Name _____ Date _____

Flower Dissection Lab

Directions: Follow this checklist to ensure that ALL sketches and discussion questions are answered/ included in your lab write-up. Your sketches should be THOROUGH, LABELED, and include TOTAL MAGNIFICATION (where applicable). Your answers to discussion questions should be thoughtful and thorough (reflecting understanding and application of scientific principles studied).

Exercise 16.2

Lab Study A: Flower Morphology

1. Sketch/ label/ color FOUR (4) *different* flowers on plain white paper (leave *space below* each drawing to write additional information following Part B, and leave additional *space next to* each drawing to diagram a pollen grain for each flower)
   Note: one of your flowers MUST be the rose
   **Hint:* if you need additional help labeling the parts of your flowers, refer back to the "Reproduction in Angiospermophytes" powerpoint!
2. Complete Table 16.3 in the lab packet (for all four chosen flowers) – leave line "Predicted pollinator" blank for now (you will fill this in during Part B)
   Note: Add an extra line to the table to identify each flower as a **monocot or dicot**
3. Answer the discussion question (above "Lab Study B") in your lab packet.

Lab Study B: Pollinators

1. Use the "Key to Pollination" (in your lab packet) to identify the most likely pollinator for each of your four flowers
2. Finish Table 16.3 in the lab packet ("predicted pollinator" line)
3. Below your sketch of each flower, list the type of pollinator and DESCRIBE the flower characteristics that lead you to choose that specific pollinator.
4. Answer the discussion question at the end of the lab packet (parts a, b, and c)
5. Research "actual pollinators" of each flower. This may be typed or hand written – attach to lab packet.

Types of Pollen

1. Use a paintbrush/ toothpick to make a wet mount of pollen from each of your four flowers.
2. Using a microscope, sketch/ label (and color – where applicable) each pollen grain NEXT to the sketch for its corresponding flower.
3. Create a table identifying/ describing similarities/ differences between each of the pollen grains.

FLOWER TYPES: Lily, Carnation, Rose, Iris, Chrysanthemum, Gladiolus, Alstroemeria

Highlight what flowers you selected

EXERCISE 16.2

Angiosperms

A unique characteristic of angiosperms (division Anthophyta) is the **carpel,** a vessel in which ovules are enclosed. After fertilization, the ovule develops into a seed (as in the gymnosperms), while the carpel matures into a fruit (unique to angiosperms). Other important aspects of angiosperm reproduction include additional reduction of the gametophyte, double fertilization, and an increase in the rapidity of the reproduction process.

The **flowers** of angiosperms are composed of male and female reproductive structures, which are frequently surrounded by attractive or protective leaflike structures collectively known as the **perianth** (Color Plate 43). The flower functions both to protect the developing gametes and to ensure pollination and fertilization. Although many angiosperm plants are self-fertile, cross-fertilization is important in maintaining genetic diversity. Plants, rooted and stationary, often require transfer agents to complete fertilization. A variety of insects, birds, and mammals transfer pollen from flower to flower. The pollen then germinates into a pollen tube and grows through the female carpel to deliver the sperm to the egg.

Plants must attract pollinators to the flower. What are some features of flowers that attract pollinators? Color and scent are important, as is the shape of the flower. Nectar and pollen provide nutritive rewards for the pollinators as well. The shape and form of some of the flowers are structured to accommodate pollinators of specific size and structure, providing landing platforms, guidelines, and even special mechanisms for the placement of pollen on body parts. While the flower is encouraging the visitation by one type of pollinator, it also may be excluding visitation by others. The more specific the relationship between flower and pollinator, the more probable that the pollen of that species will be successfully transferred. But many successful flowers have no specific adaptations for particular pollinators and are visited by a wide variety of pollinators.

Some plants do not have colorful, showy flowers and are rather inconspicuous, often dull in color, and lacking a perianth. These plants are usually wind-pollinated, producing enormous quantities of pollen and adapted to catch pollen in the wind (Color Plate 44).

The origin and diversification of angiosperms cannot be understood apart from the coevolutionary role of animals in the reproductive process. Colorful petals, strong scents, nectars, food bodies, and unusual perianth shapes all relate to pollinator visitation. Major trends in the evolution of angiosperms involve the development of mechanisms to exploit a wide variety of pollinators (Color Plates 45, 46, and 47).

In Lab Study A, you will investigate a variety of flowers, observing their shape, structure, and traits that might attract pollinators of various kinds. Following this, in Lab Study B, you will use a key to identify the probable pollinators for some of these flowers. You will follow the life cycle of the lily in Lab Study C and complete the lab by using another key to identify types of fruits and their dispersal mechanisms.

Lab Study A. Flower Morphology

Materials

living flowers provided by the instructor and/or students
stereoscopic microscope

Introduction

Working in teams of two students, you will investigate the structure of the flower (Figure 16.2, Color Plate 43). The instructor will provide a variety of flowers, and you may have brought some with you to lab. You will need to take apart each flower carefully to determine its structure, since it is unlikely that all your flowers will follow the simple diagram used to illustrate the structures. Your observations will be the basis for predicting probable pollinators in Lab Study B.

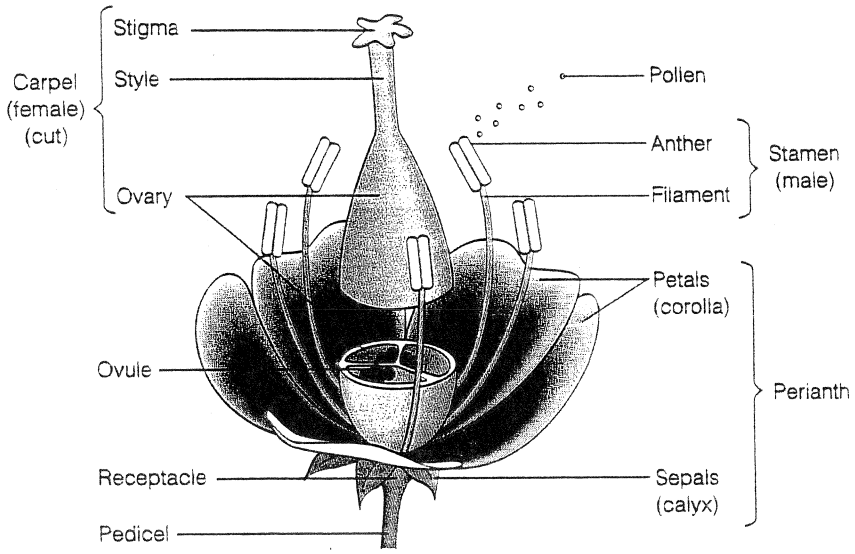

Figure 16.2.
Flower structures. Determine the structures of flowers in the laboratory by reviewing this general diagram.

Procedure

1. Examine fresh flowers of four different species, preferably with different floral characteristics.
2. Identify the parts of each flower using Figure 16.2 and the list provided following the heading Floral Parts. You may be able to determine the floral traits for large, open flowers by simply observing. However, most flowers will require that you remove the floral structures from the outside toward the center of the flower. Some flowers or structures may require the use of the stereoscopic microscope. For example, the ovary is positively identified by the presence of tiny crystal-like ovules, and these are best seen with the stereoscopic scope.
3. In the margin of your lab manual, sketch any flower shapes or structures that you might need to refer to in the future.
4. Record the results of your observations in Table 16.3. You will determine pollinators in Lab Study B.

Floral Parts

Pedicel: stalk that supports the flower.

Receptacle: tip of the pedicel where the flower parts attach.

Sepal: outer whorl of bracts, which may be green, brown, or colored like the petals; may appear as small scales or be petal-like.

Calyx: all the sepals, collectively.

Petal: colored, white, or even greenish whorl of bracts located just inside the sepals.

Corolla: all the petals, collectively.

Stamen: pollen-bearing structure, composed of filament and anther.

Filament: thin stalk that supports the anther.

Anther: pollen-producing structure.

Carpel: female reproductive structure, composed of the stigma, style, and ovary, often pear-shaped and located in the center of the flower.

Stigma: receptive tip of the carpel, often sticky or hairy, where pollen is placed; important to pollen germination.

Style: tissue connecting stigma to ovary, often long and narrow, but may be short or absent; pollen must grow through this tissue to fertilize the egg.

Ovary: base of carpel; protects ovules inside, matures to form the fruit.

Results

Summarize your observations of flower structure in Table 16.3.

Discussion

What structures or characteristics did you observe in your (or other teams') investigations that you predict are important to pollination?

Lab Study B. Pollinators

Materials

living flowers provided by the instructor and/or students
stereoscopic microscope

Introduction

Flowers with inconspicuous sepals and petals are usually pollinated by wind (Color Plate 44). Most showy flowers are pollinated by animals. Some pollinators tend to be attracted to particular floral traits, and, in turn, some groups of plants have coevolved with a particular pollination agent that ensures successful reproduction. Other flowers are generalists, pollinated by a variety of organisms, and still others may be visited by only one specific pollinator (Color Plates 45, 46, and 47). Based on the floral traits that attract common pollinators (bees, flies, butterflies, and hummingbirds), you will predict the probable pollinator for some of your flowers using a dichotomous key. (Remember, *dichotomous* refers to the branching pattern and means "divided into two parts.")

In biology, we use a key to systematically separate groups of organisms based on sets of characteristics. Most keys are based on couplets, or pairs of characteristics, from which you must choose one or the other, thus, the term *dichotomous*. For example, the first choice of characteristics in a couplet might be *plants with showy flowers and a scent,* and the other choice in the pair might be *plants with tiny, inconspicuous flowers with no scent.* You must choose one or the other statement. In the next step, you would choose from a second pair of statements listed directly below your first choice. With each choice, you would narrow the group more and more until, as in this case, the pollinator is identified. *Each couplet or pair of statements from which you must choose will be identified by the same letter or number.*

Table 16.3
Flower Morphology and Pollinators

Features	Plant Names			
	1	2	3	4
Number of petals				
Number of sepals				
Parts absent (petals, stamens, etc.)				
Color				
Scent (+/–)				
Nectar (+/–)				
Shape (including corolla shape: tubular, star, etc.)				
Special features (landing platform, guidelines, nectar spur, etc.)				
Predicted pollinator (see Lab Study B)				

Key to Pollination

I. Sepals and petals reduced or inconspicuous; feathery or relatively large stigma; flower with no odor **wind**

I. Sepals and/or petals large, easily identified; stigma not feathery; flower with or without odor

A. Sepals and petals white or subdued (greenish or burgundy); distinct odor

1. Odor strong, heavy, sweet **moth**

1. Odor strong, fermenting or fruitlike; flower parts and pedicel strong **bat**

1. Odor of sweat, feces, or decaying meat **fly**

A. Sepals and/or petals colored; odor may or may not be present

1. Flower shape regular or irregular,* but not tubular

a. Flower shape irregular; sepals or petals blue, yellow, or orange; petal adapted to serve as a "landing platform"; may have dark lines on petals; sweet, fragrant odor **bee**

a. Flower shape regular; odor often fruity, spicy, sweet, or carrionlike **beetle**

1. Flower shape tubular

a. Strong, sweet odor **butterfly**

a. Little or no odor; flower usually red **hummingbird**

*A regular flower shape is one that has radial symmetry (like a daisy or carnation), with similar parts (such as petals) having similar size and shape. Irregular flowers have bilateral symmetry.

Procedure

Using the key above, classify the flowers used in Lab Study A based on their floral traits and method of pollination.

Results

1. Record your results in Table 16.3.
2. If you made sketches of any of your flowers, you may want to indicate the pollinator associated with that flower.

Discussion

1. Review the Key to Pollination and describe the characteristics of flowers that are adapted for pollination by each of the following agents:

a. wind

b. hummingbird

c. bat