worksheet in the appropriate location. Label the anther and the filament.
 - c. Use a small piece of tape to remove some of the powdery, dust-like pollen from one of the anthers if pollen is present. Tape it to the worksheet in the appropriate location.
7. The central structure of the flower is the pistil. The top of the pistil is the stigma. In some species, the stigma may appear as one large structure, while in others, it may look split into multiple parts. The middle portion of the pistil is the style, and the bottom section is the ovary. Within the ovary is the ovule-containing locule and the ovule contains the egg.
 - a. Carefully remove the pistil by cutting it from the stem, just below the ovary.
 - b. Cut the pistil lengthwise to create a cross-section of it. You should be able to identify the locule(s) and ovule(s) at this point.
 - c. Tape one half to the worksheet in the appropriate location.
 - d. Label the following parts: stigma, style, ovary, locule.
 - e. Use the dissecting needle to carefully remove one of the ovules from the locule. Tape it to the worksheet in the appropriate location.

Clean Up

- ✓ wipe down (carefully!): dissecting tray, scalpel, dissecting probe, dissecting scissors, forceps
- ✓ trash: remaining flower parts
- ✓ everything else returned to its original location

Results & Analysis

Answer the following questions on your lab paper. For actual questions, you must either write out the questions, or include the questions in your responses. Be sure to use complete sentences and show your work for math problems.

1. Describe the appearance of the sepals and petals – or tepals if the flower doesn’t have distinct sepals and petals. How many of each flower part are there?
2. How many stamens does the flower have?
3. What structure is found attached to the end of each filament? What is the approximate, average length of the filaments?
4. If you were able to obtain pollen grains, describe their appearance.
5. What color is the pistil? What is the approximate, average length of the pistil(s)?
6. Describe the appearance of the stigma.
7. How many locules does the ovary contain? Approximately how many ovules are contained in one locule?