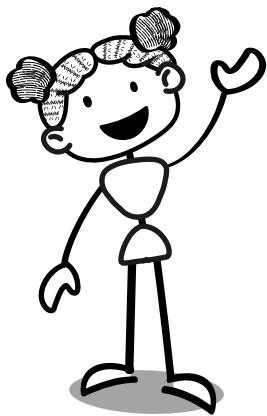


Discover!

A

LIFE SCIENCE





Discover! Life Science A

Published in Catasauqua, Pennsylvania by Edovate Learning Corp.

334 2nd Street

Catasauqua, PA 18032

edovate.com

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ISBN: 978-1-960937-93-3

Printed in United States of America

2nd Edition

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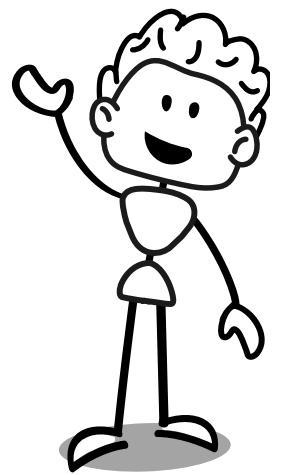


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Student & Instructor Books

Worktext

- The carefully preselected scope and sequence integrates an engaging storyline with direct instruction, practice, application, and extension activities.
- The curriculum provides direct instruction and assessment opportunities that allow the student to gain knowledge, reflect on it, and apply it.
- The curriculum correlates to national standards and integrates a variety of learning preferences (styles) to meet the unique needs of the student.
- The worktext is organized and divided into units and chapters. Each unit ends with a review and an assessment to help the student recall learned knowledge.

Instructor Guide

- The instructor guide is specifically structured to complement the worktext and lab book.
- The instructor guide provides suggestions for the instructor to facilitate, support, and extend their student's learning.
- Instruction and curriculum are differentiated with remediation, enrichment, assessment, and supporting activities suitable for a variety of learning styles.
- Answer keys for all activities are provided.
- The back of the instructor guide provides full support for all lab activities and is organized to mirror the lab book's table of contents.

Lab Book

- The lab book, when used alongside the worktext, serves as a dynamic tool to enhance student understanding of scientific principles and processes.
- Each unit has at least one lab experience. Each lab has five sections.
 - **Start!:** This section introduces the lab content and establishes a clear connection between unit content and lab application.
 - **Spark:** In this section, the student engages with the lab by making predictions and researching pre-experiment questions.
 - **Search:** In this section, the student completes the steps outlined to engage with the experiment. The section emphasizes recording observations and making critical notes.
 - **Synthesize:** In this section, the student takes the data collected during the experiment to report findings, make inferences, and/or suggest further research.
 - **Stretch:** This section invites the student to take their experiments further.

Assessment Booklet

- Traditional unit assessments and performance assessments are provided in the assessment booklet. A copy of each traditional unit assessment and performance assessment is also provided in the instructor guide along with the answer key and rubric.
- Each unit assessment has two assessment options.
 - **Traditional unit assessment:** This is a traditional assessment (multiple-choice) with an answer key.
 - **Performance assessment:** This is a performance-based option with a rubric.



Planning & Chapter Organization

Planning

- Each course is designed to cover approximately 160 days of instruction, with each chapter taking roughly 2 days to complete. This does not include time spent on the enrichment activities provided in the worktext sidebars and the instructor guide. These materials allow the instructor to customize the learning experience and encourage the student to dive deeper.
- It is recommended the student completes the **Explore** and **Read** pages on the first day and the **Practice** and **Show What You Know** pages on the second day.
- It is recommended that the student complete the unit lab(s) contained in the lab book PRIOR to the completion of the unit reviews/assessment chapter. The student should be able to complete a lab in one day (or do half of the lab on one day, and half on another day). Because of the nature of experiments, some labs may require the student to engage with the procedures over several days. Please be sure to read through the unit lab experiments in advance to adequately plan for each unit's calendar of activities.
- For unit review/assessment chapters, it is recommended the student completes the **Review** pages and the first **Practice** page on the first day and the remaining **Practice** pages on the second day.

Chapter Organization

Chapter Overview

- The overview sets the student up for success with the chapter goals and objectives. The overview also facilitates the student's learning by identifying chapters they may need to review, highlighting relevant academic vocabulary, providing an optional extension activity and a BIG question that helps drive inquiry.

Explore

- The Explore section provides the student with an opportunity to discover new concepts within a real-world narrative.

Direct Instruction

- Direct instruction provides the student with the opportunity to read the content, write about it, and apply the concepts.
 - **Read:** Here, the student reads informational text to gain knowledge about the chapter topic.
 - **Write:** Here, the student reflects on what they have read by generating a written response.
 - **Apply:** Here, the student practices what they have learned using various activities such as graphic organizers, matching, drawing, experiments, and other hands-on activities.
 - **Practice:** Here, the student practices the objectives before moving on to the chapter assessment.

Show What You Know

- This assessment is carefully crafted to align with the chapter's objectives while providing the student an opportunity to demonstrate their knowledge of the material.

Extension Activities

- **Create:** These activities require the student to construct something. Examples may include a drawing, song, poem, model, etc.
- **Online Connection:** These activities require the student to use technology-based solutions to research and investigate concepts related to the chapter or create artifacts demonstrating their understanding.
- **Closer Look:** These activities require the student to make observations about the world around them, allowing them to generate predictions, inferences, or conclusions based on those observations.
- **Mini-Lab:** These activities require the student to engage in quick experiments to apply relevant scientific concepts while utilizing common household materials.
- **In Focus:** These activities require the student to apply one element of the engineering design process to an activity relevant to the chapter's content.

Chapter 30

Water Cycles and Plants

By the end of this chapter, you will be able to:

- describe how plants contribute to the water cycle through processes like transpiration and absorption
- explain how plants not only benefit from the water cycle but also play an active role in maintaining it

Chapter Review

If you need to review nutrient cycles, please go to the chapter titled “Nutrient Cycles and Plants.”

Academic Vocabulary

Read the following vocabulary words and definitions. Look through the chapter. Can you find each vocabulary word? Underline the vocabulary word in your chapter and write the page number where you found each word on the blanks here.

- **capillary action:** the ability of a liquid to flow in narrow spaces without the help of gravity (p. ____)
- **condensation:** the conversion of a substance (such as water) from the vapor state to a denser liquid or solid state, usually initiated by a reduction in the temperature of the vapor (p. ____)
- **evaporation:** the process of changing from a liquid to a vapor (p. ____)
- **groundwater:** water underground in the cracks and spaces in the soil and rock (p. ____)
- **percolation:** the process of liquid slowly passing through soil (p. ____)
- **precipitation:** any form of water that falls from the atmosphere and reaches Earth’s surface (p. ____)
- **stomata:** openings on the undersides of leaves where gases are exchanged (p. ____)
- **transpiration:** the passage of water vapor from a living body (as of a plant) through a membrane or pores (p. ____)
- **water cycle:** the sequence of conditions through which water passes from vapor in the atmosphere through precipitation upon land or water surfaces and ultimately back into the atmosphere as a result of evaporation and transpiration (p. ____)

Materials Needed

- food coloring
- glasses
- markers
- paper towel
- plastic cups
- water
- white flower

THE BIG QUESTION

How are plants part of the water cycle?

EXPLORE

While checking out some of the water lilies living atop the pond, you notice the sun move behind a cloud. When you look up, you see dark rain clouds rolling in. It is certainly going to rain soon! You quickly move to the nearest pavilion just as the raindrops begin to fall. You wonder: What makes it rain?

You look out at the botanical garden as the rain falls. You can see all the ripples in the pond, and all the flowers and trees begin to droop from the weight of each raindrop. You notice the soil getting wet, first turning darker, then becoming muddy. You also see that you are not the only one taking shelter from the rain under this pavilion! Several other visitors of the garden, as well as Ben, are taking refuge under the pavilion. Ben shares with you that he is glad it's raining. The workers water the plants and flowers when there are dry periods, but there is nothing like a nice rain to replenish the soil. Ben explains, "We can grow so many plants here because we have good average rainfall. I went to a garden in Arizona where they only had cacti, succulents, and a few hardy trees. It was fascinating, but they couldn't grow all the different things we grow here."

You know that rain is part of the water cycle and that plants need water, but how do plants fit into the water cycle? What role do plants play? Time to find out!



Botanical Garden

CLOSER LOOK

Plant Roots

If a plant uses its roots to get the water that it needs, how does the rest of the plant get water? Explain your answer to your instructor.

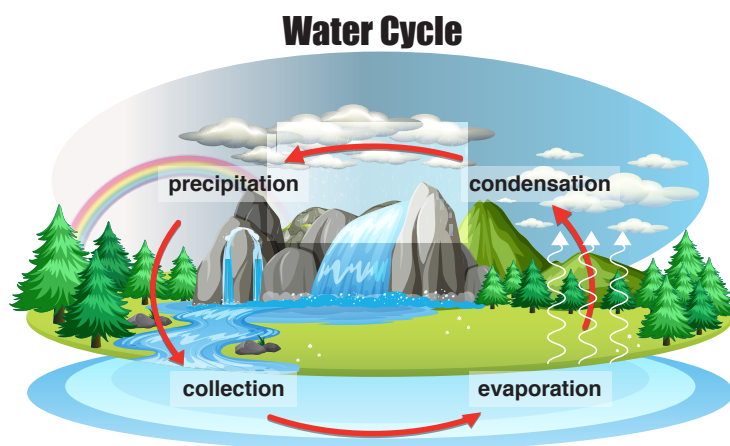


Roots

The Water Cycle

Ben tells you that the rain forcing you under the pavilion at the botanical garden is the same water Earth has always had. It never disappears—it just changes form and moves from place to place. Liquid water from the ground, lakes, streams, or seas is warmed by the sun and changes from liquid to vapor during **evaporation**. The gas, or water vapor, rises until it hits cool air where it forms clouds. **Condensation** is the conversion of a substance (such as water) from the vapor state to a denser liquid or solid state, usually initiated by a reduction in the temperature of the vapor. The water returns to the ground and ocean as **precipitation**, or any form of water that falls from the atmosphere and reaches Earth's surface. Precipitation collects in the ground or runs off to join the system of waterways that leads to the oceans. The **water cycle** is the sequence of conditions through which water passes from vapor in the atmosphere through precipitation upon land or water surfaces and ultimately back into the atmosphere as a result of evaporation and transpiration.

Water is necessary for plant life and is a main ingredient for photosynthesis. Plants need water to make food and energy to survive. Water also keeps plants cool before it is released back into the air as water vapor.



The water cycle circulates water through Earth's systems, vital for life.

WRITE

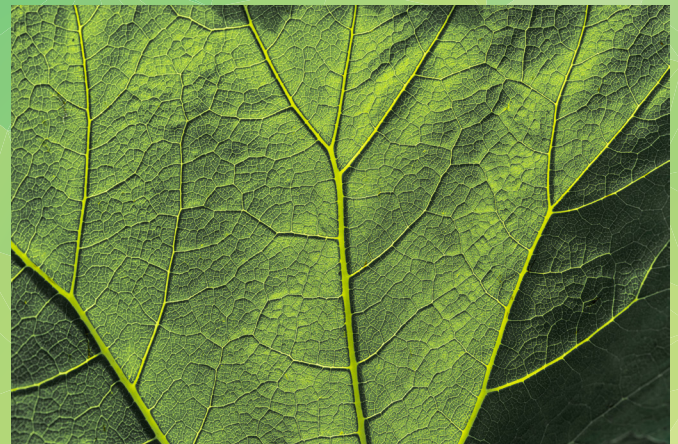
Short Answer

In your own words, explain how plants benefit from the water cycle.

IN FOCUS

Build a Prototype

Suppose you wanted to teach a friend or family member about the capillary transport system within plants. How can you help your "students" visualize this system? Build a prototype! Create a prototype of the inside capillary system within a plant. What materials should you use? What would work best? Why?



Plant capillary systems transport water throughout the plant.

Transpiration and Absorption

Plants play an active role in the water cycle. When water falls on land, it can flow as runoff along the ground's surface. It can also flow into the soil as groundwater. **Groundwater** is underground water in the cracks and spaces in the soil and rock. In fact, water can be captured in the soil where plant roots absorb it. This process is called **percolation**, which is when liquid slowly passes through the soil. Water was percolating into the soil when you saw the ground at the botanical garden turn dark and then get muddy.

Plants have an intricate transport system that allows them to move nutrients and water from the soil into their roots and then upward through the stem to the rest of the plant. This process is called absorption. Absorption is done using **capillary action**, which is the ability of a liquid to flow in narrow spaces without the help of gravity. Absorption is an essential part of the water cycle because it allows the water to travel back into the atmosphere.

Plants take in water to start photosynthesis, but excess water is also produced during photosynthesis. The excess water is removed by **transpiration**, the passage of water vapor from a living body through a membrane or pores. When a plant transpires, the water vapor leaves the plants through the **stomata**, which are openings on the undersides of leaves where gases are exchanged.

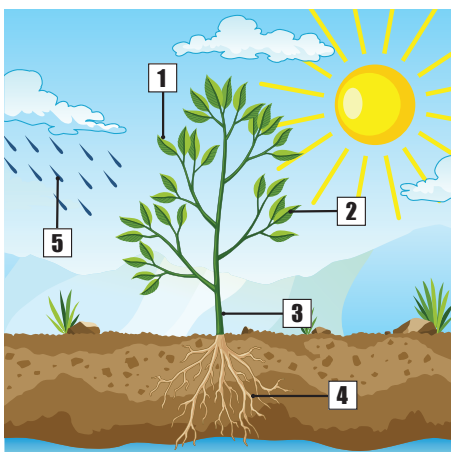
APPLY

Label It!

Label the image using terms from the Word Bank.

Word Bank: stomata capillary action
transpiration absorption precipitation

1. _____
2. _____
3. _____
4. _____
5. _____



MINI-LAB

Capillary Action

See how capillary action works!

Materials: white flower with a stem, food coloring, water, cup

Directions:

1. Fill a cup halfway with water.
2. Trim the flower to fit in the cup.
3. Add 10 drops of food coloring to the water.
4. Place the flower in the cup.
5. Record your observations.

Pull out your Lab Book and record your answers and reflections in the space provided for the Mini-Lab or make the appropriate notes in a regular notebook and share with your instructor.

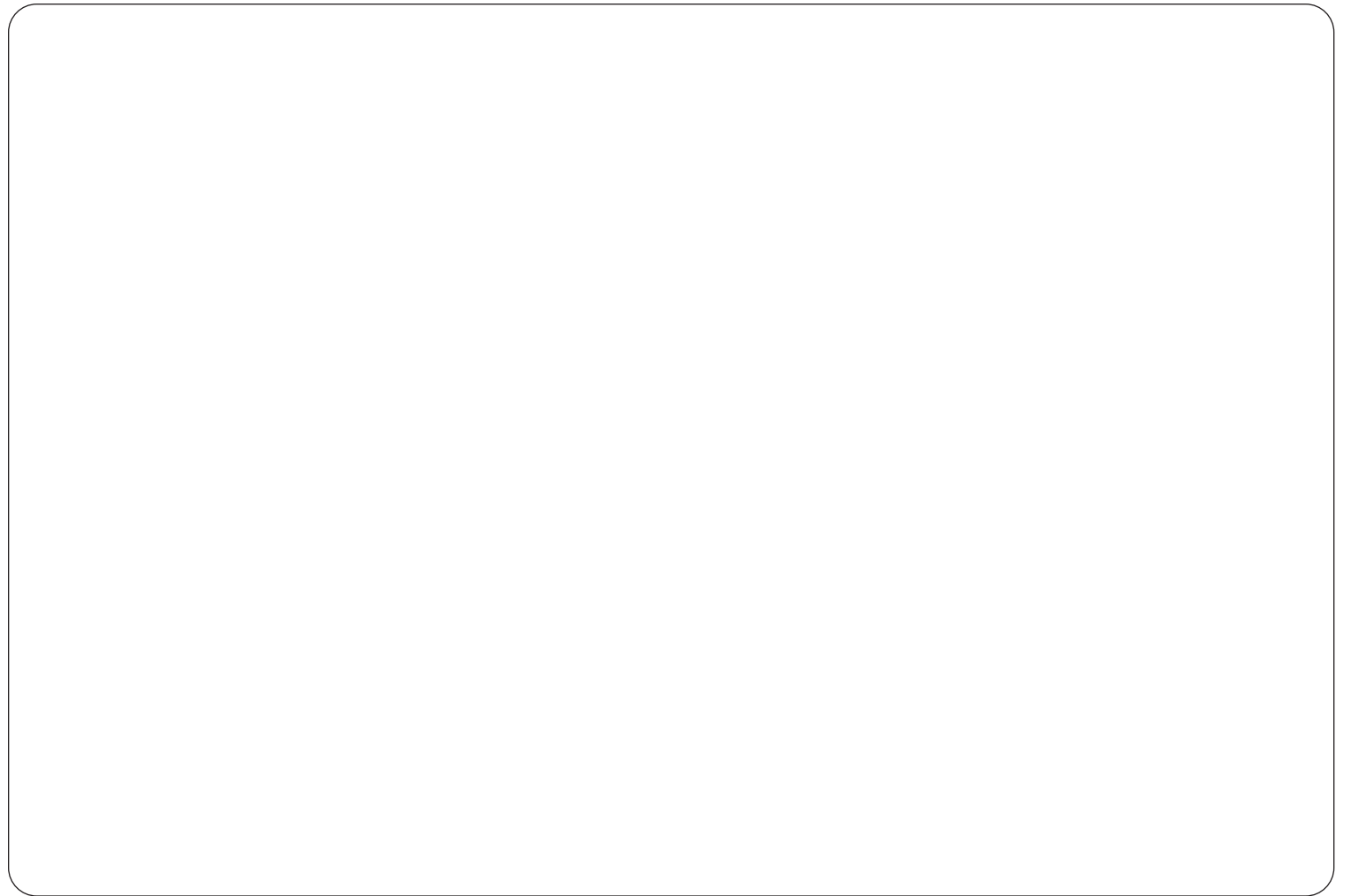


Color Experiment

PRACTICE

Draw It!

Use the drawing box to draw a picture of how absorption, capillary action, and transpiration work. Be sure to label what is happening with arrows. Show the direction of water flow in your drawing.



REVIEW

In this chapter, you learned:

- Plants play a large role in the water cycle.
- Plants take in water from the soil through absorption and release water vapor into the atmosphere through transpiration.
- Plants benefit from the water cycle because they need water to carry out photosynthesis for survival.

Can you answer The Big Question?

How are plants part of the water cycle?

SHOW WHAT YOU KNOW

Choose the correct answer for each question.

1. What is the name of the process when water vapor is released through the stomata?
A. transpiration
B. absorption
C. capillary action
D. photosynthesis
2. Water is moved from the roots to the leaves by _____.
A. transpiration
B. absorption
C. capillary action
D. precipitation
3. To get to the roots of a plant, precipitation must _____ through the soil.
A. percolate
B. capillate
C. participate
D. perspire

Read each sentence. Circle True or False.

- | | |
|------------------|---|
| 4. True or False | Plants evaporate as liquid water. |
| 5. True or False | Percolation occurs during transpiration. |
| 6. True or False | Plants get rid of water and oxygen through the stomata. |

Answer the following questions.

7. Explain how plants play an active role in the water cycle.

8. Explain how plants benefit from the water cycle.

CREATE

Grow a Rainbow

Grow a rainbow using the power of capillary action!

1. Using washable markers, color a block of each color of the rainbow on each end of a paper towel (about two inches long).
2. Fill two glasses half full with water.
3. Place the two glasses next to each other.
4. Place each end of the paper towel in each glass of water so that the colors just barely touch the water (you may need to reposition the glasses for this part).

What happened? Why did it happen? Explain it to your instructor.



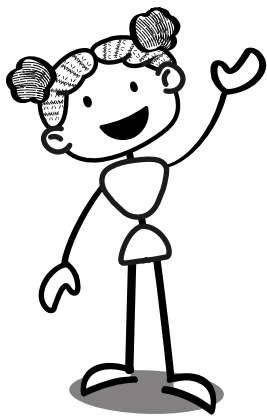
Rainbow Experiment

Discover!

LIFE SCIENCE

LAB BOOK





Discover! Life Science Lab Book

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ISBN: 978-1-960937-97-1

Printed in United States of America

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Life Science Lab Book

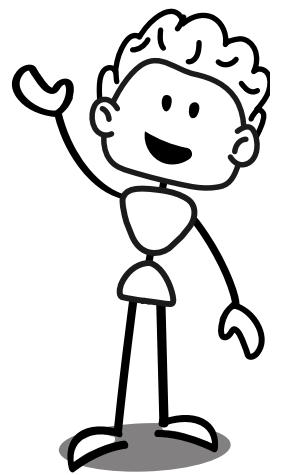


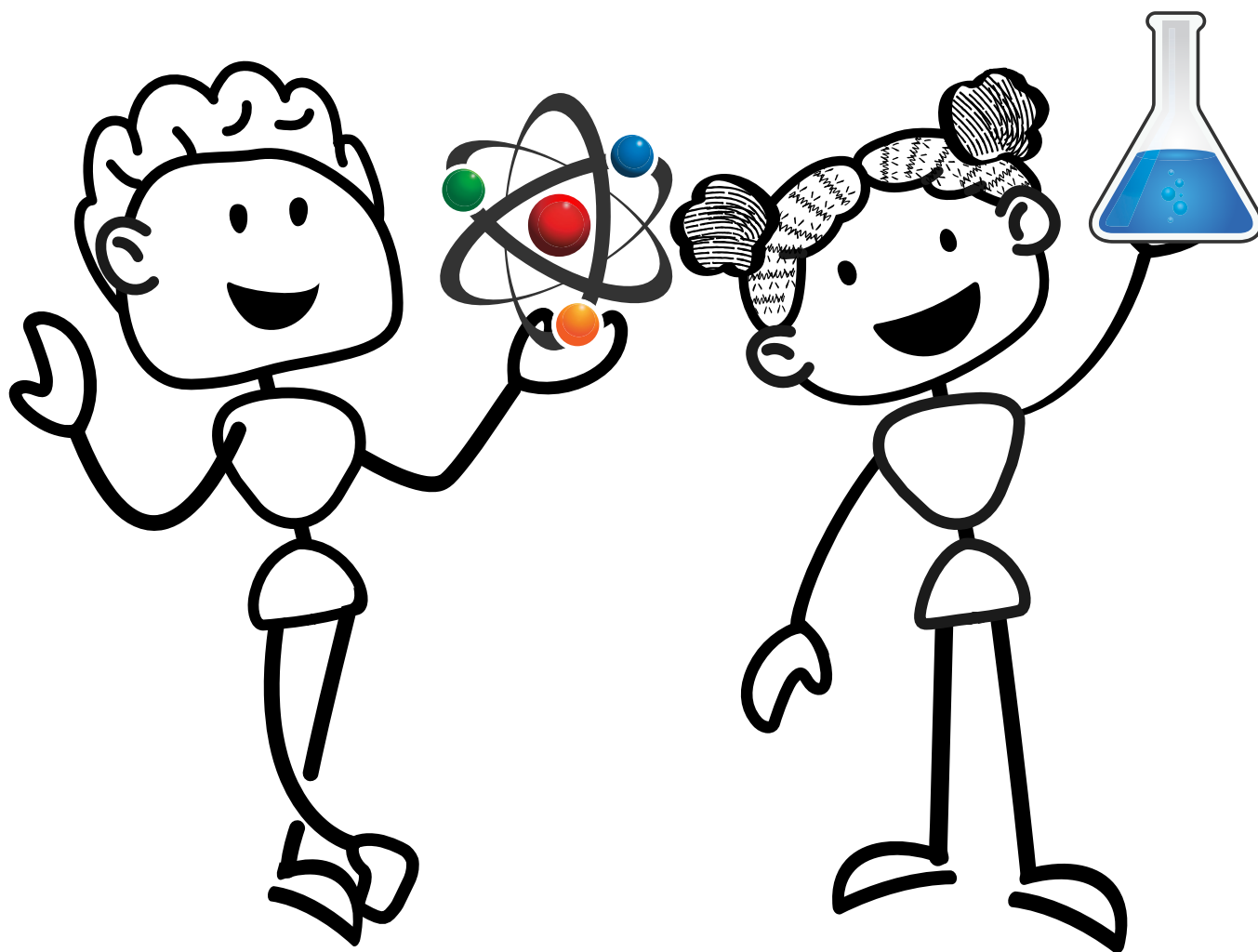
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How to Use This Lab Book

Lab Book

- The lab book, when used alongside the worktext, serves as a dynamic tool to enhance student understanding of scientific principles and processes.
- Each unit has at least one lab experience. Each lab has five sections.
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 - **Synthesize:** In this section, the student takes the data collected during the experiment to report findings, make inferences, and/or suggest further research.
 - **Stretch:** This section invites the student to take their experiments further.
- A page for lab notes is provided with each lab. The student is encouraged to record their hypothesis, experiment observations, and experiment results in this section.



Botanical Cycles

Upon completion of the lab, you will be able to:

- manipulate factors that influence plant growth
- measure plant growth over time
- observe how environmental impacts affect plant growth

Key Concepts

- Plants go through a life cycle that includes germination, growth, reproduction, and, eventually, death.
- Environmental factors such as light, temperature, and water affect a plant's life cycle.
- Plants use photosynthesis to sustain life.
- Plants are an important part of balancing the cyclic nature of ecosystems.

Safety

Be sure to read safety precautions when using nutrient-rich potting soil.

Materials

- three small plant pots or styrofoam cups
- potting soil
- acidic fruit (lemon, orange, etc.)
- nutrient-rich potting soil
- pea plant seeds
- ruler

START!

After being inspired by visiting the garden, you decide to conduct a plant study. When you make mention of your idea to your dad, he is totally on board.

He asks, "How will the plants grow inside?"

"I am researching the plants right now so that I can see the nutrient and water requirements," you reply.

"That's a great idea: work smarter, not harder!" he exclaims.

You dash into your bedroom to start setting up your new botanical garden lab.



Plants need nutrients and water to grow.



As you learned in this unit, plants play an important role in an ecosystem. It is necessary to preserve biodiversity so that plants can grow and thrive.

How does changing soil composition affect plant growth?

All plants must have their needs met to grow and thrive. To do this, you must take into account that several factors contribute to plant growth. The amount of sunlight, water, and soil quality are all things that will change plant growth over time. In today's lab, you will manipulate soil composition to see how it affects plant growth. You will create a soil that is rich in nutrients and highly acidic.

Can you write a hypothesis? Use the Lab Notes page to record your predictions about this assignment.

SEARCH

Please note that as you work with soil and other materials in this lab, things may get messy. You may want to wear gloves to protect your hands and an apron to help keep your clothes clean.

Procedures:

Step 1: Fill one of the styrofoam cups with regular potting soil (label: control).

Step 2: Fill one of the styrofoam cups with nutrient-rich potting soil (label: nutrient-rich).

Step 3: Fill one of the styrofoam cups with regular potting soil (label: acidic).

- Place the zest and juice of two lemons into the soil.

Step 4: Place the same number of pea seeds in each cup.

- Do not place more than five to not overcrowd the cup.

Step 5: Water the seeds in each cup.

Step 6: Monitor the growth in each cup at least once daily (for an added challenge, measure growth twice daily) for at least two weeks.

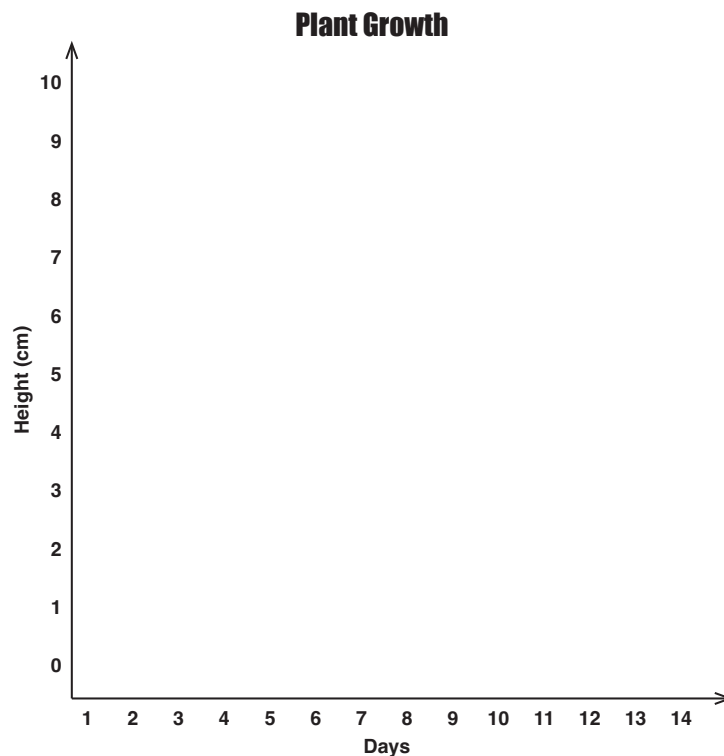
- Measure plant growth using a ruler and record observations.

Step 7: Analyze the results.

What is happening during the experiment? Use the Lab Notes page to record your observations about this assignment.

SYNTHESIZE

Over the last two weeks, you studied how soil composition affects plant growth. Plot your data using the template below. Use red to plot the control. Use blue to plot the nutrient-rich soil. Use orange to plot the acidic soil. Compare the growth between the three over time.



Use the questions below to guide your observations.

- Which pea plant had the most growth?
- Which pea plant had the least growth?
- What would you predict to happen if you continued the experiment for a longer period?

Can you describe any results? Use the Lab Notes page to record your observations about this assignment.

STRETCH

In today's lab, you learned how different factors affect plant growth. Choose two different ecosystems to research and compare them. Use the following questions to guide your analysis.

- What is the temperature of the ecosystem?
- What kind of landscape does it have (hills, mountains, rocky, grasslands, sand, etc.)?
- What is the soil like there?
- What kind of plants exist?
- Do the plants have to have special adaptations to live there?
- What kind of animals exist there?
- How do these animals survive (carnivores, omnivores, herbivores)?

Predict

Before starting this lab, I predict . . .

Observe

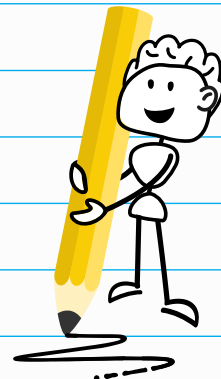
While completing the lab, I observed . . .

Explain

Upon completion of this lab, I learned . . .

Keep Going

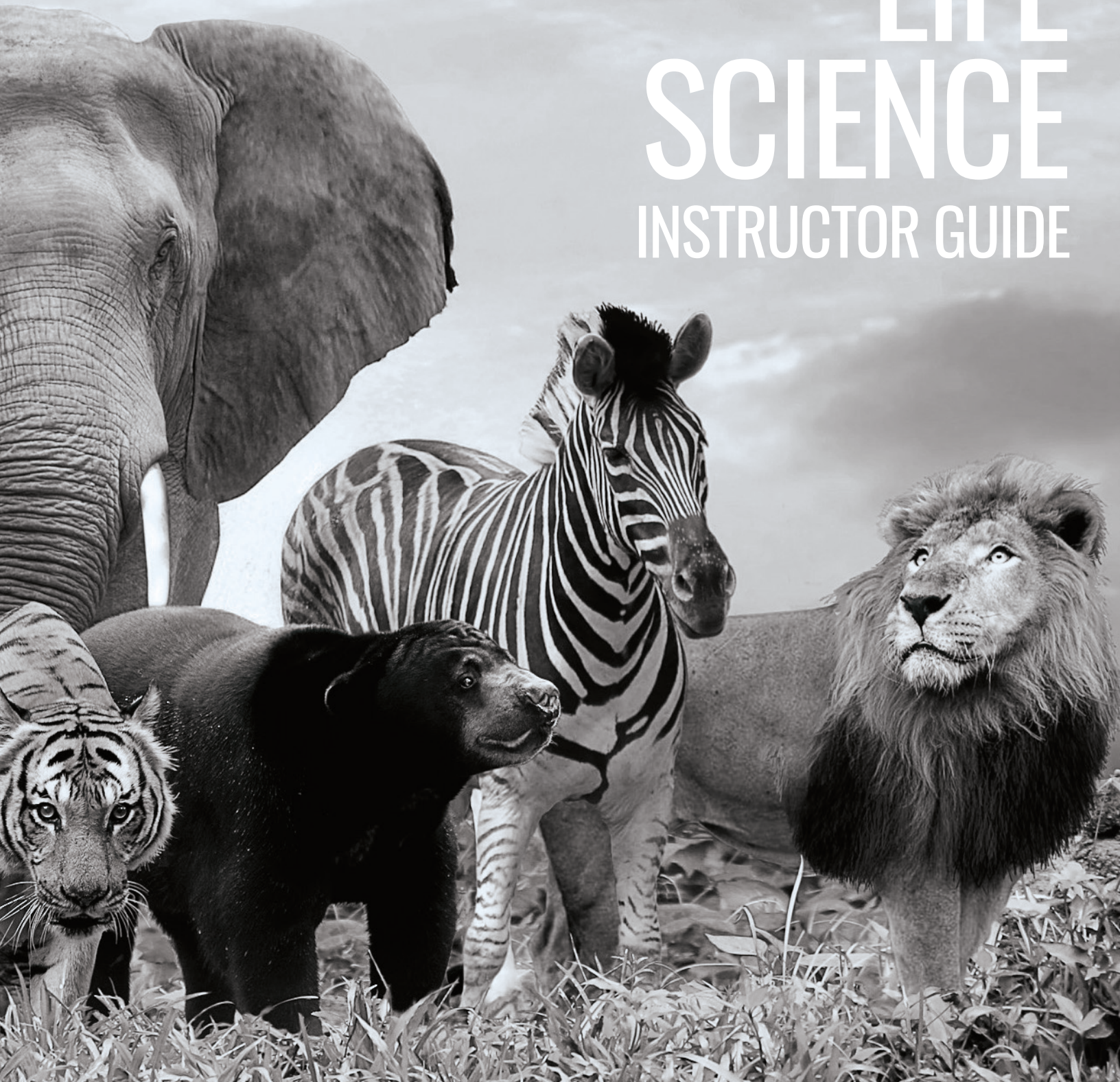
I still have questions about . . .

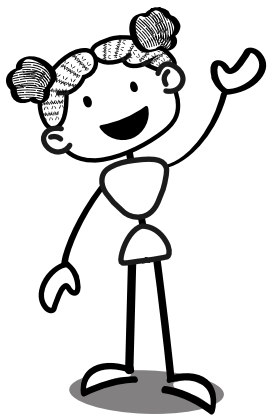


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INSTRUCTOR GUIDE





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ISBN: 978-1-960937-95-7

Printed in United States of America

2nd Edition

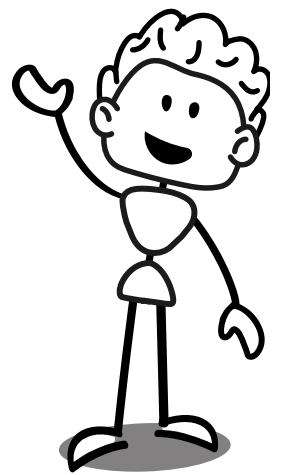


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Student Books, Instructor Guide, and Planning

Instructor Guide

- The instructor guide provides chapter-by-chapter guidance to facilitate your instruction.
- For your convenience, the objectives are provided at the beginning of each chapter.
- Each chapter provides suggestions for supporting your student with worktext activities and adapting the content to your student's learning preferences.
- Booster activities are provided for some chapters which provide your student an opportunity for repeated practice toward mastery of specific skills or concepts.
- Co-op activities are provided for many chapters and allow you to tailor the instruction with creative ideas for collaborative and group learning.
- Each chapter contains extension activities to enhance or extend the content for your student.
- Answer keys for all activities are provided in each chapter.
- The back of the instructor guide provides full support for all lab activities and is organized to mirror the lab book's table of contents.
- The unit assessments are included with each unit review as well as in the assessment booklet. Each unit has two options.
 - **Traditional unit assessment:** This is a traditional assessment (multiple-choice) with an answer key.
 - **Performance assessment:** This is a performance-based option with a rubric.

Planning

- Each course is designed to cover approximately 160 days of instruction, with each chapter taking roughly 2 days to complete. This does not include time spent on the enrichment activities provided in the worktext sidebars and the instructor guide. These materials allow the instructor to customize the learning experience and encourage the student to dive deeper.
- It is recommended the student completes the **Explore** and **Read** pages on the first day and the **Practice** and **Show What You Know** pages on the second day.
- It is recommended that the student complete the unit lab(s) contained in the lab book PRIOR to the completion of the unit reviews/assessment chapter. The student should be able to complete a lab in one day or do half of the lab on one day, and half on another day. Because of the nature of experiments, some labs may require the student to engage with the procedures over several days. Please be sure to read through the unit lab experiments in advance to adequately plan for each unit's calendar of activities.
- For unit review/assessment chapters, it is recommended the student completes the **Review** pages and the first **Practice** page on the first day and the remaining **Practice** pages on the second day.

Water Cycles and Plants

Co-Op Activities

Water Cycle Skit

What does the water cycle look like on stage? Find out! Put students into groups. Assign each group either transpiration or absorption and have them create a skit that explains the process and its relationship to the water cycle. Be sure that each person in the group has a role to play in the skit. When each group is finished, have them perform their skit for the class.

Soil Percolation

Let students investigate how water percolates through different types of soils or materials. Put students into groups and give them identical starting materials, such as a glass, a coffee filter, and a $\frac{1}{3}$ measuring cup. Then, give each group either $\frac{2}{3}$ cup of dried rice, $\frac{2}{3}$ cup of rice meal, or $\frac{2}{3}$ cup of rice flour. Have each group place the coffee filter over the cup. Holding the filter steady, have them place their “soil” atop the filter. Then, they should pour $\frac{1}{3}$ cup of water over their soil and through the filter. Each group should pour three total $\frac{1}{3}$ cups of water through their soil and filter. Have each group discuss what happened to their substances. Then, they can do a gallery walk to look at other groups’ materials and substances to see how the water affected the other soils. Finally, discuss as a group to decide how this activity relates to percolation and absorption in plants.

Extension Activities

I’m a Plant

Have your student complete this writing assignment to tap into their creativity and confirm their knowledge of how a plant is part of the water cycle. Have your student take on the perspective of a plant and write about what it is like to go through transpiration and absorption. Encourage them to use humor and creativity to explain these processes and stay true to their perspective.

Transpiration Activity

Transpiration is a process that occurs without us noticing, but it can be seen with the right activity. Place a plant in a flower pot and water it thoroughly.

Place a clear plastic bag loosely over the plant and put it in the sun. Have your student observe what happens and explain what this has to do with the water cycle. Don’t forget to remove the bag promptly after the experiment and recycle it!

Answer Key

Closer Look (*Plant Roots*)

Answers will vary. Possible answer: The water is absorbed through the roots up a transport system and through the stem, which distributes water and nutrients to the rest of the plant.

Write (*Short Answer*)

Answers will vary. Possible answer: Plants need water to go through photosynthesis, stay cool, and transport materials from the soil into the plants.

In Focus (*Build a Prototype*)

Answers will vary. Possible answer: Straws would work best, because they are small tubes that can be used for capillary action to absorb water and nutrients and distribute them to the rest of the plant.

Apply (*Label It!*)

1. transpiration
2. stomata
3. capillary action
4. absorption
5. precipitation

Mini-Lab (*Capillary Action*)

The white flower will become the same color as the food coloring. Capillary action causes the colored water to move up through the stem of the flower to the petals, turning the white flower the same color as the food coloring.

Practice (*Draw It!*)

Answers will vary. Student drawing should represent the following:

Absorption: Shows a root system under the ground. An arrow shows water going up from the dirt into the roots of the plant.

Capillary action: Shows the stem of the plant carrying water from the roots to the leaves.

Water Cycles and Plants

Transpiration: Shows a leaf with an arrow pointing away from it labeled “water vapor,” indicating that water vapor is being released.

Review (*The Big Question*)

Answers will vary. Possible answer: Plants absorb groundwater through their roots to distribute throughout the plants. The water they don’t use is released as water vapor through their leaves and into the atmosphere.

Show What You Know

1. A
2. B
3. A
4. False
5. False
6. True
7. Answers will vary. Possible answer: Plants absorb groundwater through their roots to distribute throughout the plants. The water they don’t use is released as water vapor through their leaves and into the atmosphere.
8. Answers will vary. Possible answer: Plants need water to use for photosynthesis, to stay cool, and to transport materials throughout their structures.

Create (*Grow a Rainbow*)

Answers will vary. Possible answer: The colors mix together by climbing up the paper towel and into the next glass. This is caused by capillary action, and it is what plants use to move water and nutrients up the stem.