



What is photosynthesis?

Plant Concepts: _____

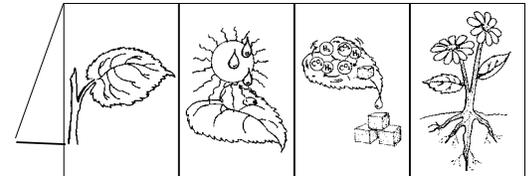
- All plants contain chlorophyll. Look at a green plant as you review these concepts.
- Chlorophyll gives the plant its green color.
- Most photosynthesis takes place in the leaves of the plant.
- Chlorophyll absorbs sunlight energy.
- The sunlight energy breaks down water into its two elements, hydrogen and oxygen.
- The plant releases oxygen into the air.
- The plant absorbs carbon dioxide from the air and mixes it with hydrogen to make glucose, or sugar.
- In addition to sugar, the plant makes other food substances that it either uses or stores for future use.
- The stored food is called sap.

Teacher's Note: An alternative assessment suggestion for this lesson is found on pages 78-79. If Graphic Pages are being consumed, photocopy assessment graphics needed first.

Vocabulary Words: green plant sugar sap absorbs hydrogen oxygen *carbon dioxide *chlorophyll *photosynthesis (foh toh SIN theh sis)

Read: *Lots of Science Library Book #2.*

Activities:



Photosynthesis – Graphic Organizer

Focus Skill: sequencing a process

Paper Handouts: 8.5"x11" sheet of paper a copy of Graphics 2A – D

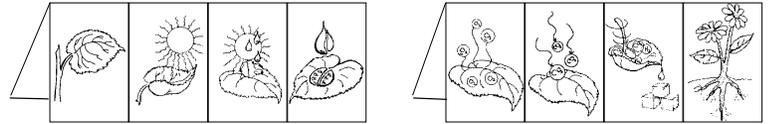
Graphic Organizer: Make a Small Question and Answer Book. Draw/glue the pictures in the correct order on the front tabs. Under the tabs, write/dictate clue words about the process of photosynthesis.

1. Plant leaves are green because of chlorophyll. (*plant, green*)
2. Plants need sunlight and water. (*sunlight, water*)
3. Plants use sunlight and water to make their food. (*make food*)
4. Plants move the food they make throughout their parts. (*move and use food*)

Paper Handouts: two 8.5"x11" sheets of paper a copy of Graphics 2A – H
a 12"x18" sheet of construction paper

Graphic Organizer: Make two Small Question and Answer Books. Draw/glue the pictures in the correct order to illustrate the process of photosynthesis. Make a Half Book from the 12"x18" paper. Glue the small Question and Answer Books inside the Half Book.

- ☞ Explain the process of photosynthesis by writing clue words or phrases under each tab. Orally explain the process using complete sentences.
- ☞ Research photosynthesis. Under each tab explain that step in the process. Explain how photosynthesis changes from day to night.



Investigative Loop – Chlorophyll in Plants – Lab 2-1

Focus Skill: drawing conclusions from observations

Lab Materials: a clear glass half full of rubbing alcohol a fresh leaf

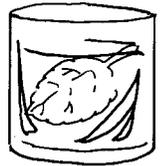
Paper Handouts: 8.5" x 11" sheet of paper a copy of Lab Graphic 2-1
Lab Record Cards (index cards or 1/4 sheets of paper)

Graphic Organizer: Make the Pocket Book. See page 2 for instructions. This is the student's Lab Book. In future Lessons, Pocket Books will be made and glued side-by-side to this one. Glue Lab Graphic 2-1 on the left pocket.

Concept: The chlorophyll that makes plants green can be extracted for observation.

Prediction: If chlorophyll is extracted from a leaf into alcohol, what color will it be?

Procedure: Place a freshly picked leaf in the glass of alcohol. (Note: Dip the leaf in boiling water before placing it in the alcohol to speed up the process.) Set a timer and check the leaf every hour for several hours. Check it the next day.



Observations: Observe the leaf before, during, and after placing it in the alcohol. How does the leaf change? How does the alcohol change?

Record the Data: On your Lab Record Cards, write Lab 2-1, the date, and leaf observations. Diagram the leaf and alcohol as they were before and after the experiment.

Conclusions: Draw conclusions from your observations.

Communicate the Conclusions: On a Lab Record Card, explain how your observations led to the conclusions. Place the Lab Record Cards in the Lab Book for Lab 2-1.

Spark Questions: Discuss questions sparked by this lab.

New Loop: Choose one question to investigate further,

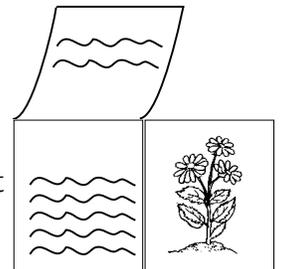
Or repeat the above procedure using leaves of different plants in new glasses of alcohol. Compare the color of the alcohol for each plant. Make a Lab Record Card for each plant.

Add to your Plant ID Book

Materials: Nature Guide Book

Paper Handouts: 8.5"x11" sheet of white paper student's Plant ID Book

Graphic Organizer: Make a Large Question and Answer Book. Glue it side-by-side to the Plant ID Book made in the previous lesson. Students select two plants to feature in their Plant ID Books. Draw one plant on each tab. Record the plant observations under the tabs. See Lesson 1 Activities section.



Experiences, Investigations, and Research

Select one or more of the following activities for individual or group enrichment projects. Allow your students to determine the format in which they would like to report, share, or graphically present what they have discovered. This should be a creative investigation that utilizes your students' strengths.



1. Write a word with plants. Find a good location for plants to grow, write a word in the dirt, and sprinkle carrot seeds in the small furrows. Cover the seeds with dirt and water. Check your word growth daily.



2. Chloroplasts are the tiny parts of the plant cell that contain chlorophyll. Research the structure of a plant cell. Focus on chloroplasts. Make a Half Book for this project. Draw a plant cell on the cover. Inside, illustrate the cell and label the parts. Describe each part and its function in the cell.



3. Read *The Tale of Peter Rabbit* by Beatrix Potter. \ \ \



4. Begin reading *My Side of the Mountain* by Jean Craighead George or *Swiss Family Robinson* by Johann David Wyss. \ \ \



Great Science Adventures



Lots of Science Library Books

Each *Lots of Science Library Book* is made up of 16 inside pages, plus a front and back cover. All the covers to the *Lots of Science Library Books* are located at the front of this section. The covers are followed by the inside pages of the books.

How to Photocopy the *Lots of Science Library Books*

As part of their *Great Science Adventures*, your students will create *Lots of Science Library Books*. The *Lots of Science Library Books* are provided as consumable pages which may be cut out of the *Great Science Adventures* book at the line on the top of each page. If, however, you wish to make photocopies for your students, you can do so by following the instructions below.

To photocopy the inside pages of the *Lots of Science Library Books*:

1. Note that there is a "Star" above the line at the top of each *LSLB* sheet.
2. Locate the *LSLB* sheet that has a Star on it above page 16. Position this sheet on the glass of your photocopier so the side of the sheet which contains page 16 is facing down, and the Star above page 16 is in the left corner closest to you. Photocopy the page.
3. Turn the *LSLB* sheet over so that the side of the *LSLB* sheet containing page 6 is now face down. Position the sheet so the Star above page 6 is again in the left corner closest to you.
4. Insert the previously photocopied paper into the copier again, inserting it face down, with the Star at the end of the sheet that enters the copier last. Photocopy the page.
5. Repeat steps 1 through 4, above, for each *LSLB* sheet.

To photocopy the covers of the *Lots of Science Library Books*:

1. Insert "Cover Sheet A" in the photocopier with a Star positioned in the left corner closest to you, facing down. Photocopy the page.
2. Turn "Cover Sheet A" over so that the side you just photocopied is now facing you. Position the sheet so the Star is again in the left corner closest to you, facing down.
3. Insert the previously photocopied paper into the copier again, inserting it face down, with the Star entering the copier last. Photocopy the page.
4. Repeat steps 1 through 3, above, for "Cover Sheets" B, C, D, E, and F.

Note: The owner of the book has permission to photocopy the *Lots of Science Library Book* pages and covers for his/her classroom use only.



How to assemble the *Lots of Science Library Books*

Once you have made the photocopies or removed the consumable pages from this book, you are ready to assemble your *Lots of Science Library Books*. To do so, follow these instructions:

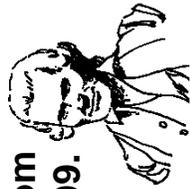
1. Cut each sheet, both covers and inside pages, on the solid lines.
2. Lay the inside pages on top of one another in this order: pages 2 and 15, pages 4 and 13, pages 6 and 11, pages 8 and 9.
3. Fold the stacked pages on the dotted line.
4. Turn the pages over so that pages 1 and 16 are on top.
5. Place the appropriate cover pages on the inside pages, with the front cover facing up.
6. Staple on the dotted line in two places.

You now have several completed *Lots of Science Library Books*.



WHO'S WHO

Jan Ingenhousz was a botanist from the Netherlands who first discovered some of the stages of photosynthesis. He lived from 1730 to 1799.



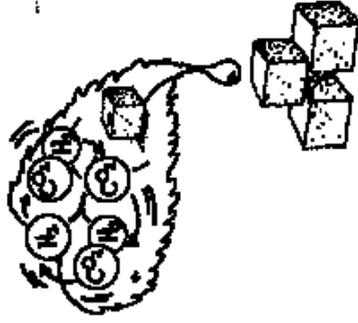
What do you do when you feel hungry?
What would you do if you could not move around to get your food or call for someone to bring you food?

This is the situation a plant finds itself in when it needs food.



Think about the factories that people use to manufacture things. They are usually big, noisy, and smell like smoke or chemicals. Plants are busy making food to feed the world, and they do it without a sound.

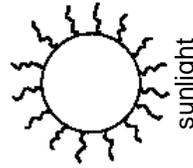
The plant mixes the hydrogen and carbon dioxide to make sugar and other food. This food is called sap.



Do you remember the things that all plants need to live and grow?



air (CO₂)



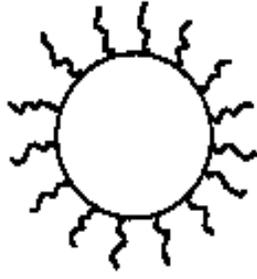
sunlight



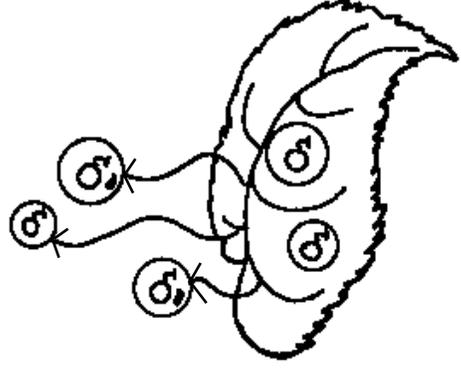
water

DID YOU KNOW?

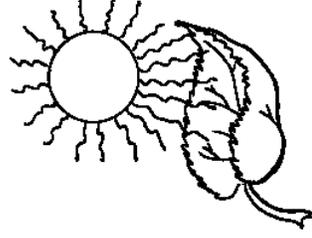
Photo means "light," and synthesis means "putting together."



The oxygen is released into the air by the plant.



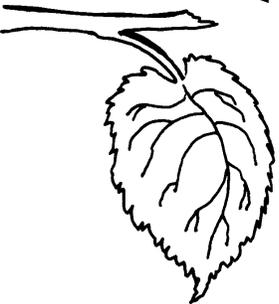
The chlorophyll captures, or absorbs, sunlight energy.



In most plants, chloroplasts are the tiny bodies in the plant cells that contain the chlorophyll.



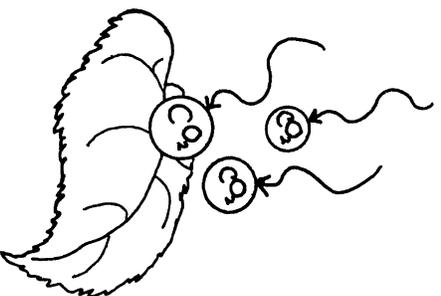
Most of the food is manufactured in the leaves of the plant. Here's how the factory works:



Plants have chlorophyll in the cells of their leaves.

6 Lots of Science Library Book #2

The plant takes in carbon dioxide from the air.



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Plants have a unique way of getting food. They make it themselves.

All plants, from the tiny weed in your driveway to the giant saguaro, make their own food.

2 Lots of Science Library Book #2

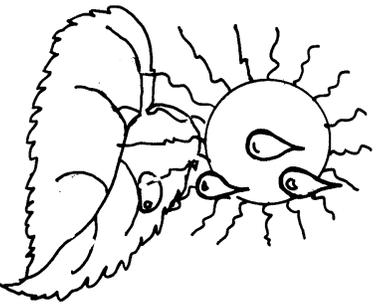
All people and animals live by either eating plants or eating animals that eat plants.



Plants are the first element of every food chain on the earth. Can you think of a few examples of food chains?

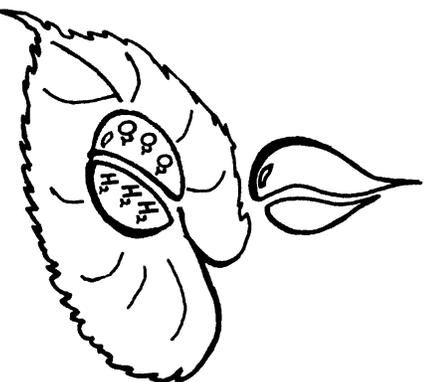
15

The plant mixes the sunlight energy with water.



8 Lots of Science Library Book #2

The sunlight energy splits the water into hydrogen and oxygen.



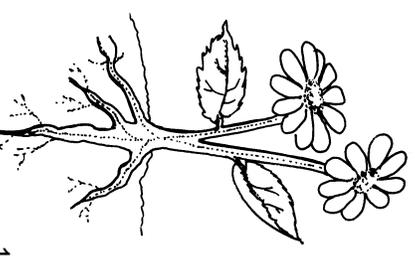
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Plants use these three ingredients to manufacture the food they need to live and grow.

This process of food manufacturing is called photosynthesis.

4 Lots of Science Library Book #2

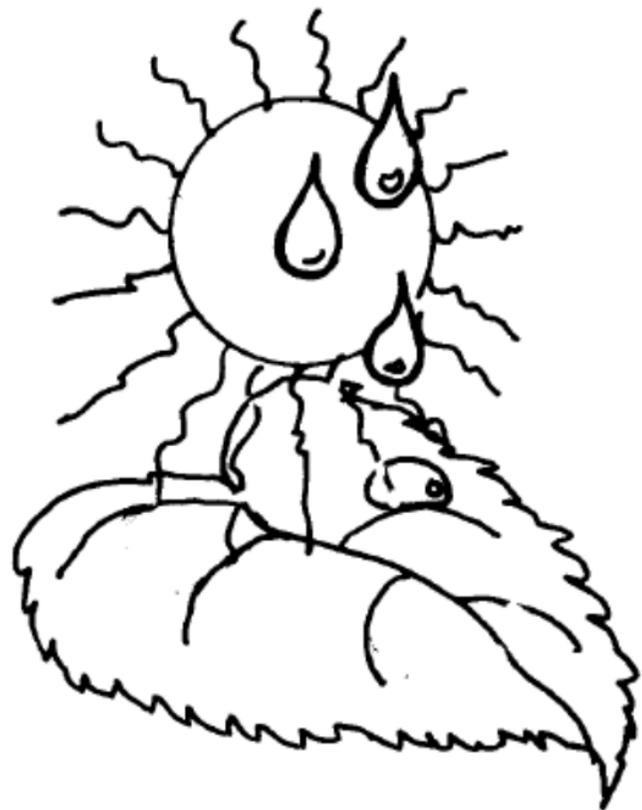
The plant moves the sap throughout its parts to use or store for later use.



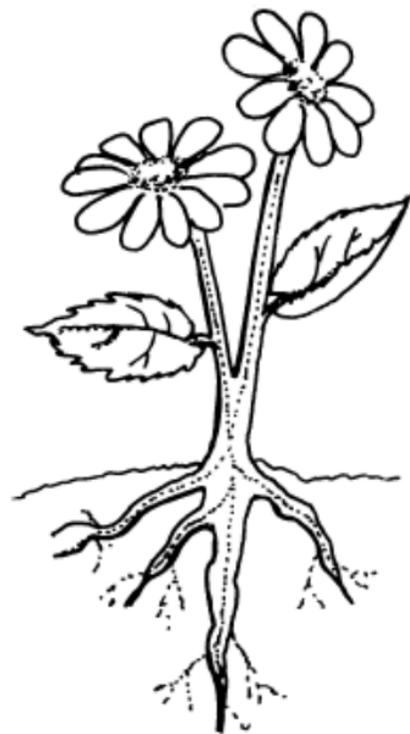
13

Photosynthesis

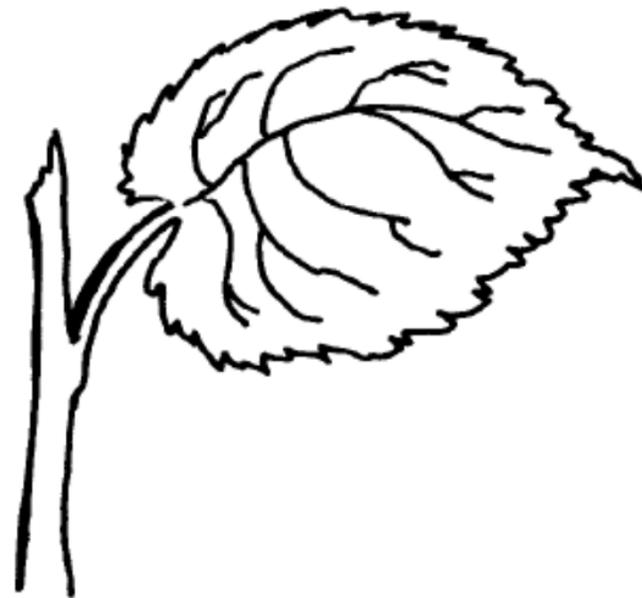
2-A



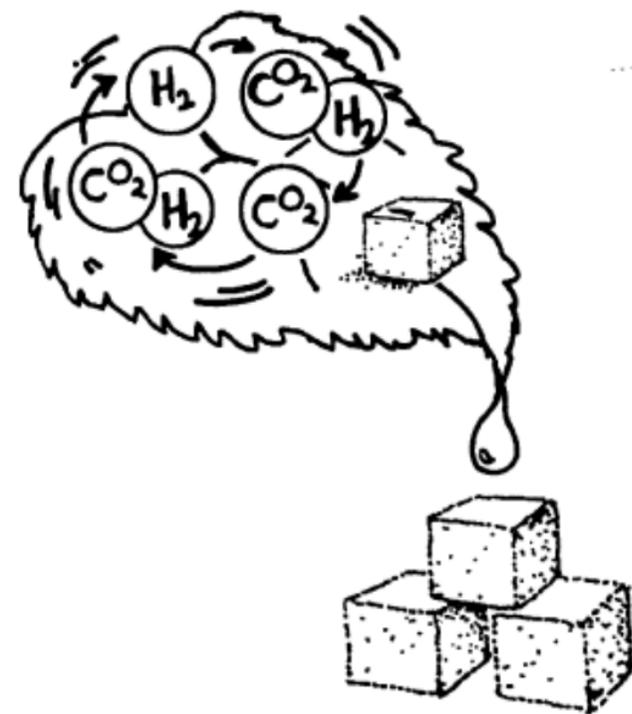
2-B



2-C



2-D

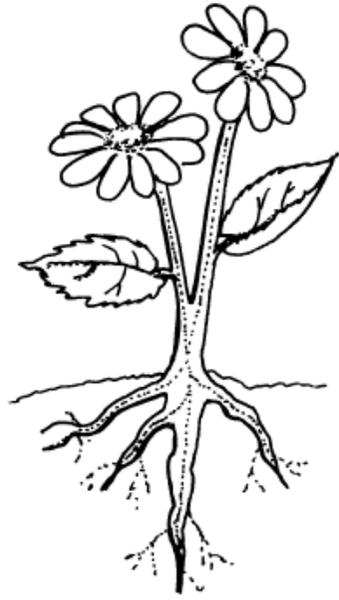


Photosynthesis

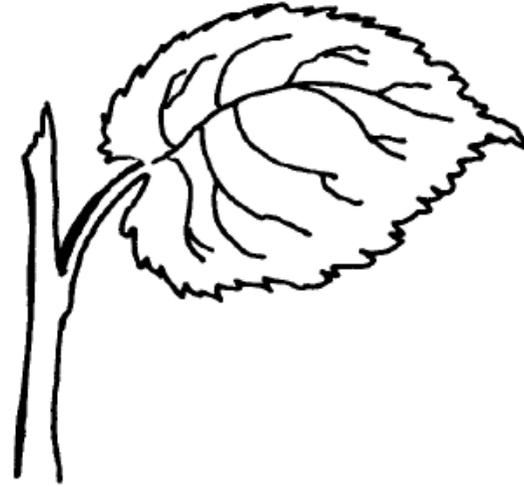
2-A



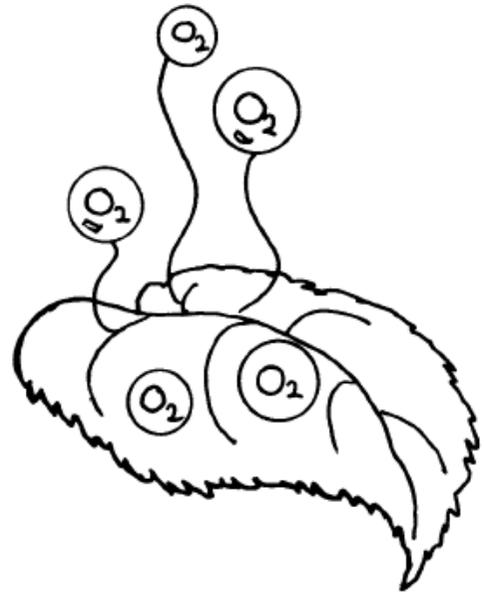
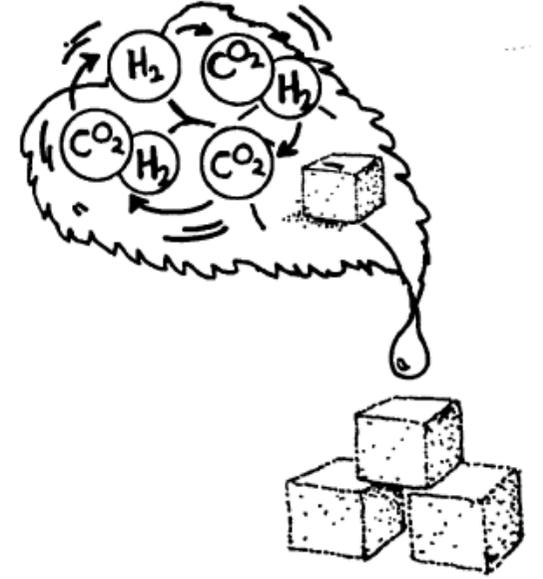
2-B



2-C



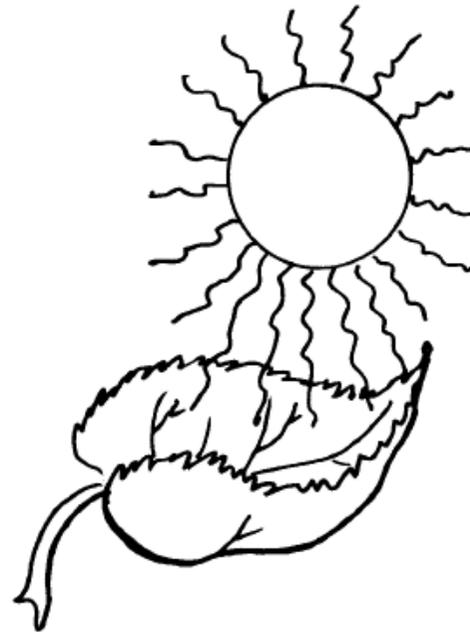
2-D



2-E



2-F



2-G



2-H

Chlorophyll in Plants Lab 2-1



Lab 2-1