

LESSON 2 The Cycle of Water

Lesson at a Glance

In this lesson students realize that water from billions of years ago has been cycling around the Earth and is being used by each one of them today. Through a PowerPoint presentation the class is introduced to the various forms or states of water and the processes that make up the water cycle; evaporation, condensation, transpiration, precipitation and accumulation. In groups, students will engage in several hands-on demonstrations to observe the water processes of condensation, evaporation, and transpiration. The lesson ends with groups of students researching a part of the water cycle to become an “expert” and teach the rest of the class what they learned.

Lesson Duration

Three 45-minute periods

Essential Question(s)

How old is water?

What is the water cycle?

How do the processes in the water cycle relate to weather?

Key Concepts

- Water we use has been on our planet for billions of years.
- Water is found on, above, and just below the surface of the Earth: in its liquid state as the ocean, lakes, rivers, and other bodies of water; in its solid state as ice and snow; and in its gaseous vapor state as clouds and humidity.
- The water cycle describes the continuous processes of evaporation, condensation, transpiration, and precipitation.
- No matter where you live on Earth, the water cycle always involves the same processes of evaporation, condensation, and precipitation.
- The processes of the water cycle play a role in the weather around the world.

Related HCPSIII Benchmark(s):

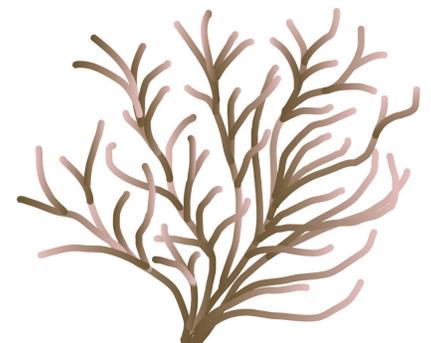
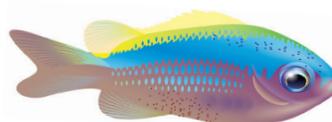
Science SC.3.8.2
Describe how the water cycle is related to weather and climate.

Language Arts LA 3.1.6
Locate information in a variety of grade appropriate resources.

Language Arts LA.3.6.1
Use oral language to obtain information, complete a task, and share ideas and personal opinions with others.

Instructional Objectives

- I can label and define the parts of the water cycle, including evaporation, condensation, precipitation, accumulation, and transpiration.
- I can explain how evaporation, condensation, precipitation, accumulation, and transpiration relate to weather.
- I can locate information on a specific topic using the internet and participate in an oral group presentation of my findings.



Assessment Tools

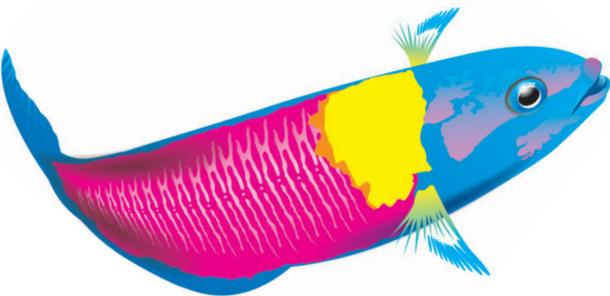
Benchmark Rubric:

Topic		Forces that Shape the Earth	
Benchmark SC.3.8.2		Describe how the water cycle is related to weather and climate	
Sample Performance Assessment (SPA)		The student: Illustrates the water cycle and explains its relationship to weather and climate.	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Describe how the phases of the water cycle relate to weather and climate	Describe how the water cycle is related to weather and climate	Give an example of how the water cycle is related to weather or climate	Recognize that the water cycle is related to weather and climate
Topic		Locating Sources/ Gathering Information	
Benchmark LA.3.1.6		Locate information in a variety of grade-appropriate sources	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Locate substantive information in an extensive variety of grade-appropriate resources	Locate information in a variety of grade-appropriate resources	Locate limited information in a few grade-appropriate resources	Locate information in one or two grade-appropriate resources or locate irrelevant information
Topic		Discussion and Presentation	
Benchmark LA.3.6.1		Use oral language to obtain information, complete a task, and share ideas and personal opinions with others	
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Use creative oral language to obtain information, complete a task, and share ideas and personal opinions with others, in a highly effective way	Use oral language to obtain information, complete a task, and share ideas and personal opinions with others	Use typical oral language that sometimes aids in obtaining information, completing a task, or sharing ideas and personal opinions with others	Use inappropriate oral language that does not aid in obtaining information, completing a task, or sharing ideas and personal opinions with others

Assessment/Evidence Pieces

Lesson

- Water Cycle Diagram student worksheet
- Water Cycle Report
- Word Wall



Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> Water Cycle Diagram as Transparency Computer projector and screen Condensation: <ul style="list-style-type: none"> Clear, plastic cup Ice cubes (about 4) Water Paper towels <ul style="list-style-type: none"> Evaporation: <ul style="list-style-type: none"> Colored construction paper Cup of water Dropper Pencil Transpiration: <ul style="list-style-type: none"> 3 leaves of lettuce Clear, zip lock baggy Evaporation /Precipitation: <ul style="list-style-type: none"> Pan Metal spoon Access to freezer Portable burner (e.g., hot plate)	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Computer with Internet access Drawing paper Aluminum foil Paints Marking Pens Tape, glue Scissors (Optional: Cotton, glitter, fabric materials, colored cellophane)	<ul style="list-style-type: none"> None

Instructional Resources

PowerPoint Presentations: *Water* and *The Water Cycle*

Student Worksheet: *Water Cycle Diagram*

Teacher Answer Key: *Water Cycle Diagram*

Student Vocabulary Words

accumulation: the collection of water on land.

atmosphere: the mass of air surrounding the Earth.

condensation: the transformation of water vapor back into liquid water by cooling.

evaporation: the process in which the sun heats up water in rivers or lakes or the ocean and turns it into vapor; the water vapor goes into the air where it becomes a cloud.

infiltration: the process of water passing into, or through land by filtering.

precipitation: rain, hail, or snow falling from the clouds due to the condensation of water.

runoff: water from rain or snow that flows over the surface of the land and into streams, rivers, lakes, ocean.

transpiration: the process by which plants release water through the pores in their leaves.

water cycle: the constant movement of water from oceans and lakes, evaporating into the air as water vapor, condensing into clouds and precipitating as rain or snow onto land and back into oceans and lakes.

water table: location of the underground water, and the vertical distance from the surface of the Earth to this underground water.

Lesson Plan

Lesson Preparation

- Review the Science Background provided in the Unit Overview.
- Preview the PowerPoint Presentations “*Water*” and “*The Water Cycle*” and make arrangements to project them.
- Review and make copies of the Student Worksheet *Water Cycle Diagram*, one per student.
- Enlarge and post a copy of the water cycle and/or prepare an overhead transparency.
- Decide whether to conduct activities under Teaching Suggestion III as teacher demonstrations or as group laboratories.

I. *States of Matter – Water!*

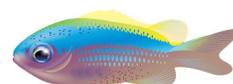
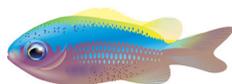
- A. View Power Point *Water* with your students. This will establish that water has three states – liquid, solid and gas. Have the students add to the word wall as the terms in the Power Point arise. Discuss the meaning of each new term as it is added to the word wall.

II. *The Water Cycle*

- A. Explain to the students that now that they know the different forms or states that water can be found they will learn how these various forms of water fit into “The Water Cycle”. Create a group K-W-L chart on the water cycle to try to assess student understanding of water cycle and to activate prior knowledge on the topic. Begin by asking the students what they already know about the water cycle and recording responses in the “K” or “... What I already Know” column. Record what students want to know as questions in the “W” or “... What I Want to Know” column.
- B. View Power Point *The Water Cycle* with your students. Discuss and review the parts of the water cycle after the PowerPoint presentation. This can be done by using the transparency or enlarged copy of the water cycle created before the lesson. Also be sure that students understand how the water cycle and weather are related.
- C. Hand out *Water Cycle Diagram* Student Worksheet. Have students label the diagram with the different processes of the water cycle. Then, on the back of the paper have them define each of the five processes in the water cycle. This may be used as one assessment piece for this lesson.

III. *Observing Evidence of the Water Cycle*

- A. Engage students in observing actual examples of condensation, evaporation, and transpiration. Be sure to connect these examples to the diagram of the water cycle and how each one is related to weather.
- B. Observe evidence of condensation.
- 1) Give each team a cup of ice water and a paper towel. Have students wipe the outside of the cups dry and place the cups on a table.
 - 2) Ask students to predict what will happen if the cups are left on the table for a while, and to give reasons to support their ideas. You can prompt them by asking, “Will any water form on the table under the cup? If so, where will the water come from? Can the water leak out of the cup? Hold up the cup. Is water leaking out of it now?”
 - 3) Have students record their initial observations, and their observations at the end of 5 or 10 minutes.
 - 4) When the students report their observations, prompt them to use terms from the water cycle. Remind students that water in the air condenses when it gets cold, and can change back to a liquid form. Be sure they understand that the cups did not leak.



- 5) Connect what they did to real-world parts of the water cycle diagram, for example clouds forming as moisture-laden wind blows from the ocean upslope, cooling and condensing as it rises. Compare the cool air around the cups to the cooler air at higher elevations in the Islands. Explain that the warm sun causes water to evaporate (and turn to vapor), and the cool mountain air causes water to condense, form clouds, and precipitate (turning back into liquid). Ask students what would need to happen in order for the water to precipitate as a solid – snow? (The temperature would have to be at least 32°F.)
- C. Observe evidence of evaporation.
- 1) Drop a few drops of water onto a dry piece of colored construction paper. Use a pencil to trace the outline where the drop wetted the paper. Place the paper onto a dry surface, preferably where it is exposed to sunlight.
 - 2) Ask students to predict what will happen to the wet spots and give reasons to support their ideas. Have students record their initial observations, and their observations at the end of 5 or 10 minutes.
 - 3) When the students report their observations, prompt them to use terms from the water cycle.
 - 4) Connect what they did to real-world parts of the water cycle diagram, for example, how the roads dry after a rain.
- D. Observe evidence of transpiration.
- 1) Put a few fresh, crispy lettuce leaves into a clear, dry closable plastic baggie. Place the baggie on a table. To speed the process up, place the bag in the sun.
 - 2) Ask students to predict what will happen and give reasons to support their ideas. Prompt their thinking by asking whether there is any water inside the baggie, and if so, can they see it? Allow the baggie to sit until moisture begins to form inside the bag. Have students record their initial observations, and their observations after approximately 10 minutes.
 - 3) When the students report their observations, prompt them to use terms from the water cycle. Connect what they did to real-world parts of the water cycle diagram, for example, how plants dry out in the sun and continually need water.
- E. Do a teacher demonstration of evaporation and precipitation. Inform students that by using heat, they will “see” water evaporate and then precipitate again.
- 1) Place a spoon in a freezer or very cold cooler.
 - 2) Heat water on a portable burner in class and observe the water vapor (steam) rise (make sure that students stand far enough away so as not to be exposed to the hot steam). Ask students to explain what is happening.
 - 3) Once steam has begun, remove the chilled spoon from the freezer/refrigerator and hold it over the steam. Ask students to “watch” how the water vapor condenses on the spoon and begins to drip down like rain.

IV. Investigate the Water Cycle

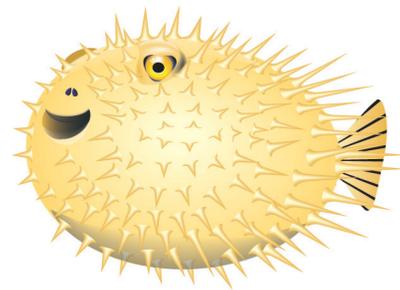
- A. Present the choices of condensation, evaporation, precipitation and transpiration, as topics on a choice board. Allow students to choose what part of the water cycle they want to learn more about. Students will form small groups or investigation teams with others who have chosen the same topic. Explain to students that they will conduct the investigation and become “experts” on their part of the water cycle, then share what they learned (their findings and conclusions) to the class as a whole. Criteria to guide student research may include:
- 1) What part of the water cycle did your group choose?
 - 2) Where does it occur in the water cycle?
 - 3) What happens if your stage of the water cycle ceases?
 - 4) How is your part of the water cycle related to weather?
- B. After the investigation teams complete their research have each group report out their findings to the class. Add any new water related words to the Word Wall as student groups present.

- C. Revisit the K-W-L chart from the start of the lesson. Record what the students learned under the “L” or “.....What I Learned” column.

Extended Activities

1. Integrate the following readings into this lesson, or add these books to your classroom library for the duration of the unit:

- Cole, J., & Degen, B. (1988). *The Magic School Bus; At the Waterworks*. Danbury, CT: Scholastic Press.
- Wick, W. (1997). *A Drop of Water*. Danbury, CT: Scholastic Press.
- Tasting Water from the Past
 - A. Give students their own cups of water, and engage them in imagining where their water came from. Have students imagine they are on a journey back in time.
 - B. Give each student a cup filled with water, a piece of masking tape, and a marker. Tell students to take a sip of water, to close their eyes and imagine where the water came from, and how it got to them. Ask them to imagine who, or what may have shared the same water. Prompt them by saying: “Where do you think the water came from? A lake? A river? The ocean? A well? A factory? Who do you think may have used the water for taking a bath? For washing dishes? Or for drinking?”
 - C. Next, have students write on the tape who, or what may have used their water. Have students place the masking tape on their cups.
 - D. Now ask students to illustrate where they imagined the water coming from, the journey their water took to reach their cups, and who also may have used their water long ago.
 - E. Bring students together in a large group, and have them discuss their drawings. Allow time for lots of laughs and giggles.
 - F. Finish this part of the activity by having students write a short paragraph describing where water is stored.



2. If Internet access is available, have students visit web sites which will reinforce and/or supplement understanding of the water cycle:

Follow a Drop Through the Water Cycle. United States Geological Survey. Web site:

<http://ga.water.usgs.gov/edu/followadrip.html>

The Water Cycle at Work. Environmental Protection Agency. Web Site:

http://www.epa.gov/safewater/kids/flash/flash_watercycle.html

Educational Water Programs. Honolulu Board of Water Supply. Web site:

<http://www.hbws.org/cssweb/display.cfm?sid=1084>

Time permitting, students can be invited to share their findings/learning that resulted from visiting these web sites.

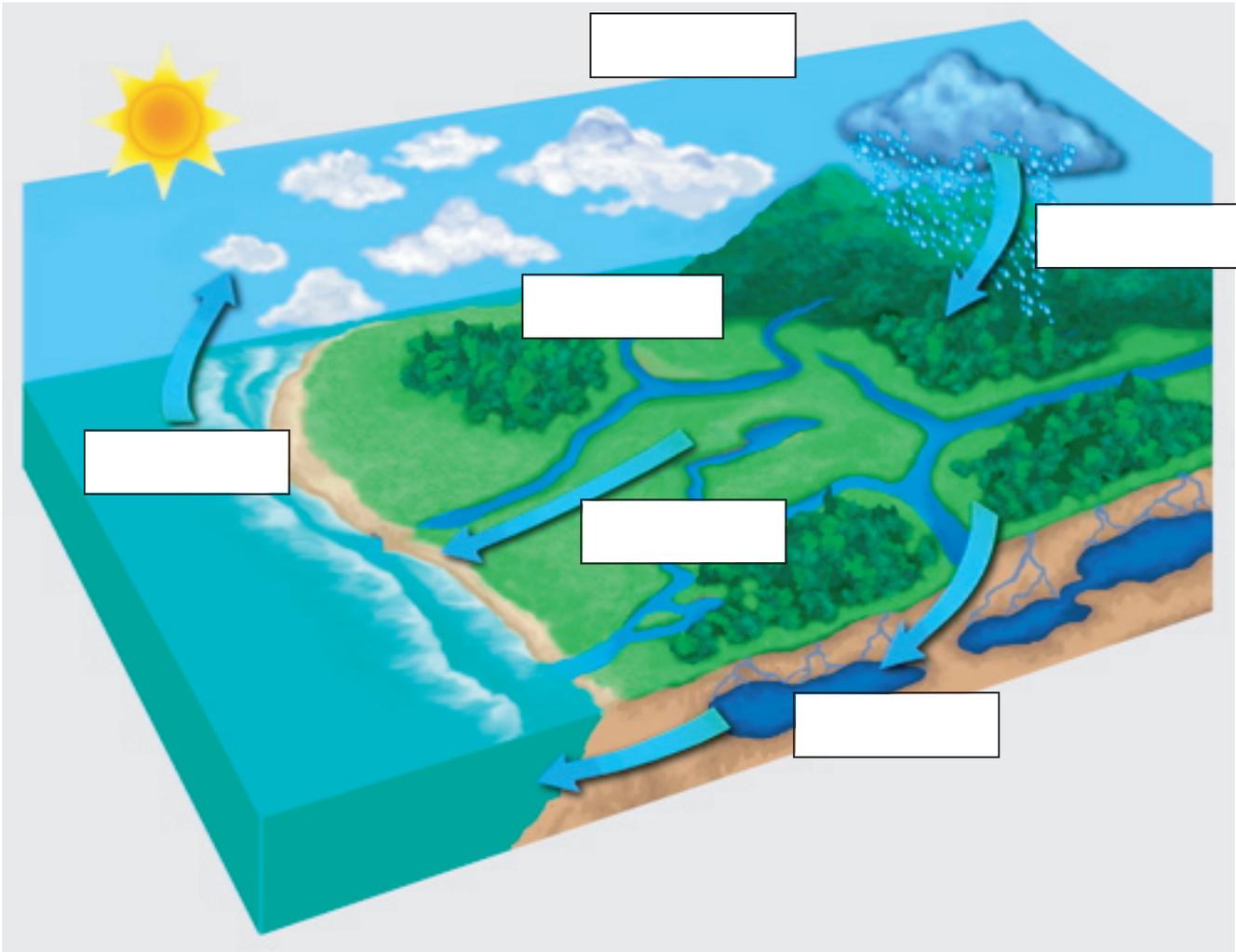
- a. Observe the water cycle inside a closed terrarium. Plant and grow bean seeds in a closed terrarium. Record observations on a chart daily. Summarize and present findings. (Allow a month to set up, make daily observations, report and discuss findings.)
 - b. Set up terrariums. Cut the top off a 2-liter soda bottle. Fill the bottom with a few inches of potting soil. Plant a few bean seeds (or other fast-growing seeds). Gently pour enough water into the container to moisten, but not flood the soil. Tightly cover the container with plastic wrap. Use tape to tightly seal the edges of the wrap around the bottle.
 - c. Place the terrarium in a location that you choose (such as a sunny window sill or a dark corner.) Label the terrarium with your team's number.
 - d. Each day, observe the terrarium. Record what you see. Include: (1) Weather conditions (hot, warm, cool day; sunny or cloudy; etc.) (2) Growth of the bean plant (estimated in inches), and (3) Evidence of the water cycle (moisture observed in the terrarium).
 - e. Summarize your observations and report what you found about the water cycle in a closed terrarium.
3. Play an active Water Cycle game where students assume the role of a drop of water and experience different pathways through the water cycle.
- http://response.restoration.noaa.gov/book_shelf/1064_Watercycle_instructions.pdf
4. The Water Cycle Skit:
- a. Have students apply what they have learned by creating and performing a class skit to portray the water cycle.
 - b. Allow students to decide what role they would like to play. The purpose is for them to show that they understand each part of the water cycle. For example, a few students might act each of these:
 - Clouds (condensation)
 - Rain drop and snowflakes (precipitation)
 - Sun (evaporation)
 - Trees and plants (transpiration/evaporation)
 - Oceans, rivers, lakes, streams (accumulation)
 - c. Conduct a group planning session to initiate the development of the skit. Prompt students by saying that most skits have at least three acts: the first act, which sets the stage for the story, the second act, where a "complication" arises, and the third act, where the complication is resolved. Students should begin developing the skit by deciding on the main story line, and then they can develop the characters of the play. Remind students that at least two students should be assigned to "record" the play (using a digital video or still camera), while two students should be assigned to helping other students with costumes. The teacher may choose to be the skit director, or may assign one student, or students to act as the director(s).

- d. Once students have settled on the general direction of the skit, provide students with the *Water Cycle Skit Storyboard*, into which they are to sketch out each scene of the skit.
- e. Provide students with the materials to design their own costumes (see suggested materials for skit). This may also be a homework assignment where each student is responsible for creating his or her own costumes at home. Inform students that they will have two or three dress rehearsals before the skit is recorded. When students are ready to have their skit recorded, make sure the digital or still camera is available and that the students in charge of recording the skit have the skills necessary to operate the equipment.
- f. Recorded skit may become a PSA to instruct others about the water cycle. Note: If properly implemented, the PSA *may* address FA 3.3.1: Create a dramatization based on a story.



LESSON 2

Water Cycle Diagram



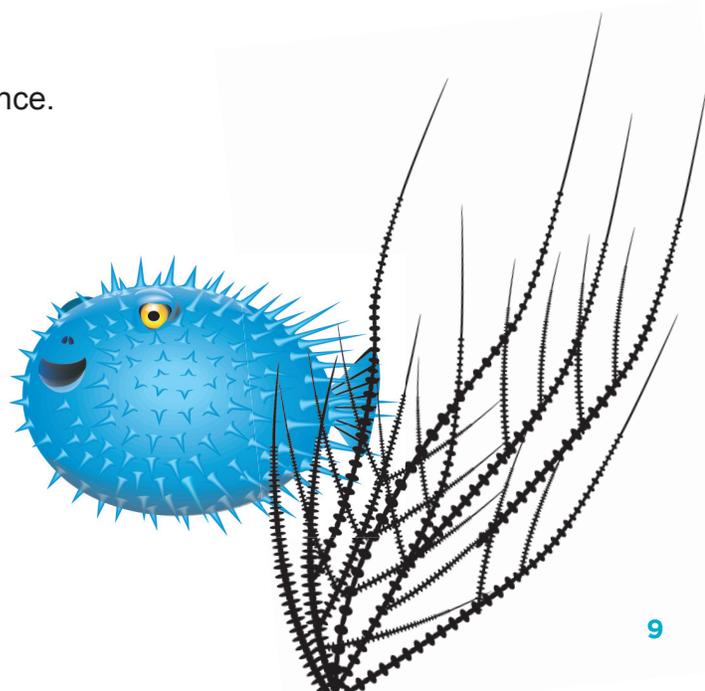
DIRECTIONS:

Label the water cycle diagram.

Make sure to use all the processes listed below at least once.

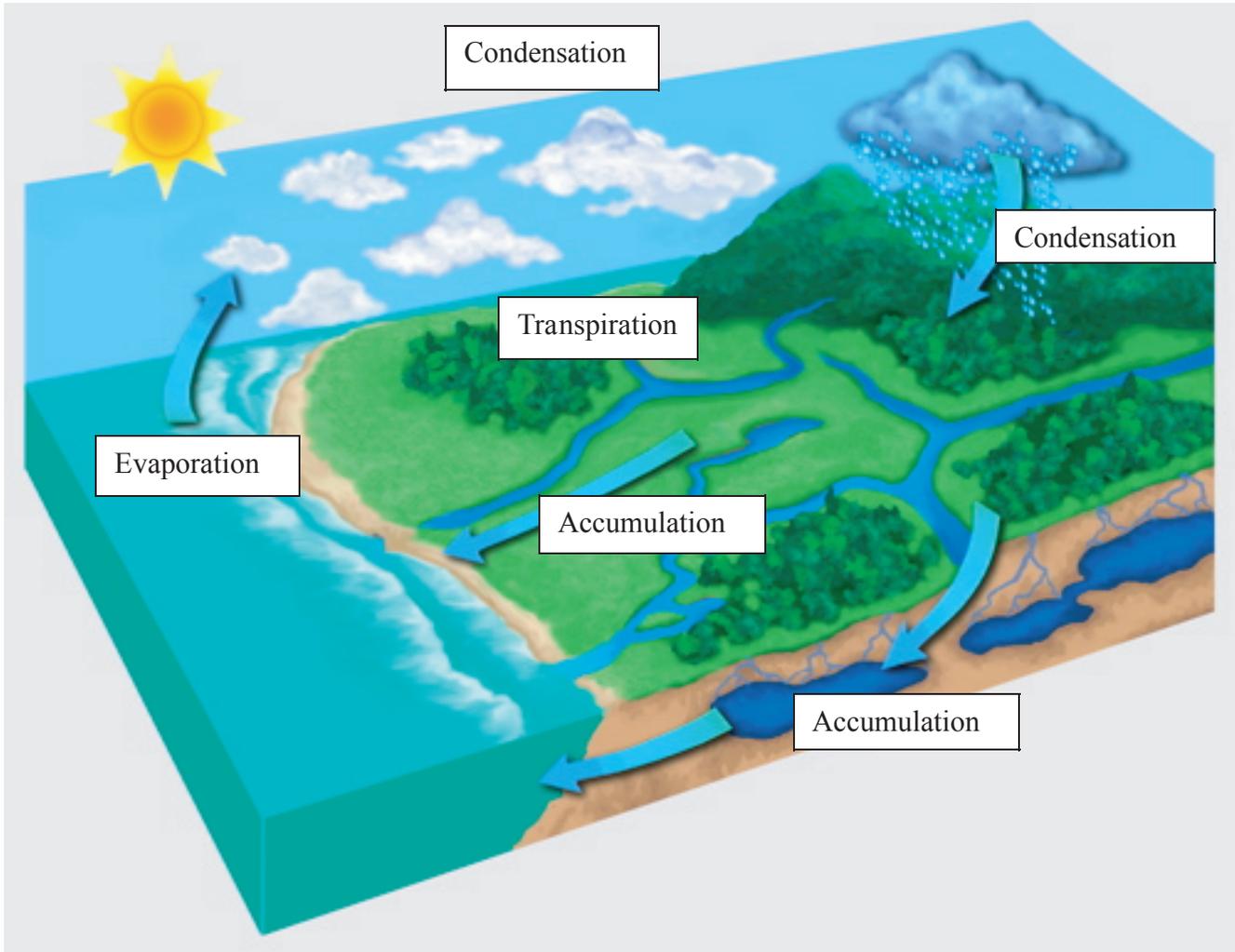
On the back side of this worksheet define each one.

- Evaporation
- Condensation
- Accumulation
- Transpiration
- Precipitation



LESSON 2 Teacher Answer Key

Water Cycle Diagram



DIRECTIONS:

Label the water cycle diagram.

Make sure to use all the processes listed below at least once.

On the back side of this worksheet define each one.

- Evaporation
- Condensation
- Accumulation
- Transpiration
- Precipitation

