


Natural Perspective: Plant Classification

1. Complete the table below:

Phylum	Tissue Structure	"Seed" Structure	Stature	Picture <small>Copy/ paste a picture</small>									
<i>Bryophyta</i> ()	<hr/> <i>(Bryophytes)</i>												
<i>Psilophyta</i> ()													
<i>Lycopodophyta</i> ()													
<i>Sphenophyta</i> ()													
<i>Filicinophyta</i> ()													
<i>Cycadophyta</i> ()													
<i>Ginkophyta</i> ()													
<i>Coniferophyta</i> ()													
<i>Gnetophyta</i> ()													
<i>Angiospermophyta</i> ()													
<i>Dicotyledons</i> ()													
<i>Monocotyledons</i> ()													

Please see the [plant page](#) for a discussion of the different classification methods

Mosses and Allies

- 2. List the two stages that mosses go through for reproduction
 - a.
 - b.

- 3. What is unique about the chloroplasts in hornworts?

Ferns and their Allies

- 4. Explain how the sporophyte and gametophyte stages differ between mosses and ferns:

- 5. What is a vascular system?

- 6. Discuss the type of habitat that ferns grow in.

Conifers and their Allies

- 7. Look at the picture. What do we commonly call the structure that contains conifer seeds?

- 8. List at least 6 common species names that are Conifers:
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
 - f. _____

Flowering Dicot Plants/ Flowering Monocot Plants

- 9. List three characteristics of monocots and dicots and give examples of each:

	Monocots	Dicots
Characteristics		
Examples		

Flower Anatomy

47

Flowers are more than ornamental parts of a plant. They are the reproductive structures of angiosperms, the flowering plants. Flowers are structures for sexual reproduction. Thus, angiosperms are widespread.

In this investigation, you will

- observe macroscopically and identify the reproductive structures of a plant.
- observe microscopically certain parts of flowers.
- label diagrams of the structures associated with plant reproduction.
- give the functions of flower parts.
- learn how monocot and dicot flowers differ.

Materials



tobacco flowers
razor blade (single-edge)
microscope
water
microscope slides—2

coverslips—2
hand lens (or binocular microscope)
dropper
sunflower (optional)
colored pencils—red, blue, green

Procedure

Part A. Macroscopic Examination

Flowers have many different sizes, shapes, and numbers of parts. You will study a tobacco flower because it has all the flower parts.

The outside of a tobacco flower has two parts. Sepals are green, leaflike parts at the base of the flower. Tobacco has five sepals. These parts are joined so it is difficult to see each sepal. Sepals protect the young flower.

Petals are the brightly colored parts of a flower. Tobacco has five petals. However, they are fused making counting difficult. Petals protect the flower parts inside. Their colors may also attract insects.

NOTE: If using preserved flowers, the colors of petals and sepals may have faded.

- Properly label Figure 47-1 using words *sepals* and *petals*.
- Remove the petals of your flower by gently pulling them off.

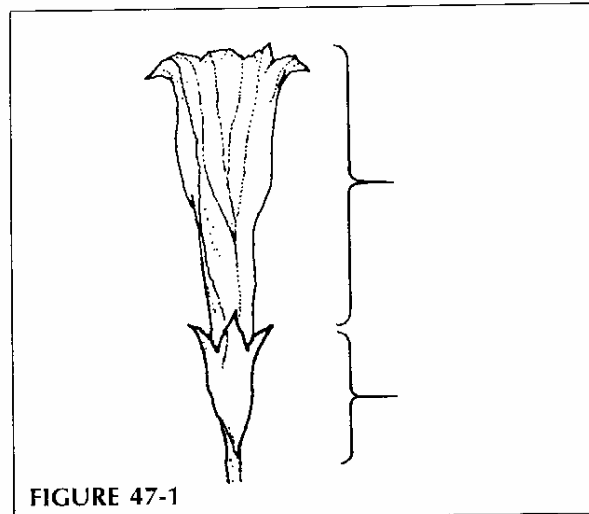


FIGURE 47-1

Two different types of parts should now be seen. The pistil is a single, slender, stalklike structure with a round base connected to the stem (see Figure 47-2). All parts which make up the pistil are associated with a flower's female reproductive system. Also, on the inside of the

petals are stamens. They are also stalklike structures. Each stamen has a two part caplike part on its end (see Figure 47-2). All parts which make up the stamen are associated with a flower's male reproductive system.

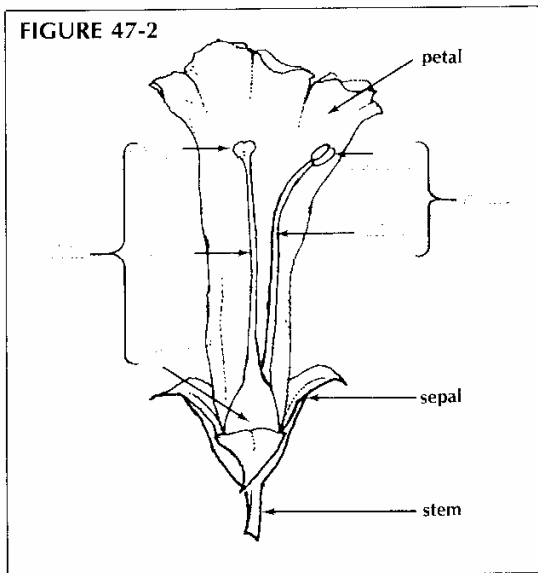
A more detailed study of a stamen reveals that it is composed of two parts. The stalk portion of a stamen is the filament. It supports the cap. The cap on the filament is the anther. The anther produces pollen grains.

- Label *stamen*, *filament*, and *anther* in Figure 47-2.

A detailed study of the pistil reveals that it is composed of three parts. The stigma is the top portion of the pistil. It is usually sticky. The stigma is the collecting place for pollen grains. The stalk of the pistil is the style. The style supports the stigma. The base portion of the pistil is the ovary. The ovary may be partly hidden from view by the sepals. If so, remove the sepals by gently pulling them off.

- Label the *pistil*, *stigma*, *style*, and *ovary* in Figure 47-2.

1. How many stamens are present in tobacco flowers? _____
2. How many pistils are present in tobacco flowers? _____
3. How does the number of stamens compare to the number of petals and sepals in tobacco flowers? _____

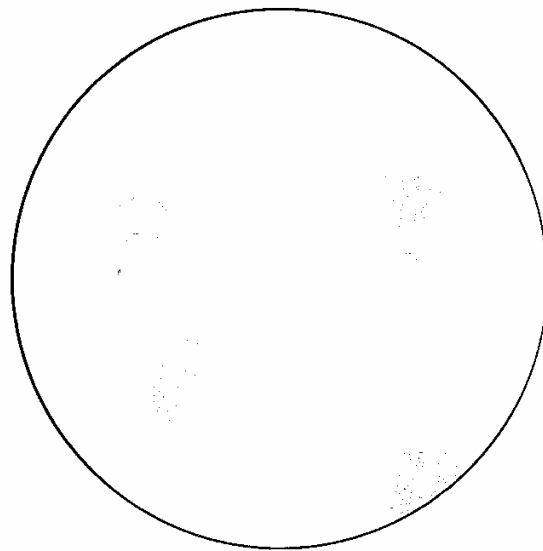


Part B. Microscopic Examination

- Prepare a wet mount of pollen grains. Place an anther onto a slide and add a drop of water. Cut the anther into several small pieces with the razor blade. **CAUTION: Blade is sharp. Cut away from your fingers.** Add a coverslip and gently press down to squash the anther pieces.

- Examine the anther under low and high power of your microscope. The small dotlike structures are pollen grains. Pollen grains contain the male sex cells.

- Diagram in the space provided several pollen grains as they appear under high power.



pollen grains

- Using Figure 47-3 as a guide, slice the ovary exactly in half lengthwise with a razor blade.

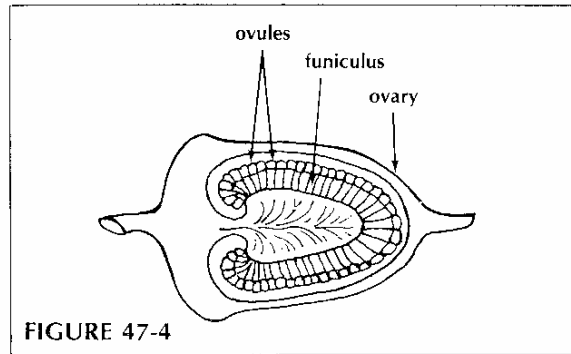
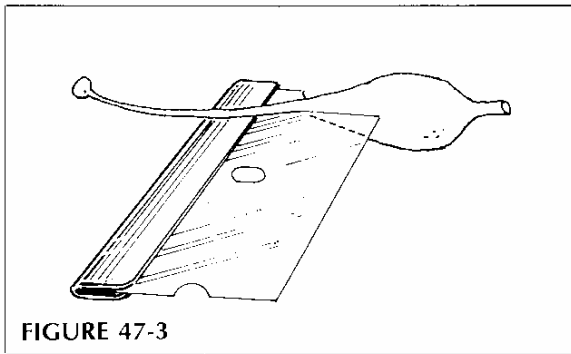
- Mount one half in a drop of water on a microscope slide. Make sure that the cut surface is facing up.

- Examine the ovary section with a hand lens or binocular microscope. Two structures of the ovary should be visible.

The many small, dotlike structures which fill the two ovary halves are ovules. Each ovule contains an egg cell that is not visible.

A funiculus, a tiny stalk, connects each ovule to the ovary.

- Label the *ovary*, *ovules*, and *funiculus* in Figure 47-4.



4. About how many pollen cells are present in each anther? (Make a reasonable guess.)

5. How many ovaries are present in tobacco flowers? _____
6. About how many ovules are present in tobacco flowers? (Make a reasonable guess.) _____

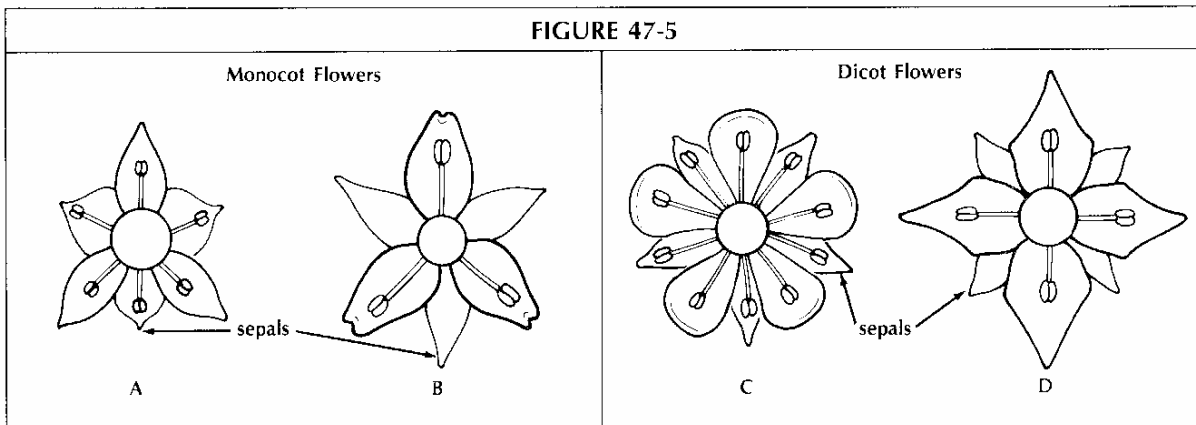
7. (a) Are there more pollen cells produced by one anther than ovules produced by one ovary?

- (b) Give a possible explanation for your answer.

Analysis

1. Give the functions of the following parts.

PART	FUNCTION	PART	FUNCTION
sepal		filament	
petal		style	
anther		pollen	
stigma		flower	
ovule		stamen	



2. Angiosperms are classified as either monocotyledon (monocot) or dicotyledon (dicot) plants. One difference between these two plant groups is found in their flower anatomy. Use Figure 47-5 to complete the table below.

		NUMBER SEPALS	NUMBER PETALS	NUMBER STAMENS	NUMBER PISTILS	SEPALS, PETALS, STAMENS IN MULTIPLES OF 3, 4, OR 5?
Monocot plant	A					
	B					
Dicot plant	C					
	D					

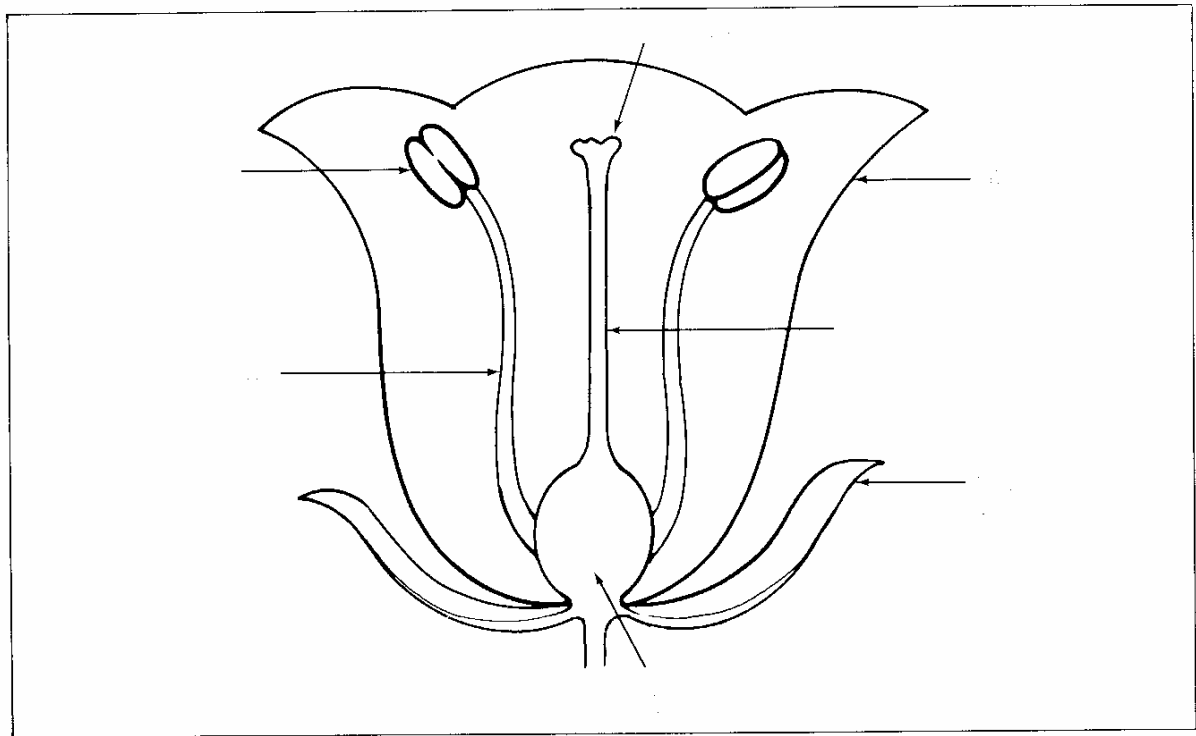
3. (a) Explain how to identify a monocot plant by examining its flowers. _____

(b) Explain how to identify a dicot plant by examining its flowers. _____

4. (a) Using your answer from Question 3, decide if the tobacco flower dissected in Part A of this experiment is a monocot or a dicot. _____

(b) What is your evidence? _____

5. This diagram shows those flower parts found in a typical flower. Label those parts indicated by the arrows. Color the flower's male reproductive parts green. Color the female reproductive parts red. Petals and sepals are neither male nor female, color them blue.



Fruits And Seeds

48

Fruit formation is an important phase of sexual reproduction in flowering plants. Fruits protect and help distribute seeds. Fruits often are eaten by animals. The seeds enclosed within the fruit are not digested; they pass through the animals. Thus, some seeds are dispersed by animals.

Because they are associated with reproduction, fruits and seeds are related to flower parts. Fruits are enlarged ovaries. Seeds are enlarged and thickened ovules.

In this investigation, you will

- (a) examine and compare traits of six different fruit types.
- (b) examine the inside parts of a string bean and okra fruit.
- (c) examine and compare outside and inside parts of a bean and corn seed.

Materials



string bean
peach
pistachio
peanut
cucumber
green pepper
okra
bean seed soaked in water
hand lens
razor blade (single-edge)
corn seed soaked in water—2

Procedure

Part A. Fruit Comparison

- Examine samples of the fruits listed in Table 48-1. Use a razor blade to cut open the fruits to examine their interiors. **CAUTION:** *Blade is sharp. Cut away from your fingers.*
- Complete Table 48-1. Base your answers on the following brief explanations.
 - (a) "Nature of fruit" should be either *dry* (hard or brittle) or *fleshy* (soft and usually thick).
 - (b) "Number of seeds" should be a number. For some fruits (cucumber, green pepper), an estimate rather than an actual number should be given.
 - (c) "Fruit edible" should be yes or no, considering humans as the consumers.
 - (d) "Seed edible" should also be yes or no, considering humans as the consumers.

- (e) "Evidence of flower parts" should be answered yes or no. A scarlike structure appears on the ends of certain fruits showing remains of reproductive parts no longer present (stigma, petals, and so on). Do not confuse this with the stalk end where the fruit was connected to the plant.

Part B. Fruit Parts

String bean pods are the fruit of a string bean plant. The string bean pod was the ovary of the bean flower. Evidence of this can be seen inside the string bean pod.

- Using a razor blade, cut the string bean pod open lengthwise. Use the "line" found along its outside as a guide.

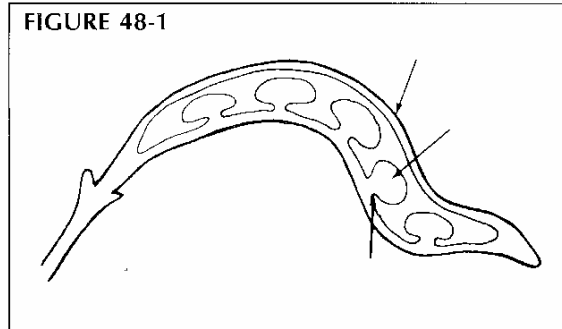
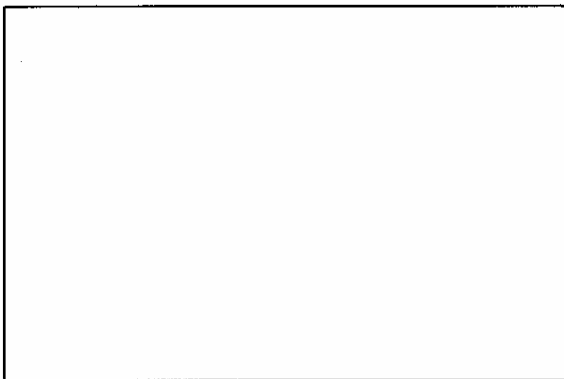
TABLE 48-1. CHARACTERISTICS OF SOME FRUITS

FRUIT	NATURE OF FRUIT	NUMBER OF SEEDS	FRUIT EDIBLE	SEED EDIBLE	EVIDENCE OF FLOWER PARTS
Okra					
Peach					
Pistachio					
Peanut					
Cucumber					
Green pepper					

- With the string bean pod open, identify the seeds inside. A small thin stalk can be seen connecting each seed to the fruit or pod. This stalk is the funiculus.

- Correctly add the following labels to Figure 48-1: *fruit, seed, funiculus*.

- Make a cross-sectional slice through an okra fruit. Observe and diagram what you see in the space below. Label these parts: *fruit, seed, and funiculus*.

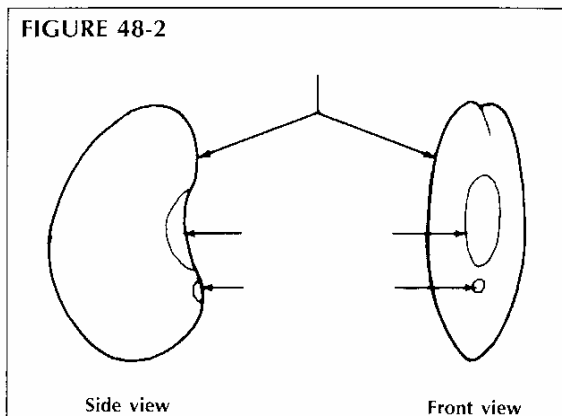


The thick, outer covering of the seed is the seed coat. It protects the seed.

- Correctly add the following labels to Figure 48-2: *hilum, micropyle, seed coat*.

- Using a razor blade, carefully remove the seed coat from your bean seed.

- Open the seed into two equal halves. Four internal structures should be visible with the aid of a hand lens.



Part C. Seed Parts

- Examine a bean seed that has been soaked in water. Three structures should be visible.

An oval scar on the side of the seed is the hilum. It represents the point of attachment of the ovule by the stalklike funiculus.

The tiny dot directly below (or above) the hilum is the micropyle. It is the opening through which the pollen tube entered the ovule and the egg was fertilized.

The bulk of the seed is two cotyledons. They store food which is used by the developing plant during germination.

The other three parts of a seed located near the edge of one of the cotyledons form the young plant. The stemlike structure is the hypocotyl. It will form the stem of the plant. The lower tip of the hypocotyl is the radicle. It will form the roots of the new plant. The small leaflike structure connected to the hypocotyl is the epicotyl. It will form the first true leaves of the plant during its early growth.

● Correctly add the following labels to Figure 48-3: *epicotyl, hypocotyl, radicle, cotyledons.*

● Examine the outside of a soaked corn seed.
1. Can you see the same outer parts as easily on

corn as you did on the beans? _____

● Using a razor blade or fingernail, carefully remove the seed coat from your corn seed.

2. Does the corn seed split open easily into two equal halves? _____

Flowering plants are grouped into two categories, monocotyledons and dicotyledons. These groups refer to the number of cotyledons present in the seeds. Mono- means one, di- means two.

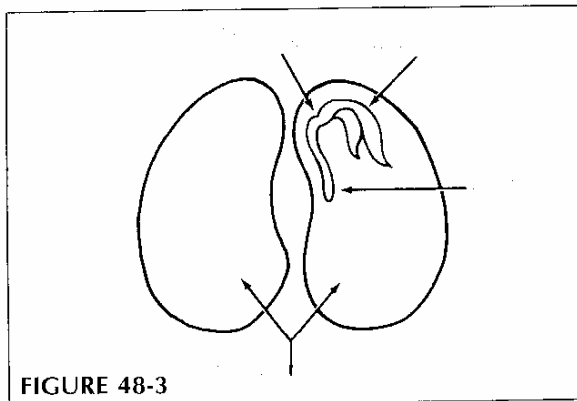


FIGURE 48-3

3. (a) Are beans a mono- or dicotyledon plant?

(b) Is corn a mono- or dicotyledon plant? _____

● Cut a second soaked corn seed in half. Use Figure 48-4 as a guide.

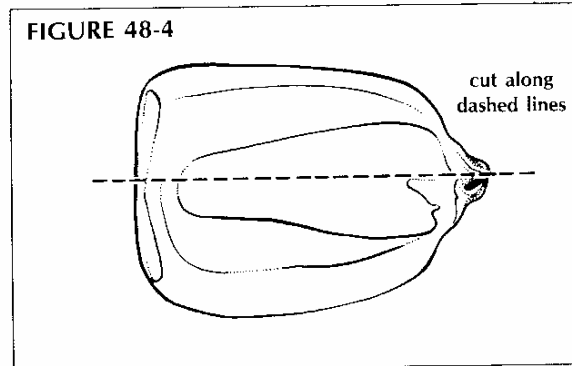


FIGURE 48-4

● Examine the cut edge. Those parts which appear white are the cotyledons, radicle, epicotyl, and hypocotyl. Together these parts form the embryo or future plant. The remaining part is a tissue called endosperm. Endosperm serves as a food source for the young embryo as it first grows. Label the *embryo* and *endosperm* in Figure 48-5.

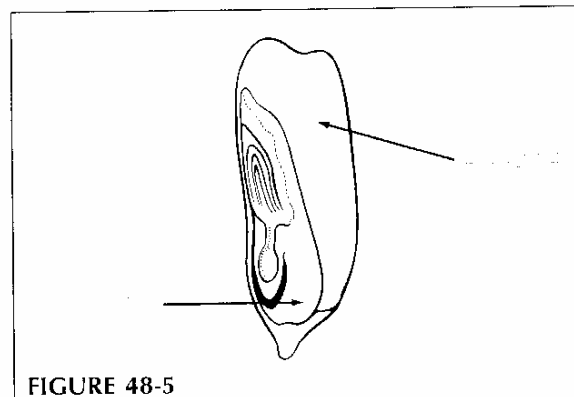


FIGURE 48-5

Analysis

1. Did all fruits examined in Part A have seeds in them? _____

2. (a) Is there a relationship between the nature of a fruit (Table 48-1) and its edibility? _____

(b) Explain. _____

3. (a) Is there a relationship between number of seeds (Table 48-1) and seed edibility? _____
- (b) Explain. _____
4. (a) A string bean pod usually has five to seven seeds in it. How many ovules were present in a bean flower ovary before fertilization? _____
- (b) A tomato may have over 500 seeds in it. How many ovules were present in a tomato flower ovary before fertilization? _____
5. What structure found in string beans, green peppers, tomatoes, and cucumbers tells you that they are all fruits? _____
6. Categorize each of the following plant parts as either fruits or vegetables. (Consider vegetables as a nonscientific category assigned to any plant or plant part other than a fruit.) Give reasons to support your decisions.
- (a) strawberry _____
- (b) beet _____
- (c) squash _____
- (d) pumpkin _____
- (e) lettuce _____
- (f) carrot _____
7. Explain what each of the following parts is or does.
- (a) hilum scar _____
- (b) micropyle _____
- (c) cotyledon _____
- (d) embryo _____
- (e) endosperm _____
8. Explain what becomes of each of the following seed parts as the seed sprouts.
- (a) hypocotyl _____
- (b) epicotyl _____
- (c) radicle _____
9. Define
- (a) monocotyledon (monocot). _____
- _____
- _____
- (b) dicotyledon (dicot). _____
- _____
- _____

