

The Importance of Leaves on a Plant

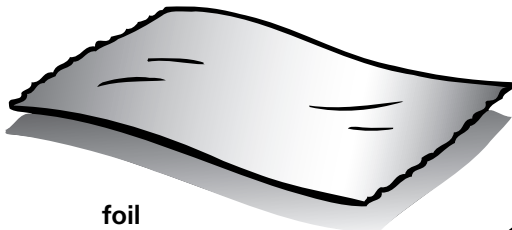
WHAT YOU NEED



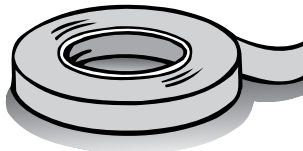
scissors



two identical houseplants



foil



masking tape



metric ruler

Find Out

Do this activity to see how an individual plant organ is important to the survival of the plant.

Process Skills

Measuring
Predicting
Controlling Variables
Observing
Communicating
Inferring
Designing
Investigations

Time

- 35 minutes the first day
- 10 minutes twice a week for three weeks

WHAT TO DO



1. Label one plant "A" and the other plant "B."
2. Cut out 15 pieces of foil, each about 20 cm square.
3. **Predict** how plant A will compare with plant B if the leaves on plant B are covered for three weeks.
4. Wrap a piece of foil around each leaf of plant B. Use the masking tape to hold the foil in place.
5. Place both plants on a sunny windowsill for three weeks. Water both plants as your teacher instructs.
6. **Observe** the plants twice a week for three weeks. **Record** your observations on the chart.
7. After three weeks, take the foil off the leaves. **Draw** a picture and describe plants A and B on the chart.



Prediction: _____ Predictions will vary.

| Observing the Importance of Plant Leaves | | | | |
|---|-------------------------|--------------|----------------|--------------|
| Time | Observations | | | |
| | Plant A | | Plant B | |
| Week 1 | Day 1 | Day 2 | Day 1 | Day 2 |
| Week 2 | Day 1 | Day 2 | Day 1 | Day 2 |
| Week 3 | Day 1 | Day 2 | Day 1 | Day 2 |
| After Three Weeks | Observations will vary. | | | |

Conclusions

1. What is the relationship between the survival of a plant and the functioning of its leaves?

Answers will vary but may include that the leaves on the plant need to be exposed to the sun for photosynthesis to occur. Without the sun, the leaves and then the plant will not survive.

2. Based on what you know about the functions that leaves perform in a plant, **infer** why there was a difference between plants A and B after the three weeks.

Answers will vary but may include that because the leaves on plant B were covered, the plant's systems could not function. Plant A's systems were able to function normally.

New Questions

1. What processes do the cells in leaf tissues perform?

Answers may include photosynthesis, transpiration, protection, reducing water loss.

2. Make a **hypothesis** about how a plant's survival would be affected if its roots did not function.

Hypotheses will vary.

3. Plan an investigation that would test your hypothesis. Write instructions that others could follow to do your investigation.

Student designs will vary.



Name _____



ACTIVITY

Investigating Plant Tissue

Predict what will happen to the celery stalk in the colored water.

Answers will vary.

What do you **observe** has happened to the celery stalk?

The stalk should be stained by the food coloring.

Draw an outline of the bottom of the celery stalk and show the parts that are stained.

Student drawings should show the circular vascular bundles along which the food coloring traveled.

Draw what the cut edge of the celery stalk looks like after you cut it in half lengthwise.

Student drawings should show the length of the vascular bundles that run through the stalk to the leaves.

Name _____

Conclusions

1 Compare your prediction with your observations.
Answers will vary according to the predictions made. Students should observe that the celery stalk changed color.

2 What kind of tissue was stained by the food coloring?
The vascular tissue of the celery stalk was stained as water was transported (however, over time, the colored water will move into other tissues by osmosis).

3 How did the cells in this tissue work together?
The cells worked together to move the water up the stalk to the leaves.

Asking New Questions

1 How did you know what kind of tissue was stained by the colored water?
Answers may vary but students should know that it was vascular tissue because vascular tissue carries water throughout a plant.

2 **Predict** what might happen if you left the celery stalk in the colored water for a day. Why might this happen?
The entire celery stalk would become the color of the food coloring as the water moved through the plant and into cells by osmosis.

Name _____



ACTIVITY

Investigating the Lungs

Predict what will happen when the air is released into the solution.

Answers will vary.

What happened to the color of the bromothymol blue solution when the air from the balloon was released into the solution?

Students should observe that the solution changed color from blue to green to yellow when carbon dioxide was released into the solution.

Name _____

Conclusions

- 1** Compare your prediction with your observations.
Answers will vary depending upon the predictions. Students should observe that the solution changed color.

- 2** Was carbon dioxide present in your breath? How do you know?
Carbon dioxide was present in students' breath; they would know this because the bromothymol blue changed to green, then yellow.

- 3** What particular function of your lungs was detected by this activity?
Answers may include: the exchange of gases; the release of carbon dioxide by the lungs; the elimination of the waste product carbon dioxide through the lungs.

Asking New Questions

- 1** What cellular process produces carbon dioxide as a waste product?
respiration

- 2** Would the gases released from the leaves of a plant change the color of the bromothymol blue solution?
No, the predominant gas released from plants is oxygen, not carbon dioxide.

Name _____



ACTIVITY

Investigating Systems

How many heartbeats did you feel in 20 seconds? **Record** this number in the chart below.

Answers will vary.

What is your heart rate for one minute?

Answers will vary but should be the number of beats felt in 20 seconds multiplied by 3.

How many times did you exhale in 20 seconds? **Record** this number in the chart below.

Answers will vary, but students should observe that their breathing rates are lower than the heart rates.

Predict how your heart rate and breathing rate might change if you run in place.

Answers will vary.

How many beats did you feel in 20 seconds after running in place for two minutes? **Record** this number in the chart below.

Answers will vary, but students should note a significant increase.

How many times did you exhale in 20 seconds after running in place for two minutes? **Record** this number in the chart below.

Answers will vary, but students should note a significant increase.

| | Number of Heartbeats | Number of Exhales |
|-------------------------------|-----------------------------|--------------------------|
| While Sitting | Answers will vary. | Answers will vary. |
| After Running in Place | Answers will vary. | Answers will vary. |

Conclusions

1 Compare your prediction with your observations.
Answers will vary depending on the predictions made. Students should observe that their heart rates and breathing rates increased with activity.

2 What system did you observe when you felt your neck with your fingers? When you felt your breath?
Pulse—the circulatory system or cardiovascular system; breath—the respiratory system

3 What organ pumped the blood into the carotid artery that you felt in your neck?
The heart pumped the blood.

4 Did you see a relationship between your heart rate and the number of times you exhaled?
Answers will vary depending on the students' observations. Students will likely see that when they ran, their heart rates and breathing rates increased. When one rate increases, the other increases; when one decreases, the other decreases.

Asking New Questions

1 Based on what you know about the flow of blood in an animal, explain why a relationship might exist between your heart rate and the number of times you exhaled.
Answers may include: When the student ran in place, his or her body needed more oxygen. The heart pumps blood to the lungs, where the blood takes in oxygen and releases carbon dioxide. When the body needs more oxygen, both the heart and the lungs have to work harder. Remind students that oxygen is needed for cellular respiration to occur. When the body needs more energy, it also needs more oxygen.

2 If your heart rate were measured while you were sleeping, how might it compare to the heart rates you recorded in this activity?
Students' heart rates would be lower because less energy is needed in sleep than when the body is exercising.