

# Plant Needs — Light, Water and Air

**Objective** Students will be able to list and describe the things plants need to grow and produce.

**Grade Level** 1-3 4-6

**TEKS:** S- 2.6C; 2.9B; 3.10A S- 4.10A; 5.6A,C; 5.10A

TAKS:	GRADE	OBJECTIVES
Reading	3, 4, 5, 6	1
Writing	4	1, 2
Science	5	1, 2, 3, 4
Math	3, 4, 5, 6	1, 4, 5

**Assessment Summary:**  
 Teacher observation of student participation in Investigations.  
 Teacher interaction with students concerning Investigations.  
 Students record keeping and reports to class about Investigation results.

**Background**

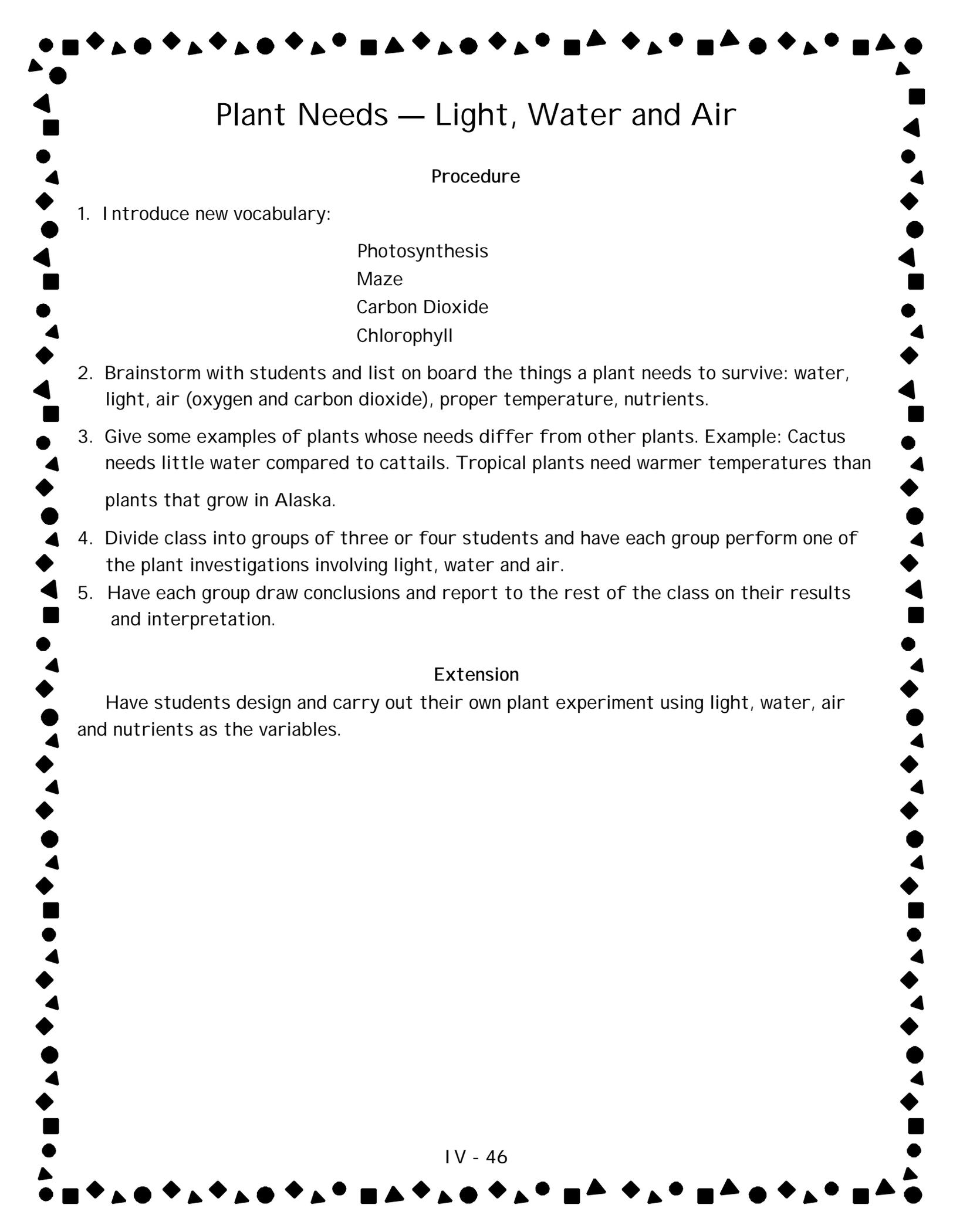
Information: "Plant Needs", included in lesson

**Materials and**

Potted plants. Should be the same variety

**Equipment:**

- Aluminum Trays
- Shoe boxes
- Potatoes
- Plant Growth Charts
- Paper and pencil for recording results
- Student made journals
- Water can
- Computer with Internet connection

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# Plant Needs — Light, Water and Air

## Procedure

1. Introduce new vocabulary:

Photosynthesis

Maze

Carbon Dioxide

Chlorophyll

2. Brainstorm with students and list on board the things a plant needs to survive: water, light, air (oxygen and carbon dioxide), proper temperature, nutrients.
3. Give some examples of plants whose needs differ from other plants. Example: Cactus needs little water compared to cattails. Tropical plants need warmer temperatures than plants that grow in Alaska.
4. Divide class into groups of three or four students and have each group perform one of the plant investigations involving light, water and air.
5. Have each group draw conclusions and report to the rest of the class on their results and interpretation.

## Extension

Have students design and carry out their own plant experiment using light, water, air and nutrients as the variables.

# Plant Needs — Light, Water and Air

Plants alone produce food. All other organisms simply convert plant food into fuel for their own bodies. A plant takes energy from the sun, combines the nutrients and water from the soil and produces the carbohydrates and proteins that we think of as food and fiber.

Growing plants need sunlight, water, nutrients, proper temperature and air. If deprived of any of these it will not be able to sustain itself.

**Light** - All plants need light. Different plants, however, have adapted to different amounts of light. That is why some plants make excellent houseplants. Some plants can actually get sunburned if they are in full sun, while other plants require full light. A plant that grows on a prairie, desert or open meadow will need bright, direct sunlight. Most plants we grow for food need a lot of sunlight.

**Water** - All plants need water. The amount of water a plant needs depends upon the adaptations a plant has made. A desert plant, having adapted to its environment, needs little water. Some food crops, like rice, need a lot of water so they will produce a good crop.

Some farmers provide water for their crops. This is called irrigation. Other farmers depend on natural rainfall to water their crops. This is called dry land farming. If there is not enough rainfall for the plants to produce, the farmer has nothing to sell, so he loses money.

**Air** - All plants need air, both above and below the ground. The one fact that people are not generally aware of is that a plant's roots need equal amounts of water and air. If the soil becomes waterlogged, the plant will literally drown. Some plants, like cattails, can thrive in standing water, but a cactus will rot.

**Temperature** - The temperature, which a plant needs to thrive, varies with the plant. Tropical plants, such as orange, lemon and grapefruit trees, will not be able to withstand a freeze. The same is true for crops such as cotton, corn, soybeans and grain sorghum. They like warm temperatures. They are planted in the spring and grow in the summer. Wheat, oats and rye, however, like cooler temperatures. These crops are planted in the fall and grow slowly during the winter. When the weather becomes a little warmer in the spring, they grow quickly and are harvested in the early summer.

**Nutrients** - Plants obtain nutrients through their roots from the soil. The three major nutrients a plant needs are nitrogen, phosphorus, and potassium, known by their chemical symbols N-P-K. When one purchases a "plant food" or fertilizer, a ratio will be found on the package. This ratio tells what percent of those nutrients is in that container. Farmers must use fertilizer to feed their crops in order for them to grow and produce properly.

## Investigation

### Do Plants Need Air?

**Objective:** The student will demonstrate that plants need air, and that plants suffer when denied this substance.

**Materials:** One or more potted plants. If more than one is used they should be the same type.

**Procedure:**

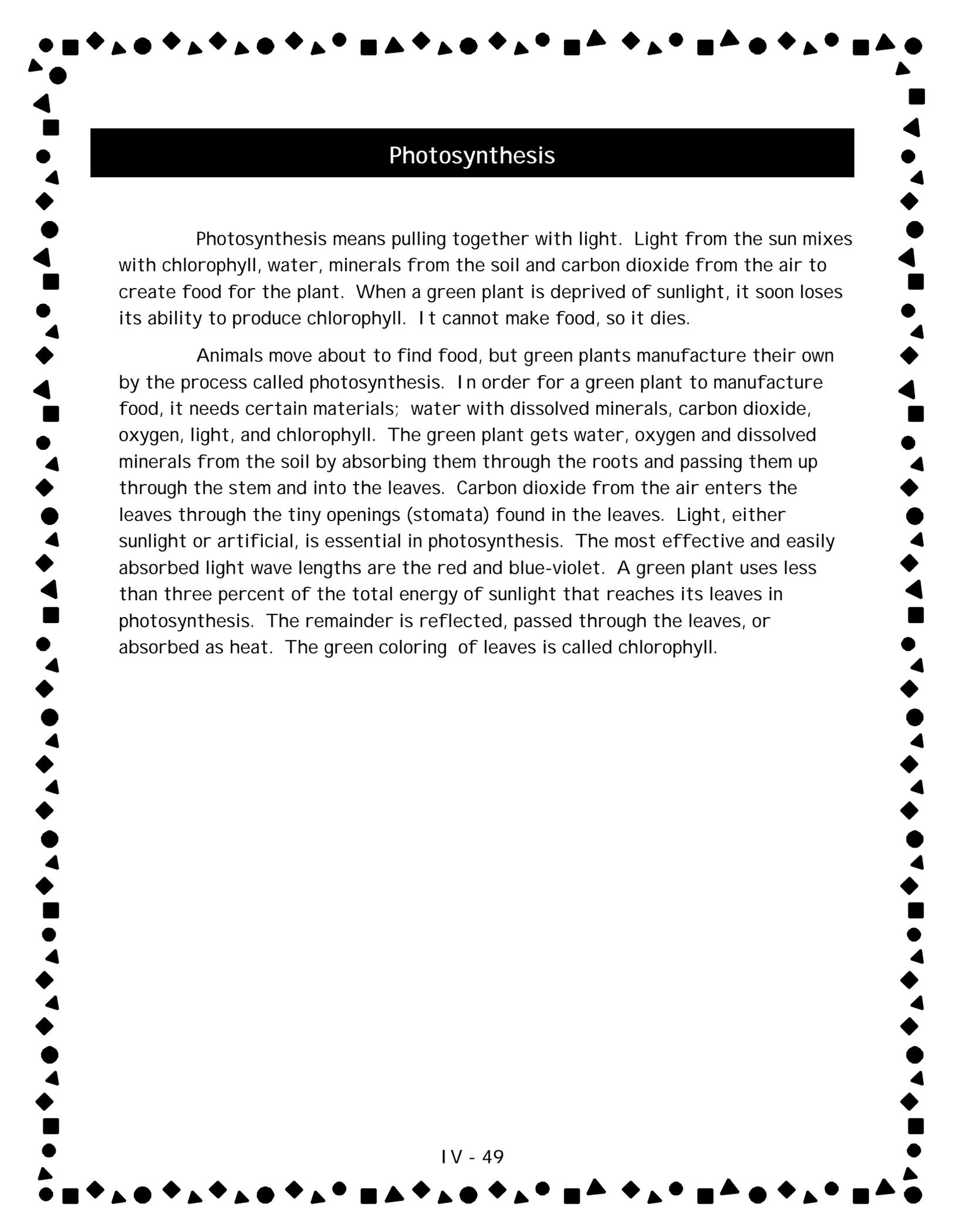
1. Cover just the top of several leaves of a plant with the petroleum jelly.
2. Cover just the bottom of several leaves.
3. Cover some leaves entirely with the jelly.
4. Let a few leaves remain uncovered.
5. Observe the change in the leaves after a few days.
6. This will show a cause/effect of the petroleum jelly on the leaves.
7. Answer the questions and report your conclusions to the class.

What happened to the leaves covered on the top?

What happened to the leaves covered on the bottom?

Which leaf changed the quickest and Why?

How does a plant get air?

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## Photosynthesis

Photosynthesis means pulling together with light. Light from the sun mixes with chlorophyll, water, minerals from the soil and carbon dioxide from the air to create food for the plant. When a green plant is deprived of sunlight, it soon loses its ability to produce chlorophyll. It cannot make food, so it dies.

Animals move about to find food, but green plants manufacture their own by the process called photosynthesis. In order for a green plant to manufacture food, it needs certain materials; water with dissolved minerals, carbon dioxide, oxygen, light, and chlorophyll. The green plant gets water, oxygen and dissolved minerals from the soil by absorbing them through the roots and passing them up through the stem and into the leaves. Carbon dioxide from the air enters the leaves through the tiny openings (stomata) found in the leaves. Light, either sunlight or artificial, is essential in photosynthesis. The most effective and easily absorbed light wave lengths are the red and blue-violet. A green plant uses less than three percent of the total energy of sunlight that reaches its leaves in photosynthesis. The remainder is reflected, passed through the leaves, or absorbed as heat. The green coloring of leaves is called chlorophyll.

## Investigation

# Do Plants Need Light ?

## The Amazing Plant Maze

**Objective:** The student will identify, observe, and record the function of light affecting plant growth.

**Material:** shoe boxes (4)  
cardboard squares  
potato (cut into pieces)  
small pots

**Procedure:**

1. Prepare the shoe boxes by inserting cardboard squares to form a maze.
2. Cut out a hole in one end of each box. Box #1 - 1/2" hole, Box #2 - 1" hole, Box #3 - 2" hole, Box #4 - 3" hole.
3. Cut a potato into pieces, making sure each piece has at least one "eye".
4. Plant the potato pieces in a small pot or cup, one potato piece per pot.
5. Place it in the opposite end of the box from the hole.
6. Close the lid securely and face the hole towards sunlight. You may need to cover the box with a cloth except for the end holes, to keep light from entering around the lid. It may take several weeks for the vine to grow through the maze. Keep it watered and only open to peek at its progress.
7. Keep track of the growth on the "Plant Maze Growth Chart" for 2-3 weeks after the potato sprouts. Use different color map colors to plot each plant's growth on the same chart.

# PLANT GROWTH CHART

12"									
11"									
10"									
9"									
8"									
7"									
6"									
5"									
4"									
3"									
2"									
1"									
DAY	2	4	6	8	10	12	14	16	18

## Investigation

### Roots Have to Breathe, Too!

**Objective:** Students will see that too much water or too little water is detrimental to plant growth.

**Material:** Three Potted plants of the same variety  
Aluminum trays or plates, one for each plant  
Watering can

**Procedure:**

1. Use three potted plants of the same variety and as close to the same size as possible. Label pots "NO WATER", "SOME WATER" and "OVER WATER".
2. Put an aluminum pan or tray under each pot and place them together in the same location, with the same light and temperature conditions.
3. Water each plant thoroughly the first day.
4. Beginning the second day water the "OVER WATER" plant until water runs through into the aluminum pan. Do this every day.
5. Do not water the "NO WATER" plant for the remainder of the investigation.
6. Water the "SOME WATER" plant every 4-5 days.
7. Observe the plants and record any changes. It may take several weeks for significant changes to occur. Keep a daily journal, describing the plants and their appearance, and any other significant observations.
8. Write a paragraph explaining your conclusions and report to the class.