



Table of Contents

Introduction	i
How to Use This Program	iii
1. What is a plant?	10
2. What is photosynthesis?	12
3. What are respiration and transpiration in plants?	16
4. How do plants respond to the world around them?	20
5. How do plants reproduce?	24
6. What are the different types of plants?	28
7. What are bryophytes?	30
8. How do bryophytes reproduce?	32
9. What are ferns and how do they reproduce?	34
10. What are gymnosperms?	38
11. What is a conifer?	40
12. What is an angiosperm?	44
13. How does an angiosperm develop and grow?	46
14. What are the two types of seeds?	48
15. What are roots and what do they do?	50
16. What are stems and what do they do?	52
17. What are leaves and what do they do?	54
18. What are flowers and what do they do?	58
19. What is pollination?	62
20. What is a fruit?	64
21. What are deciduous trees?	68
22. What do tree trunks and roots do?	70
23. What are trees rings and what do they tell us?	72
24. Why do deciduous leaves change color?	74
Above and Beyond	77
Assessment	78
<i>Lots of Science Library Books</i>	81
Graphic Pages and Lab Log	143



What is a plant?

Plant Concepts:

- All plants need water, sunlight, and air to live and grow.
- All plants grow throughout their lives.
- All plants reproduce plants of their own kind.
- All plants are eukaryotes, or contain more than one cell.
- Most plants are rooted in one location their entire lives unless someone or something moves them.

Vocabulary Words: rooted air sunshine live plant cell
grow *reproduce *eukaryotes (u KAIR ih otes) *biome (BY ome)



Read: *Lots of Science Library Book #1.*

Activities:

Investigative Loop – Watch a Plant Grow

Focus Skill: quantitative observations

Lab Materials: 2-3 bean seeds paper towels ruler clear jar filled with soil

Paper Handouts: 2 sheets of 8.5"x11" paper a 12"x18" sheet of construction paper

Graphic Organizer: Make two Small Question and Answer Books out of 8.5"x11" sheets of paper. Make a Half Book out of a 12"x18" sheet of paper. Glue the Small Question and Answer Books inside the Half Book.

Concepts: Plants use water, soil, air and light to grow. Plant growth can be measured.

Procedure: Sprout seeds between wet paper towels. Plant sprouts around the inside edges of the jar. Keep the soil moist and warm. Place the jar to receive indirect sunlight.

Observations: Choose one seedling to observe and measure as it grows for eight days. Mark your Lab Log for eight days.

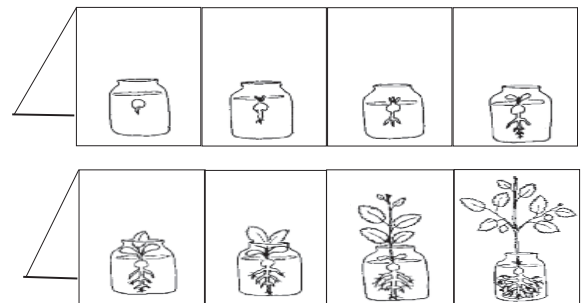
Record the Data: Label the front tabs of the Small Question and Answer Books with Day 1: date, Day 2: date, etc. at the bottom. Each day, sketch the plant on the outside tab and label the parts. Under the tab, record the plant growth in standard measurements.

Conclusions: Draw conclusions about the needs of a plant and the progress of its growth.

Communicate the Conclusions: On the back of the Half Book, write a narrative of the life of the bean plant.

Spark Questions: Discuss questions sparked by this lab.

New Loop: Choose one question to investigate further through research, observations or Investigative Loop.










Common Characteristics of Plants - Graphic Organizer

Focus Skill: obtaining information

Paper Handouts: 8.5"x11" sheet of paper
a copy of Graphics Page 1

Graphic Organizer: Make a Half Book.

-  Write/copy *Plants* on the cover. Inside, draw/glue the pictures from Graphics Page 1. Write/dictate clue words about each picture. Examples: *sunlight, air, water, many cells, young plants, rooted*. Orally explain each picture using a complete sentence.
-   Begin the same as  students. Write two sentences that describe the common characteristics of plants.
-    Create a title and cover for the Half Book. Inside, summarize information about the common characteristics of plants.



Identify Plants - Plant ID Book









Materials: Nature Guide Book

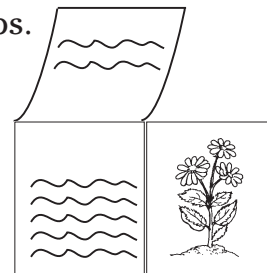
Paper Handouts: 8.5"x 11" sheet of white paper

Graphic Organizer: Make a Large Question and Answer Book. See page 2 for instructions.

This book is used in this and future lessons. As new Large Question and Answer Books are made in future lessons they will be glued "side-by-side" to this book.

Procedure: Go on a nature walk. Guide students in plant observation and aid in identification. Students select two plants to feature in their Plant ID Books. Draw one plant on each tab. Record the plant observations under the tabs.

-  Copy the name of the plant and draw a picture of the location where it was found.
-   Copy the name of the plant, using the scientific name if possible. Record the following data: date, weather conditions, and location where it was found.
-    Complete  . Hypothesize as to why each was found growing in this location.



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. Take responsibility for the care of an indoor plant. What must be done to meet its basic needs? Compare and contrast this plant to an outdoor plant.



2. Research an unusual plant. Suggestions: Venus flytrap, butterwort, pitcher plant, or sundew. Share this information with three people in a 24 hour period.



3. Most states and countries use flowers and trees as symbols. Investigate the symbols that represent your area and a location you would like to visit.



4. The olive branch is a symbol for peace; find out why.





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

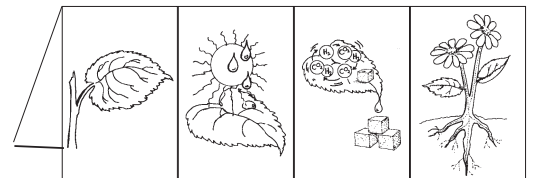
Graphic Organizer: Make a Small Question and Answer Book. Draw/glue the pictures in the correct order on the front tabs. Under the tabs, write/dictate clue words about the process of photosynthesis.



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*)

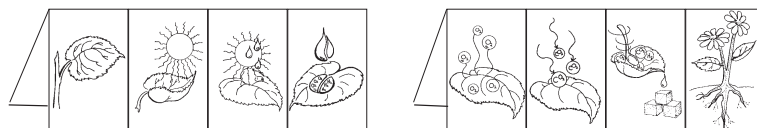


Paper Handouts: two 8.5"x11" sheets of paper a copy of Graphics 2A – H
a 12"x18" sheet of construction paper

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.

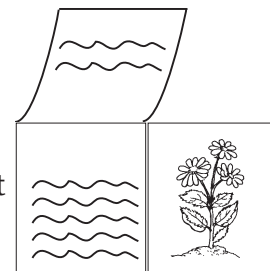
New Loop: Choose one question to investigate further,
Or repeat the above procedure using leaves of different plants in new glasses of alcohol.
Compare the color of the alcohol for each plant. Make a Lab Record Card for each plant.

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.   



5. Using an Internet Search Engine, research photosynthesis.

Notes





What are respiration and transpiration in plants?

Plant Concepts:

- The respiration cycle is the process of breaking down food molecules into gases, water, and energy.
- Plants take in carbon dioxide and give off oxygen in this process.
- Since all animals inhale oxygen and exhale carbon dioxide, the respiration cycle of plants is essential to all other life.
- During the transpiration cycle, water is released through pores on the underside of leaves.

Vocabulary Words: inhale exhale oxygen *carbon dioxide *respiration
*transpiration *stomata (STO muh tuh)

Read: *Lots of Science Library Book #3.*

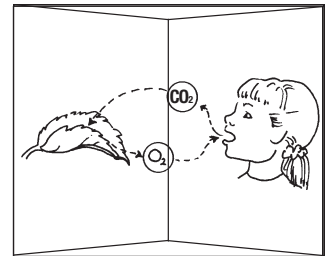
Activities:

The Respiration Cycle - Graphic Organizer

Focus Skill: cause and effect

Paper Handouts: 4.25"x11" sheet of paper a copy of Graphics Page 3

Graphic Organizer: Make a Shutter Fold Book. Cut Graphic 3A in half and glue one half on each shutter, as shown.



- ✍ Write/dictate clue words about the respiration cycle.
Example: under the leaf shutter - *gives off oxygen, takes in carbon dioxide*
under the girl shutter - *breathes in oxygen, breathes out carbon dioxide*
Orally explain the process using complete sentences.
- ✍✍ Complete ✍. Under the clue words, write sentences explaining each part of the respiration cycle. On the inside middle section, draw the respiration cycle of an animal in its native habitat.
- ✍✍✍ On the back of each shutter, explain the steps of the respiration cycle. On the inside middle section, compare and contrast respiration and photosynthesis. On the back, explain why the tropical rain forests are called the "lungs of the earth." Defend your statements with facts about the rain forests.

Investigative Loop – Leaves Give Off Oxygen – Lab 3-1

Focus Skill: diagramming

Lab Materials: clear glass

Paper Handouts: Lab Book

newly cut leaf

new Lab Record Cards

magnifying glass

a copy of Lab Graphic 3-1

Graphic Organizer: Glue Lab Graphic 3-1 on the right pocket of the Lab Book.

Concept: Leaves release oxygen.

Research: Read the *Lots of Science Library Book #3*. Review how leaves release oxygen.

Predictions: Predict where you will find oxygen being released from the leaf.

Procedure: Put the leaf in a clear glass of water. Place the glass in indirect sunlight.

In four hours, examine the leaf with a magnifying glass.

Observations: Describe the leaf using qualitative observations before, during, and after the lab.

See *How to Use This Program, Investigative Loop* for more information.

Record the Data: On a Lab Record Card, record Lab 3-1, the date, and observations. Sketch the leaf and describe it qualitatively.

Conclusions: Draw conclusions about what you observed in the leaf based on your knowledge of photosynthesis and respiration. **Possible answer: The oxygen bubbles on the leaf and in the water were released by the leaf.**

Communicate the Conclusions: On another Lab Record Card, write your conclusions. Include a sketch of the leaf after one hour in the water. Put the Lab Record Cards in the Lab Pocket for Lab 3-1.

Spark Questions: Discuss questions sparked by this lab.

New Loop: Choose one question to investigate further.

Or complete the procedure above except put the glass in a dark location. After the observations and conclusions are made, compare and contrast them with the previous lab.

Note: There should be fewer or no bubbles as the lack of sunshine slows down the photosynthesis process thus slowing down the release of oxygen.



Investigative Loop – Leaves Transpire - Lab 3-2

Focus Skill: questioning

Lab Materials: a plastic reclosable bag newly cut leaf magnifying glass

Paper Handouts: 8.5"x11" sheet of paper a copy of Lab Graphic 3-2
Lab Book new Lab Record Cards



Graphic Organizer: Make a Pocket Book and glue it side-by-side to the students' Lab Book.

Glue Lab Graphic 3-2 to the left pocket of the new Pocket Book.

Question: How do leaves release water?

Research: Review the *Lots of Science Library Book #3* and review the question.

Predictions: Predict if and where water from this leaf will be released. Write your prediction on a Lab Record Card labeled Lab 3-2.

Procedure: Place a newly cut leaf in a plastic reclosable bag. Examine the leaf with a magnifying glass in three hours.

Observations: Make qualitative observations of the leaf. See *How to Use This Program, Investigative Loop* for more information.

Record the Data: On a Lab Record Card, record Lab 3-2 and the date. Enter the time and a brief description of each observation. Draw the leaf at the final observation time.

Conclusions: Explain why the leaf looked as it did after three hours. Draw conclusions about the release of water by leaves. **Note: The moisture on the underside of the leaf indicates it is releasing water through transpiration.**

Communicate the Conclusions: On a Lab Record Card, compare your observations and conclusions with your predictions. Share your Lab Record Cards with one person who did not participate in the Lab. Store them in the Lab Book for Lab 3-2.

Spark Questions: Discuss questions sparked by this lab.

New Loop: Choose one question and investigate it further.



Plants in Different Environments - Research Project

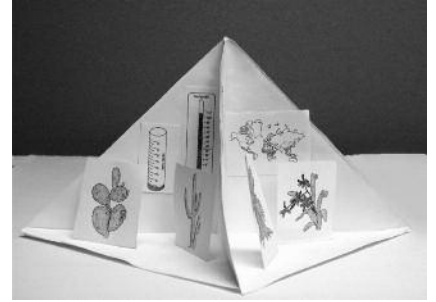
Choose a Topic: Select two or all four of the following biomes: tundra, grasslands, rain forest, desert.

Conduct research, document your findings, and report on the following:

Average annual temperature, average annual precipitation, effect of geographic locations, common native plants, and interesting facts about the vegetation in general.

Paper Handouts: One sheet of 12" x 18" construction paper for each biome researched
a copy of these Graphics for each biome: world map, rain gauge, thermometer, plants for that biome, index cards, a copy of the world map in the Graphics Pages.

Graphic Organizer: Make a Pyramid Project diorama for each biome researched. Record annual temperatures and rainfall on the graphics, and color the small world maps to indicate geographic locations of each biome. Glue these inside the biome dioramas. Select appropriate plants to glue in the foreground. Glue your pyramid dioramas together to make a 2 or 4 part display. Write additional information on index cards to display on the table around the diorama. Compare and contrast the environments. Share what you have learned with others.



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. Design an Investigative Loop to answer this question: How much water is lost by leaves in 24 hours? Example: After sunset, tie a clear plastic bag over a cluster of leaves on a living shrub. At the end of 24 hours, remove the bag and describe the amount of water.



2. Investigate the flora and fauna of the tropical rain forest and how they affect one another.



3. Discover which rain forest plants are used for commercial products.



4. Discover which rain forest plants are used for medical purposes.



5. Predict what would happen if the rain forests were cut down.



6. Read *The Great Kapok Tree: A Tale of the Amazon Rain Forest* by Lynne Cherry.

