The NASA SCI Files™
The Case of the
Prize-Winning Plants

Segment 2

The tree house detectives are eager to learn more about the basic needs of plants. While accompanying her mom on a trip to NASA Kennedy Space Center in Florida, Bianca visits Ms. Lori Jones at the CO_2 lab. Ms. Jones explains how plants need oxygen for respiration and how they use CO_2 from the air to make sugars and other chemical compounds. Next, Bianca visits Dr. Gregory Goins to learn about the light spectrum and why light is important to plants. Meanwhile, back at the tree house, Jacob is busy with his own CO_2 experiment, which leaves him a little "breathless." The other detectives decide that they should learn more about photosynthesis and contact students at Pearl Harbor Kai Elementary School in Honolulu, Hawaii, who share the results of their experiments on light. However, the tree house detectives are still concerned that a pineapple plant won't adapt to the Virginia climate, so they decide to visit Dr. D to learn about plant adaptations.

Objectives

Students will

- understand the importance of carbon dioxide for plant growth.
- learn the function of stomata.
- understand that light is an energy source that powers the food-making process of photosynthesis.
- learn how plants adapt to their environment.

Vocabulary

adaptations—characteristics that enable a living thing to survive in its environment

air—the invisible mixture of odorless, tasteless gases that surrounds the Earth

carbon dioxide ***(CO_2)***—a heavy, colorless gas that does not support burning, dissolves in water to form carbonic acid, is formed especially by the burning and breaking down of organic substances, is absorbed from the air by plants in photosynthesis, and has many industrial uses

chlorophyll—a pigment that causes a plant to appear green. Chlorophyll absorbs visible light from the Sun to provide the energy for photosynthesis.

epiphyte—a plant that gets moisture and the materials needed to make its food from the air and rain and that usually grows on another plant

fluorescent light—light created by an electric lamp in the form of a tube in which light is produced on the inside fluorescent coating by the action of ultraviolet light

light—an electromagnetic radiation in the wavelength range, including infrared, visible, ultraviolet, and X-rays, which travel in a vacuum about 300,000 km per second

photosynthesis—the process by which plants that contain chlorophyll use carbon dioxide and water with light energy to produce food and oxygen

respiration—the physical and chemical processes by which a living thing obtains the gases that it needs to produce energy and eliminate waste gases

stomata—small openings surrounded by two guard cells through which moisture and gases pass in and out of a leaf's epidermis

visible spectrum—the only part of the electromagnetic spectrum we can see that includes the colors of the rainbow: red, orange, yellow, green, blue, and violet

Video Component

Implementation Strategy

The NASA SCI Files™ is designed to enhance and enrich existing curriculum. Two to three days of class time are suggested for each segment to fully use video, resources, activities, and web site.

Before Viewing

1. Prior to viewing Segment 2 of *The Case of the Prize-Winning Plants*, discuss the previous segment to review the problem and reaffirm what the tree house detectives have learned thus far. Download a copy of the Problem Board from the NASA SCI Files™ web site, select Educators, and click on the Tools section. The Problem Board can also be found in the Problem-Solving Tools section of the latest online investigation. Have students use it to sort the information learned so far.
2. Review the list of questions and issues that the students created prior to viewing Segment 1 and determine which, if any, were answered in the video or in the students' own research.
3. Revise and correct any misconceptions that may have been dispelled during Segment 1. Use tools located on the Web, as was previously mentioned in Segment 1.

View Segment 2 on the Video

For optimal educational benefit, view *The Case of the Prize-Winning Plants* in 15-minute segments and not in its entirety. If you are viewing a taped copy of the program, you may want to stop the video when the Focus Question icon appears to allow students time to answer the question.

After Viewing

1. Have students reflect on the "What's Up?" Questions asked at the end of the segment.
2. Discuss the Focus Questions.
3. Have students work in small groups or as a class to discuss and list what new information they have learned about plants, how plants are classified, the parts of plants, plants' basic needs, and plant adaptations.
4. Organize the information and determine whether any of the students' questions from the previous segments were answered.
5. Decide what additional information is needed for the tree house detectives to grow a healthy, prize-winning pineapple plant. Have students conduct independent research or provide students with information as needed. Visit the NASA SCI Files™ web site for an additional list of resources for both students and educators.
6. Choose activities from the Educator Guide and web site to reinforce concepts discussed in the segment. Pinpoint areas in your curriculum that may need to be reinforced and use activities to aid student understanding in those areas.
7. For related activities from previous programs, download the Educator Guide for *The Case of the Mysterious Red Light* and *The Case of the Inhabitable Habitat*, select Educators, and click on Activities/Worksheets in the menu bar at the top. Scroll down to the 2001–2002 season and click on either *The Case of the Mysterious Red Light* or *The Case of the Inhabitable Habitat*.

   a. In the Educator Guide for *The Case of the Mysterious Red Light*, you will find

      a. Segment 1—*Natural or Artificial, Photons, Traveling the Straight and Narrow, Roping a Wave,* and *Roll Out the Frequency*

      b. Segment 2—*The Zig-Zag Race of Reflectors, The Bendable Light*, and *Refraction Action*

      c. Segment 3—*Over the Rainbow, Primary Colors of Light*, and *Rainbow of Knowledge*

   b. In the Educator Guide for *The Case of the Inhabitable Habitat*, you will find

      a. Segment 1—*Biomes, Welcome to My Habitat*, and *How Does Your Garden Grow?*

      b. Segment 2—*Sprouts to Grow*

      c. Segment 3—*Leaf the Wax On* and *Have Seed, Will Travel*

   c. On the web site in the Activities/Worksheet section for *The Case of the Mysterious Red Light*, you will find

      a. *The Edible Spectrum*

      b. *The Incredible Edible Wave*

      c. *Pouring a Little Light on the Subject*

      d. *What is the Color White?*

   d. On the web site in the Activities/Worksheet section for *The Case of the Inhabitable Habitat,* you will find

      a. *Animal Adaptations*

      b. *The Creature from the Adapting Lagoon*

8. If time did not permit you to begin the web activity at the conclusion of Segment 1, refer to number 6 under After Viewing on page 13 and begin the Problem-Based Learning activity on the NASA SCI Files™ web site. If the web activity was begun, monitor students as they research within their selected roles, review criteria as needed, and encourage the use of the following portions of the online, Problem-Based Learning activity:

   Research Rack—books, Internet sites, and research tools

   Problem-Solving Tools—tools and strategies to help guide the problem-solving process

   Dr. D's Lab—interactive activities and simulations

   Media Zone—interviews with experts from this segment

   Expert's Corner—listing of Ask-an-Expert sites and biographies of experts featured in the broadcast

Careers

ethnobotanist

9. Have students write in their journals what they have learned from this segment and from their own experimentation and research. If needed, give students specific questions to reflect upon as suggested on the PBL Facilitator Prompting Questions instructional tool found by selecting Educators on the web site.

10. Continue to assess the students' learning, as appropriate, by using their journal writings, problem logs, scientific investigation logs, and other tools found on the web site. For more assessment ideas and tools, go to Educators and click on Instructional Tools in the menu bar.

Resources

Books

Batten, Mary: Hungry Plants (Road to Reading Series: Mile 4). Golden Books, 2000, ISBN: 0307264017.

Charman, Andrew: I Wonder Why Trees Have Leaves and Other Questions About Plants. Houghton Mifflin Company, 2003, ISBN: 075345663X.

Moore, Jo Ellen: Learning About Plants. Evan-Moor Educational Publishers, 2000, ISBN: 155799772.

Silverstein, Alvin: Photosynthesis. Millbrook Press, 1998, ISBN: 0761330003.

VanCleave, Janice: Janice VanCleave's Play and Find Out About Nature: Easy Experiments for Young Children. John Wiley & Sons, 1997, ISBN: 0471129399.

Web Sites

NASA-Fundamental Space Biology
Visit their site to learn how NASA is studying biological processes through space flight and ground-based research.
http://fundamentalbiology.arc.nasa.gov

Composition of the Atmosphere
Take a short trip through history to learn how atmospheric gases were discovered and how they affect us today.
http://www.msnucleus.org/membership/html/jh/earth/atmosphere/lesson1/atmosphere1a.html

National Gardening Association/Kids & Classrooms
This site provides information about the Grow Lab Indoor Garden—Basic Science Program and includes an online newsletter with articles on herbs, seed saving, nutrition, and more. *http://www.kidsgardening.com/*

Arizona State University—Photosynthesis
This wonderful resource helps teachers find out everything they ever wanted to know about photosynthesis.
http://photoscience.la.asu.edu/photosyn/education/learn.html

BBC—ReviseWise Science
Visit this web site to learn about the basic needs of a plant and the photosynthesis process. Play an interactive game to learn what makes a plant grow.
http://www.bbc.co.uk/schools/revisewise/science/living/06_act.shtml

BBC—Gardening with Children
Learn all about photosynthesis and other interesting facts about plants.
http://www.bbc.co.uk/gardening/children/didyouknow/didyouknow_photosynthesis.shtml

USDA—Agricultural Research Service—Sci4Kids
This USDA web site illustrates some of the ways that plants defend themselves against hungry animals and how important plants are to people.
http://www.ars.usda.gov/is/kids/plants/plantsintro.htm

Environmental Protection Agency (EPA)—Global Warming
This site is a great resource for educators to learn the latest on how increasing carbon dioxide in the atmosphere affects our Earth.
http://yosemite.epa.gov/oar/globalwarming.nsf/content/index.html

Classroom of the Future—Biomes
This web site is a great introduction to the various biomes of the world. Within each biome, students can further explore the plants of the biome and learn how they adapt to their environment. Great teacher resources too!
http://www.cotf.edu/ete/modules/msese/earthsysflr/biomes.html

Activities and Worksheets

In the Guide

On the Web

Plants of a Different Color Adapt Together
Research various biomes and learn how plants adapt to their unique environment.

Guards at the Door

Purpose

To understand how stomata function in a plant

Materials

houseplant
petroleum jelly
2 plastic bags
2 twist ties

Background

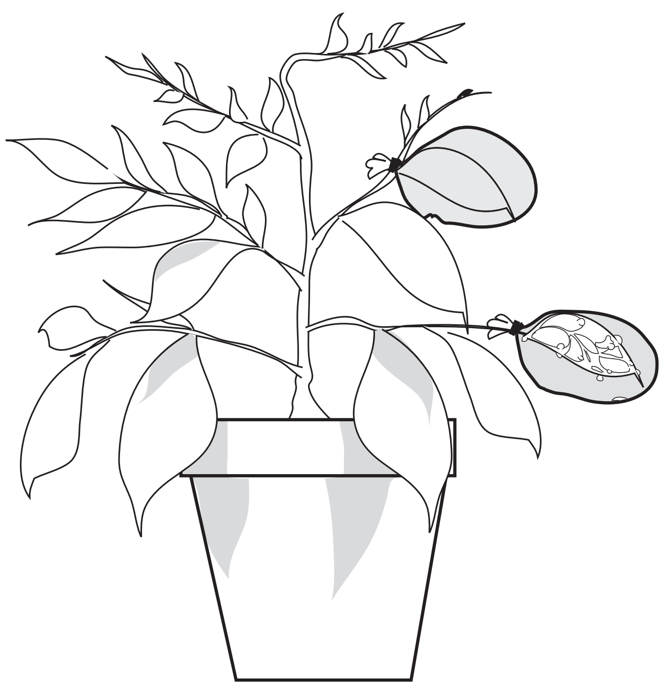
Plants contain openings that permit air to enter and water vapor to leave. These openings are called stomata. The word stoma comes from the Greek word meaning "mouth." Stomata open into the air spaces inside the leaf, and two cells called guard cells surround each stoma. Leaves usually have more stomata on the lower surface layer (epidermis) of a leaf than on the upper layer. Green stems can also have stomata.

Procedure

1. Place a plastic bag over one leaf of the plant.
2. Use a twist tie to close the bag's opening firmly around the leaf's stem.
3. Rub petroleum jelly on both sides of a second leaf.
4. Repeat steps 1 and 2 for the second leaf.
5. Observe and record your observations in your science journal.
6. Observe the two leaves every 24 hours for three days and record your observations.

Conclusion

1. What happened to the two different leaves? Why?



Stomata, Up Close and Personal

Purpose

To observe stomata open and close

Teacher Note

An adult may need to prepare slides ahead of time.

Materials

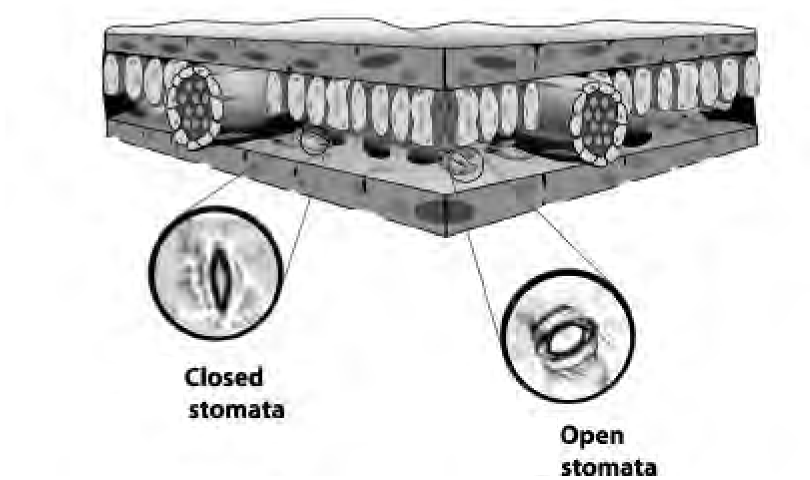
clock
cover slip
distilled water
dropper
forceps or tweezers
hand lens
lettuce leaf
metric ruler
microscope
microscope slide
paper towel
saltwater
science journal

Procedure

1. Use a hand lens to observe the upper and lower surfaces of the lettuce leaf.
2. Tear a small 5-cm square from the lettuce leaf.
3. Bend this square in half.
4. Use the forceps to remove a thin layer of epidermis from the leaf.
5. Place one drop of distilled water onto the microscope slide.
6. Place the thin layer of epidermis removed from the lettuce leaf onto the drop of water and place a cover slip over it.
7. Place the prepared slide on the microscope and observe the epidermis layer by using low power.
8. Locate a pair of kidney-bean-shaped guard cells and a stoma. Illustrate your observations in your science journal.
9. Use the dropper to place a drop of saltwater next to the edge of the cover slip.
10. Use a small piece of the paper towel to draw the saltwater under the cover slip by touching the paper towel to the side of the cover slip opposite the drop of saltwater.
11. Wait about 5–10 minutes and observe using low power on the microscope.
12. Illustrate your observations in your science journal.
13. Compare and contrast the two illustrations. Describe how guard cells are different from the other cells of the epidermis.

Conclusion

1. How are the stomata affected by the guard cells when they come in contact with the saltwater?
2. What causes the stomata in a plant to open and close?
3. Why is it important for a plant to have stomata?



The Green, Green Grass of Home

Problem

To understand that plants need light

Materials

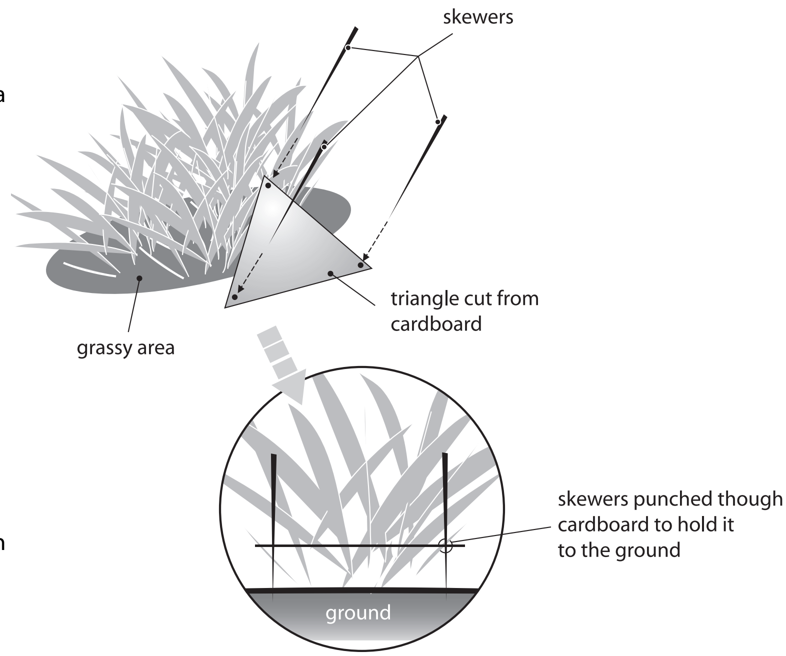
cardboard (cereal box)
large, green, grassy area
pencil
scissors
science journal
wooden skewers

Background

Rocks that have hardened from liquids are called igneous {IG nee us} rocks. The word "igneous" comes from the Greek word for fire. All igneous rocks begin below the Earth's surface in a liquid state of hot melted matter called magma. When magma forces its way to the surface through volcanic eruptions, it is called lava. As magma and lava cool, they form different types of igneous rocks. When magma cools underground, it cools very slowly, forms large crystals, and is called an intrusive igneous rock. When lava cools above ground, it cools more quickly, forms very small or no crystals, and is called extrusive igneous rock.

Procedure

1. Cut out one side of an empty cereal box.
2. On the cardboard, draw a shape such as a crescent moon, a triangle, or even the first letter of your name.
3. Use scissors to cut out the shape.
4. Go outside to a large, grassy area and place your shape on the ground, covering a section of the grass.
5. Punch a hole through the cardboard with the sharp end of the wooden skewer and insert the skewer into the ground to hold the cardboard shape in place.
6. Wait one week and return to the grassy area and remove your cardboard.
7. Observe the grassy area where the cardboard had been and record your observations. (***Safety tip:*** *Use caution when handling pointed, wooden skewers.)*



Conclusion

1. What happened to the grass under the cardboard? Why?
2. Which one of a plant's basic needs does this experiment demonstrate?

Extension

1. Cut out small shapes and paper clip them to the leaves of a large plant. After several days to a week, take the shapes off and observe.
2. Place a small drop of iodine on the green part of the leaf and observe what happens. Place a small drop of iodine on the part of the leaf that was covered by the shapes and observe. Why did the iodine change color on only one part of the leaf? Hint: Iodine is an indicator for starch.

Oh Colors, Where Art Thou? Chromatography

Problem

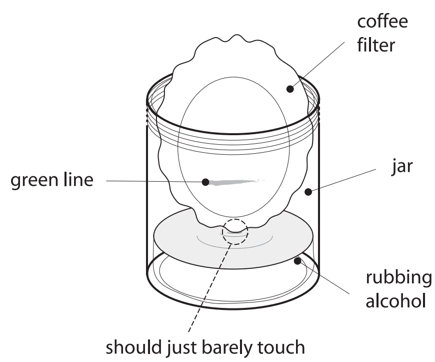
To separate the colors hidden within a leaf

Materials

clock
coffee filter
coin
jar
leaf from outdoor plant
metric ruler
pencil
permanent marker
rubbing alcohol
science journal
tape

Procedure

1. Lay the coffee filter flat and place the green leaf on top of it about 2 to 5 cm from the bottom of the filter.
2. Roll a quarter back and forth several times over the leaf to make a line of pigment on the filter paper.
3. Have an adult pour a small amount of rubbing alcohol into a jar or beaker until the liquid level is approximately 5 mm deep.
4. Place the bottom edge of the filter into the liquid so that the filter is just barely touching the liquid and hold it steady. Optional: Tape the filter to the side of the jar.
5. Allow enough time for the filter to absorb the liquid. You will notice that the liquid creeps upward toward the line of pigment that you made on the filter. Once it reaches the line, continue to wait and observe what happens as more of the alcohol reaches the line of pigment.



Conclusion

1. What happened to the green line after you placed the coffee filter paper in the rubbing alcohol?
2. What colors did you observe on the paper after it was in the rubbing alcohol for 10 minutes?
3. Where did these colors come from?

Bubbles To Go

Problem

To demonstrate that different wavelengths of light affect the process of photosynthesis

Teachers Note

Elodea is an inexpensive aquatic plant that can be obtained from most pet stores. It is also sometimes referred to as *Anacharis* or *Elodea canadensis*. An overhead projector works well for the light source, but a fluorescent lamp can also be used. For several groups, position a test tube rack(s) so that the overhead projector or lamp shines directly on it from a distance of about 15-20 cm. As the students finish their test tubes, have them place the test tubes in the rack for observation. If you have a large class, a second light source might be needed.

Materials

(per group)
large test tube
de-chlorinated water
12-14 cm of *Elodea*
metric ruler
scissors
stopwatch or clock with second hand
red, blue, and green filter sheets
baking soda
grease pencil or marker

(per class)
light source
test tube rack(s)

Background

Photosynthesis is the metabolic process within the green parts of the plant. During this process, molecules of carbon dioxide and water are restructured into sugar. Light provides the energy needed for photosynthesis to occur. However, many factors such as the wavelength of the light, the intensity of the light, the amount of carbon dioxide, and even the temperature can affect the process. During the process of photosynthesis, oxygen is created as a "waste product."

Procedure

1. Using a grease pencil or marker, label your test tube with your group's name or number.
2. Place one-eighth of a teaspoon of baking soda in the bottom of the test tube.
3. Fill the test tube halfway with water.
4. Gently shake the test tube to mix the water and baking soda.
5. Measuring from the top of the plant cut a 12-14 cm section.
   Note: Be careful as you cut the plant not to smash the tubes in the stem. If you do, try to roll them between your fingers to open the tubes up or make a new cut.
6. Remove a few of the bottom leaves from the cut end.
7. Place the *Elodea* plant into the test tube lengthwise with about 2 cm of space from the plant to the top of the test tube. Cut end of plant should be facing up. If the plant is too long, cut it to fit. See diagram 1.
8. Fill the remainder of the test tube with water.
9. Place the test tube 15-20 cm from the light source.
10. Let the test tube stand in front of the light source for about 10-15 minutes and then check for bubbles. Once bubbles are forming and floating to the top from the end of the stem, you are ready to collect your data.
11. Data Collection:
    a. Place a red filter sheet in front of your test tube.
    b. Wait for a bubble to float to the surface and start the stopwatch.
    c. Count the bubbles after that first one until you reach 10 bubbles and stop the stopwatch.
    d. Record the time in the data chart.
    e. Repeat for 3 more trials.
    f. Find the average time for all 3 trials.
    g. Place the blue filter sheet in front of your test tube and repeat steps a-f.
    h. Place the green filter sheet in front of your test tube and repeat steps a-f.
12. Using the average time for each filter, create a graph of your data. Be sure to label the x and y axis, create a key, and title the graph.
13. Share your data with your class and create a class chart and graph.

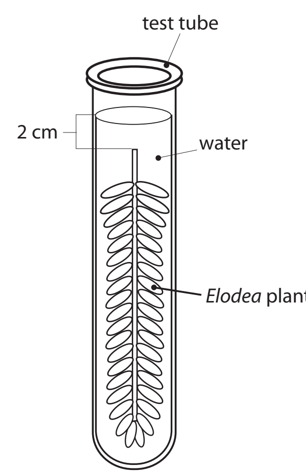


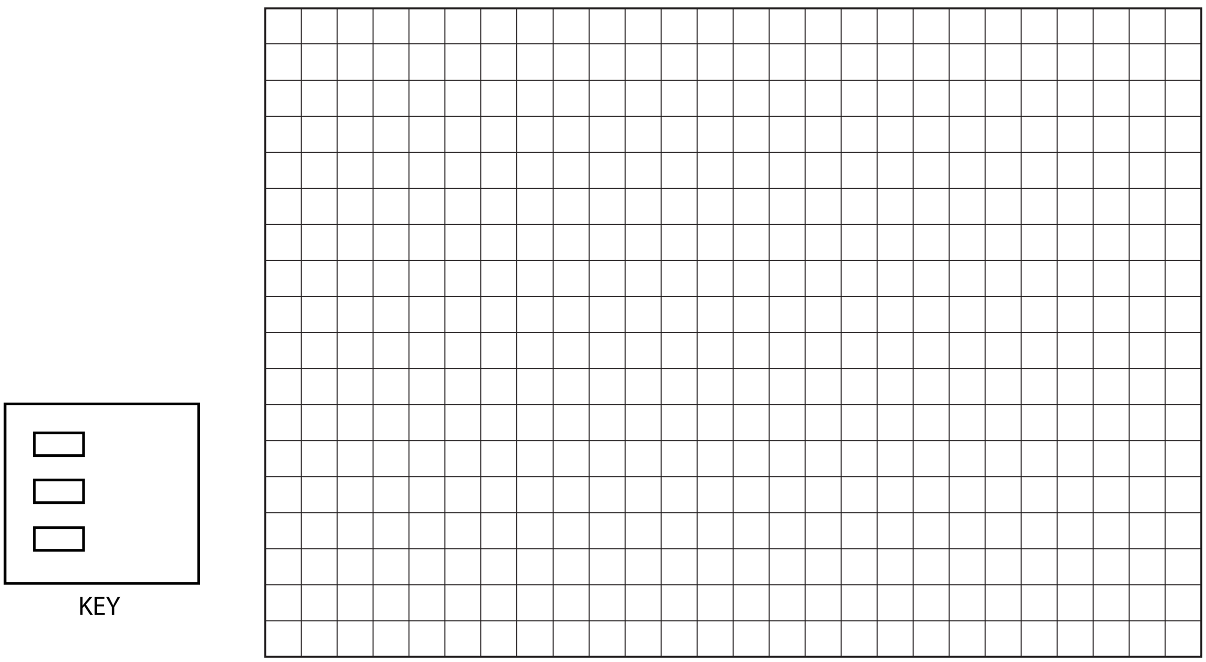
Diagram 1

Bubbles To Go (concluded)

Data Chart

Filter	Trial 1	Trial 2	Trial 3	Average Time
Red Filter				
Blue Filter				
Green Filter				

Graph: ______________________
Title



Conclusion

1. Where are the bubbles coming from?
2. Which filter made the bubbles form the fastest? Why?
3. Which filter made the bubbles form the slowest? Why?
4. Why is it important to do three trials?
5. How did your class chart and graph compare to your data?
6. Explain why more data are better?

Extension

To understand the effect that the intensity of light has on photosynthesis, place the test tube at different distances from the light (10 cm, 15 cm, 20 cm, and so on). Record the amount of time it takes for 10 bubbles to form, create a chart and graph of your data.

Waxing a Plant

Materials

science journal
scissors
2 small pans
2 sponges
water
zippered plastic bag

Purpose

To learn how some plants adapt to a dry environment

Procedure

1. Soak each sponge in water.
2. Use scissors to make five small cuts in the plastic bag.
3. Place one sponge in the bag and "zip" the bag closed.
4. Place the plastic bag with the sponge in a pan.
5. Place the other sponge in the other pan. See diagram 1.
6. Leave both pans in a warm, sunny place.
7. Observe the two sponges and record your observations in your science journal.
8. Predict what will happen to the two sponges and record your prediction in your science journal.
9. Observe the sponges again the next day and record your observations.

Conclusion

1. Which sponge lost the least amount of water? Why?
2. How might leaves with a wax covering help plants adapt to a dry environment?
3. Where might you find plants with wax coverings?

Extension

Instead of using a plastic bag, cover one sponge with petroleum jelly.

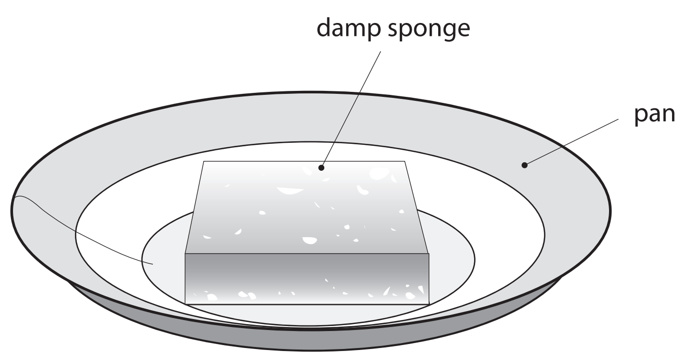
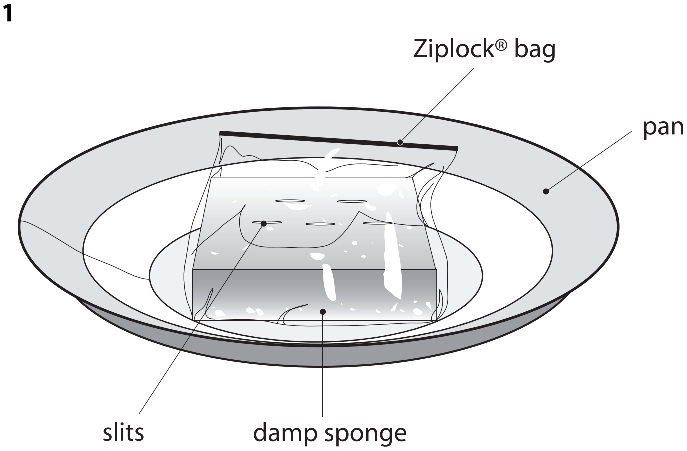


Diagram 1



Adapting for the Future

Purpose To understand how plants must adapt to survive changes in their environment

Procedure

1. Choose one of the following scenarios:
   a. Meteorologists have noted a slow change over time in the weather patterns for your local area. Currently, the area's average rainfall is only 40 inches per year. However, the meteorologists predict that in the next 100 years, the area will receive an extraordinary amount of rainfall with a possible 100 or more inches of rain each year. What will happen to the plant life in the area? How will plants adapt to such a drastic change in the environment?
   b. Meteorologists have noted a slow change over time in the weather patterns for your local area. Currently, the area's average rainfall is only 60–80 inches per year. However, the meteorologists predict that in the next 100 years, the area will experience a drought and will receive about 10–15 inches of rain each year. What will happen to the plant life in the area? How will plants adapt to the change in the environment?
   c. You have just been hired as a marine biologist to study plants in the Pacific Ocean. You will be spending the next year in an underwater habitat to learn how plants adapt to the ocean's ever-changing environment. Scientists are worried that if global warming is possible and the sea levels rise, then the oceans will become less salty with the increase of freshwater. Will an increase in sea level affect aquatic plants? How will they adapt to the changing environment?
2. As a botanist, research the scenario you chose and design a garden that could survive in the new environment.
3. Your garden may be real (in a planter) or may be presented in the form of a poster, PowerPoint presentation, or other creative way.
   a. Draw and label the parts of at least four of the plants in your garden.
   b. Identify the type of environment (biome) to which it has adapted.
   c. Describe the area's new climate.
   d. Describe how each plant reproduces and mention any adaptations that might aid in the reproduction process.
   e. Describe any other adaptations that help plants survive in the new environment.
4. Share your garden and research with the class.

Answer Key

Guards at the Door

1. The bag surrounding the leaf without the petroleum jelly had moisture on its surface while the other one remained dry. Rubbing petroleum jelly on the surface of one leaf prevented the escape of moisture through the stomata and the bag remained dry. The normal exchange of air and water occurred in the bag with the untreated leaf, and the moisture condensed on the inside surface of the bag.

Stomata, Up Close and Personal

1. When the guard cells came in contact with the saltwater, they shrank in size and the stomata closed.
2. When guard cells absorb water by osmosis, they swell and the stomata open. When stomata are open, carbon dioxide gas can diffuse into leaves and any waste gases such as oxygen can move out. When guard cells lose water by osmosis, they shrink, causing the stomata to close; therefore, gases cannot move either in or out of the leaves.
3. Stomata are important to plants because they help protect the plant from the changing environment. When the stomata on a leaf are open, carbon dioxide gas can diffuse into the leaf, and water can diffuse out of the leaf by the process of transpiration. Transpiration decreases the amount of water in the leaf, and the plant then needs to absorb more water from the soil through its roots to make up for the water lost by transpiration. Also, plants must make their own food by photosynthesis. Photosynthesis can occur only when chlorophyll absorbs the light in a leaf, when the stomata are open and allow carbon dioxide gas into the leaf, and when water is available in the cells of the leaf. Photosynthesis cannot occur at night because there is no light; therefore, the stomata on a leaf will close to keep the water from transpiring from the leaf and being wasted.

The Green, Green Grass of Home

1. The grass under the cardboard turned a yellowish color. The green coloring in plant leaves is called chlorophyll. It traps the Sun's energy to produce food, which makes the plant grow. Plants need light to be able to make chlorophyll. When there is no light, the plant stops producing this green pigment and its leaves yellow. As soon as the plant has light again, it is stimulated to make chlorophyll, turning the leaves green and putting its food-making processes back into production.
2. This experiment demonstrates a plant's basic need for light.

Oh Colors, Where Art Thou? Chromatography

1. The green line began to separate into different colors.
2. Orange, yellow, light green, and dark green.
3. The colors are in the leaf, but you are unable to see them because the chlorophyll (green) is dominant during photosynthesis. Have you ever noticed that leaves change colors in the fall? Have you wondered why they change? During the autumn, fewer hours of daylight and less sunlight cause changes in plant hormones (chemical messengers). These changing plant hormones can cause chlorophyll to break down. When chlorophyll breaks down, the plant will no longer appear green. Without chlorophyll, photosynthesis cannot occur. As the chlorophyll begins to fade away, the other colors in the leaf can finally show their true intensity. The fall colors were always there; they were just hidden by the abundant amount of green color produced by the chlorophyll. For more information, visit NASA Kids' Science News Network™ (KSNN™) at *http://ksnn.larc.nasa.gov/webtext.cfm?unit=leaves*

Answer Key (concluded)

Bubbles to Go

1. Photosynthesis is the metabolic process within the green parts of the plant. During this process, molecules of carbon dioxide and water are restructured into sugar. Light provides the energy needed for photosynthesis to occur. The "waste product" of photosynthesis is oxygen. The bubbles are the oxygen that was created during photosynthesis.
2. The bubbles formed the fastest and about equally with the red and blue filters. In the visible spectrum of light there are many colors (red, orange, yellow, green, blue, and violet). Plants absorb light energy as photons, which are packets of energy. To grow well, plants require (absorb) mostly red and blue light while reflecting most of the green light. By receiving red and blue light, photosynthesis occurred more quickly and the bubbles were created faster.
3. The green filter. Plants mostly reflect the green part of the spectrum; therefore, with the green filter the plant was receiving less energy and photosynthesis slowed.
4. At least three trials are necessary to make sure that your data are accurate. If your times were very different from each other, then several more trials would be required.
5. Answers will vary.
6. The more data you collect, the more reliable your results and conclusions will be. There are too many factors that can "skew" data and by performing many trials and collecting data from other groups, you are less likely to have "skewed" data.

Waxing a Plant

1. The sponge with the plastic bag lost the least amount of water. The plastic bag helped keep most of the moisture from evaporating.
2. Just as the plastic bag helped keep the sponge wet, the wax covering on a leaf helps keep the water in a plant from escaping. Not allowing water to escape helps the plant retain more water so it can survive during droughts.
3. Plants with wax coverings exist in many places, but answers should include the desert and alpine environments.