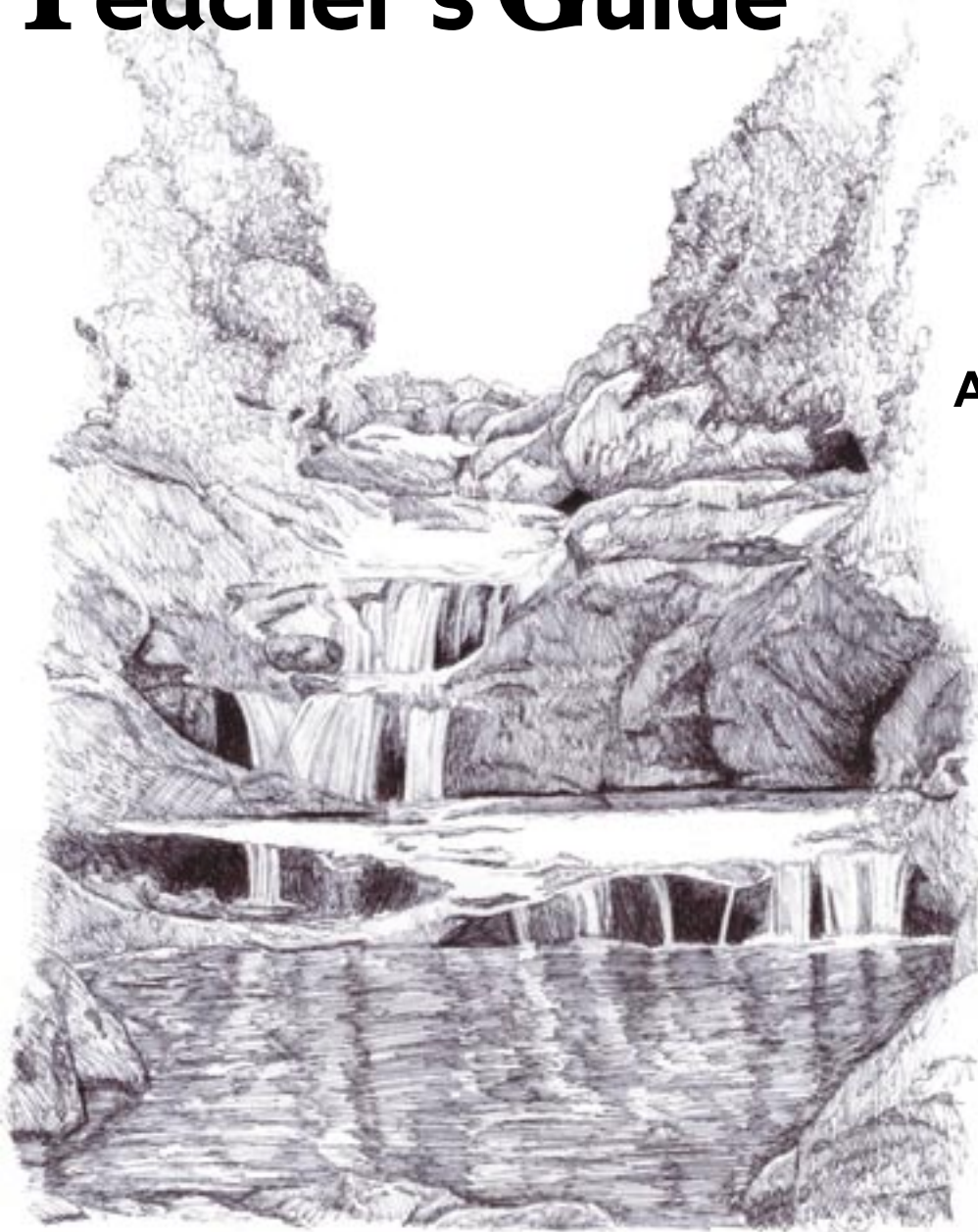


Water, Everywhere



Water,

Teacher's Guide



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A Message from our Company . . .

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National Standards Correlations

Benchmarks for Science Literacy

(Project 2061 – AAAS, c. 1993)

Grades 3–5

By the end of the fifth grade, students should know that:

4B The Earth

- When liquid water disappears, it turns into a gas (vapor) in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water. Clouds and fog are made of tiny droplets of water.

By the end of the 8th grade, students should know that:

- The cycling of water in and out of the atmosphere plays an important role in determining climatic patterns. Water evaporates from the surface of the earth, rises and cools, condenses into rain or snow, and falls again to the surface. The water falling on land collects in rivers and lakes, soil, and porous layers of rock, and much of it flows back into the ocean.

National Science Education Standards

(Content Standards: National Academy of Sciences, c. 1996)

Physical Science – Content Standard B:

As a result of the activities in grades K-4, all students should develop an understanding of:

- Materials can exist in different states - solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling.

Earth and Space Science – Content Standard D:

As a result of their activities in grades 5-8, all students should develop an understanding of:

- Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.

Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students will be able to do the following:

- List some of the ways they use water everyday in their lives.
- Describe why water is important to plants and animals.
- Explain the structure of a water molecule: 2 hydrogen atoms and one oxygen atom.
- Identify the chemical formula for water as H₂O.
- Understand that water can exist as a solid, liquid, or a gas.
- Explain that the water cycle involves the continual movement of water from water sources, into the atmosphere, and back to Earth's surface in the form of precipitation.
- Describe the main steps in the water cycle including evaporation, condensation, and precipitation.
- Cite evidence of the importance of freshwater to humans, plants, and many animals.
- Differentiate between bodies of standing water and moving water.
- Define the terms groundwater and aquifer.
- Compare some of the characteristics of groundwater and saltwater.

Assessment

Preliminary Test (p. 15):

The Preliminary Test is an assessment tool designed to gain an understanding of students' preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Post-Test (p. 16):

The Post-Test can be utilized as an assessment tool following student completion of the program and student activities. The results of the Post-Test can be compared against the results of the Preliminary Test to assess student progress.

Video Review (p. 17):

The Video Review can be used as an assessment tool or as a student activity. There are two sections. The first part contains questions displayed during the program. The second part consists of a five question video quiz to be answered at the end of the video.

Introducing the Program

Before showing the program to the class, hold a short discussion about water. Hold up a glass of water in front of the class. Ask students to describe what they see. Then ask one student to smell and taste the water. Ask the student to describe their observations to the class. Next ask students where they think the water in the glass came from. After saying that it came from the faucet, ask them about the source of the water. Discuss the notion that it came from a lake, river, or groundwater depending on your specific location. Then ask students to think about where this water may have come from. Tell students that the water in the glass is probably thousands of years old, but has probably been cycled many times through a process called the water cycle.

Create a drawing illustrating the different parts of the water cycle including water sources, evaporation, condensation, clouds, and precipitation. Tell students to pay close attention to the video for more information about water and the water cycle.

Program Viewing Suggestions

The student master “Video Review” is provided (p. 17) for distribution to students. You may choose to have your students complete this Master while viewing the program or do so upon its conclusion.

The program is approximately 14 minutes in length and includes a five-question video quiz. Answers are not provided to the Video Quiz in the video, but are included in this guide on page 13. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.

Activities Across the Curriculum

Math

- **How Much Water Do We Use?** - Water is a vital natural resource for all living creatures. First, gather information concerning water usage from your local water company, municipal water authority, or the EPA (Environmental Protection Agency - Office of Water). Some information can be found on page 21 of this guide. Using this information ask students to design graphs showing daily water usage (drinking, cooking, laundry, flushing, bathing, and lawn watering, etc.) Instruct students to add statements to the graphs promoting the conservation of water. Display the graph posters throughout the school.
- **Water Bills** - Collect water bills from homes, the school and businesses for students to analyze (cover the names and addresses). Discuss the information found on each bill. Ask the students to calculate the average daily, monthly, and yearly water use and cost (bill information will vary). If a yearly usage graph is included, compare the water use between months. In addition, ask students to calculate how much water will be used in two years, three years, etc. Perhaps, the class could calculate how long it would take a company or home to use a million gallons of water!
- **Water Meter Reader** - Discuss the information found on a water meter. Find the location of the water meter in your school. Explain to the students how to read the meter. Instruct students to design ‘water logs’! Ask students to read the meter in the morning and again at night. Tell students to record how many gallons of water are used daily in their homes for two weeks. Compare log results between classmates.

Writing

- **Flowing Water** - Tell the students to close their eyes and imagine they are sitting on the bank at the bottom of a waterfall. Ask them to think about what the waterfall looks like, the sounds they hear, the smells around them and how the waterfall makes them feel. Provide the students with background experience by reading *To Climb a Waterfall*, by Jean Craighead George (page 8 resources) or use the illustration on the cover of the teacher’s guide. Instruct students to write a description of their waterfall. Ask them to use imaginative and descriptive language. The students could also create mythical characters that dwell by the waterfall, or they can describe the lives of animals that live in the area.
- **Raindrop Journey** - Guide students to use their knowledge of the water cycle to trace the journey of a raindrop. Students can pretend to actually be the raindrop as they describe their journey through the water cycle. Encourage students to write adventurous stories including both the triumphs and tribulations of their journey. (Use the books on page 8 for references).

- **Be A Poet** - Ask the students, “What words can you think of to describe water?” List the words on the board. Explain what an acrostic poem is to the students. Acrostic poems are written by aligning the letters in a word vertically. Then, a word, phrase or sentence is written about the subject next to each letter. Here is an example:

Wet and wild
Across the rocks
Turning the bend
Ebbing
Running down the mountain

The students could also illustrate their acrostic, water poems.

Art

- **Gliding Ice Painting - Materials: plastic ice cube trays, food coloring (red, yellow, and blue), Liquid Watercolors™ by Bio Color®, wooden craft sticks, tin foil and white paper.** Paint with ice! Fill the tray sections two-thirds full with water. Add several drops of color in each section. Mix the water and color in each section with a craft stick. In addition, combine the colors to create shades of green, orange, and purple. Cover the tray lightly with foil and carefully push a stick into each cube section. Now put the tray(s) in the freezer. When the colored cubes are frozen, remove the foil. Let the cubes thaw just a bit, so they can be easily removed. Instruct students to paint with the ice cube, stick paints. Provide background music while the students glide the ice over the paper!
- **Tie-Dye Painting - Materials: white absorbent paper towels or white coffee filters, several dishes of colored water (make the colors strong and brilliant with food coloring or Liquid Water Colors™), and a drying rack.** Create brilliant designs! Instruct students to fold the paper towel or coffee filter several times. Then dip one corner into a color for a few seconds to absorb the liquid. Continue by dipping another section of paper towel/filter in a different color. Open the paper up and enjoy the designs! Instruct students to experiment with different ways of folding the paper and vary the time allotments for color absorption. Also, they could compare how well the filters absorb liquid as compared to the paper towels. Hang the color creations in a window and enjoy!
- **Raindrop Paths - Materials: white paper, small dishes of brilliantly, colored water (color the water with food coloring or Liquid Watercolors™), straws, and eyedroppers.** Instruct students to fill an eyedropper with one color and then drop the colored water onto the paper. Guide the students to blow into the straws to direct the path of the colored water. Continue with more drops of colored water to create beautiful raindrop paths.

Social Studies

- **Water Through The Years** - Divide students into groups and ask each group to research a body of water in their geographical area. Instruct students to discuss and research the following questions; What is the water used for? (fishing, recreation, industry, drinking) What changes have taken place to the water and surrounding area over the years? Is the water polluted? If so, what steps have been taken to clean it up. Two books that discuss the clean up of polluted water are *Come Back Salmon* and *A River Ran Wild* (see resources on page 8). Students could present their findings with a mural, oral report, skit or time line.
- **Where Does The Water Go?** - Take a field trip to the local water treatment plant. In preparation for the visit, provide students with information regarding local water usage. Guide students to create a list of questions to ask while they are at the water treatment plant. After the visit, ask students to write a class thank you letter highlighting the new information they learned at the plant.
- **Snowflake Bentley** - Read the book *Snowflake Bentley* (page 8, resources) to the class. Discuss Bentley’s determination to create a process for photographing snow crystals. Guide the class to develop a time line that includes the significant discoveries and events in Wilson Bentley’s life. Next, direct small groups of students to draw illustrations or create skits depicting an event from the time line. In addition, challenge students to create six sided (hexagonal shaped) snow crystals using coffee filters. Guide them to experiment with different folds and cuts. The books, *Snow Crystals*, *Snowflakes in Photographs* and *The Snowflake* (page 8, resources) provide excellent snowflake photographs!

Safety

Safety goggles should be worn when needed, such as during experiments. When using sharp tools such as scissors, instruct students on how to use them safely.

Suggested Resources

Astan-Nankivell, Sally and Dorothy Jackson. *Science Experiments with Water*. New York: Scholastic Library Publishing, 2000.

Azarian, Mary (Illustrator) and Jacqueline Briggs Martin. *Snowflake Bentley (read aloud book)*. Boston: Houghton Mifflin Company, 1998.

Bentley, W. A. and W. J. Humphreys. *Snow Crystals*. New York: Dover, 1962. (Actual snowflake photographs).

Bentley, W.A. *Snowflakes in Photographs*. Mineola, NY: Dover Publications, Inc., 2000. (Actual snowflake photographs).

Cherry, Lynne. *A River Ran Wild: An Environmental History*. San Diego: Harcourt, 2002. (Read aloud book).

Cole, Joanna and Patricia Relf. *The Magic School Bus Wet All Over: A Book About the Water Cycle*. New York: Scholastic, Inc., 1997.

Cone, Molly and Sidnee Wheelwright (Photographer). *Come Back Salmon: How a Group of Dedicated Kids Adopted Pigeon Creek and Brought It Back To Life*. San Francisco: Sierra Club Books for Children, 1992.

Creech, Sharon and David Diaz (Illustrator). *Wanderer*. New York: Harper Collins Children's Books, 2002. (In this story a thirteen year old girl and her cousin record their journey in a sailboat, The Wanderer, across the ocean.)

George, Jean Craighead and Thomas Locker. *To Climb a Waterfall*. New York: Putnam Publishing Group, 1995. (Read aloud book).

Hooper, Meredith and Chris Coady (Illustrator). *The Drop in My Drink: The Story of Water on Our Planet*. New York: Viking, 1998.

Lauw, Darlene and Lim Cheng Puay. *Water (Science Alive! Series)*. New York: Crabtree Publishing Co., 2002.

Libbrecht, Kenneth and Patricia Rasmussen (Photographer). *The Snowflake*. Stillwater, MN: Voyageur Press, 2003.

McKinney-Shaw, Barbara and Michael S. Maydak (Illustrator). *A Drop Around the World*. Nevada City, CA: Dawn Publications, 1998.

Murphy, Bryan. *Experiment With Water*. Minnetonka, MN: Creative Publishing International, Inc., 2001.

Singer, Marilyn and Meilo So (Illustrator). *How to Cross a Pond: Poems About Water*. Westminster, MD: Alfred A. Knopf Inc., 2003.

Trueit, Trudi S. *Rain, Hail, and Snow*. New York: Scholastic Library Publishing, 2002.

Trueit, Trudi S. *The Water Cycle (Watts Library Series)*. New York: Scholastic Library Publishing, 2002.

White, Larry B., et al. *Water: Simple Experiments for Young Scientists*. Brookfield, CT: Millbrook Press, 1995.

Wick, Walter. *Drop of Water: A Book of Science and Wonder*. New York: Scholastic, Inc., 1997.

Video Script

1. Introduction

2. Have you ever had the chance to sail across the ocean,
3. Or witness the thundering power of a large waterfall? ...
4. Have you taken a walk along a mountain stream? ...
5. or walked in the rain, ...
6. Maybe you have taken a swim in a lake, if so you know that water is everywhere.
7. What exactly is water?
8. Where does it come from?...
9. ... and where does it go?
10. And how is water found in the ocean? ...
11. ... different from water found in rivers and lakes?
12. During the next few minutes we are going to answer these questions and others, ...
13. ... as we explore the fascinating world of water.

14. Graphic Transition – Why is Water Important?

15. You Decide! How many times have you used water today?

16. As soon as you woke up you may have had a drink of water ...
17. ... brushed your teeth...
18. ... or taken a shower.
19. Put on clean clothes which were washed in water,
20. and then given your pet a drink of water.
21. As you can see, you have used water in many ways before even leaving your home.
22. All life in one-way or another depends on water.
23. Many plants and animals actually live in water.
24. Plants and animals that live on land also require water.
25. Not only do we drink water directly,...
26. ...but, many of the foods we eat contain large amounts of water.
27. Plus we use water to wash things,
28. ... we use it as a source of power,
29. ... and we even use it for recreation.
30. So as you can see, not only is water found everywhere, ...
31. ... it is essential for the well being of all living things.

32. Graphic Transition – What is Water?

33. When we think of water, we normally think of a clean, pure liquid that has no taste, smell, or color.
34. We do not usually think about the fact that water is made up of two different kinds of particles called atoms.
35. When two atoms of hydrogen combine with one atom of oxygen, a water droplet is formed that scientists refer to as H₂O.
36. H₂O is the chemical symbol used for water.
37. But water does not just exist as a liquid.
38. **You Predict!** What will happen to this glass of water if you put it in the freezer overnight?

Video Script

39. When we open the freezer door in the morning and look inside the glass, we see that the liquid water has turned into solid ice.
40. Freezing is the process of liquid water changing into solid ice.
41. In some places the surface of lakes may freeze forming a layer thick enough to walk on and skate on.
42. What would happen if we were to leave frozen water in the sun on this windowsill?
43. Eventually it melts, once again becoming a liquid.
44. And what would happen if we left the water on the windowsill for several days?
45. Where did the water go?
46. The water went into the air in a process called evaporation.
47. Evaporation is the process of water changing from a liquid to a gas.
48. If you look at a hot cup of steaming water from the side, you can actually see liquid water changing to a gas in the form of water vapor.
49. So as you can see, water can exist as a liquid, as a solid, and as a gas.
50. **Graphic Transition – The Water Cycle**
51. Chances are you have experienced a rainstorm.
52. ... or a snowstorm.
53. Maybe you have seen sleet.
54. And perhaps, you have even seen hard, solid ice falling from the sky called hail.
55. **You Compare!** What do rain, snow, sleet, and hail have in common?
56. That is right, all these things are a form of precipitation that falls from the sky.
57. Precipitation is rain, snow, sleet, or hail that falls to earth.
58. Where does the water found in precipitation come from?
59. Precipitation falling from the sky could have originally come from this fountain...
60. ...or the ocean...
61. Or perhaps from someone's swimming pool.
62. Where does the water found in precipitation go once it hits the earth?
63. The answers lie in something called the water cycle.
64. The water cycle is the continual movement of water from water sources, such as, lakes and the oceans into the atmosphere, then returning to earth's surface in the form of precipitation.
65. Let us look at the steps in the water cycle.
66. The oceans serve as huge collecting basins of water, and they are the places where evaporation occurs.
67. Evaporation also occurs from lakes, rivers, and other water sources.
68. Plants also give off large amounts of water vapor.
69. As water vapor rises into the atmosphere, it gradually cools as it gets higher and higher.
70. At some point water vapor condenses to form tiny liquid water droplets. Condensation is the process of water vapor changing into liquid water.
71. What forms in the sky as a result of condensation?
72. Clouds form in the sky as a result of condensation.
73. Clouds are made up of billions of tiny water droplets.

Video Script

74. Over time these water droplets grow larger and larger as more water condenses on them.
75. When these droplets get large and heavy enough they fall in the form of precipitation.
76. When precipitation hits the earth, it may seep into the ground...
77. ... or it may flow across the surface in the form of surface runoff...
78. ...eventually collecting in lakes, streams, rivers, or the ocean.
79. Once on earth, water evaporates into the atmosphere, starting the water cycle all over again.
80. **Graphic Transition – Freshwater**
81. Freshwater refers to water that is not salty and is found in both moving water and standing water.
82. Without freshwater we would be thirsty.
83. ... and dirty. We cannot survive long without freshwater.
84. We cannot use saltwater for drinking because our bodies cannot process it.
85. For this reason, freshwater is described as one of the most valuable natural resources.
86. A natural resource is anything taken from the earth and used by people.
87. While water is abundant on earth, freshwater is less common.
88. **You Decide!** What are some examples of standing water?
89. Lakes and ponds are referred to as standing water in that the water remains relatively still.
90. Freshwater lakes possess large concentrations of freshwater.
91. For example, the Great Lakes in North America contain a large amount of freshwater.
92. Lakes and ponds provide homes to many different kinds of freshwater plants and animals.
93. Freshwater often enters and exits ponds and lakes through streams or rivers.
94. Streams and rivers are examples of moving water.
95. The Niagara River, seen here, flows between Lake Erie and Lake Ontario,
96. and forms the Niagara Falls en route.
97. Both streams and rivers serve as sources of drinking water to hundreds of thousands of people.
98. A less obvious source of freshwater lies beneath your feet – underground.
99. Groundwater refers to water that lies below the surface of the earth.
100. A great deal of the water from precipitation seeps into the ground.
101. In some places, groundwater lies quite close to the surface.
102. While in other places, it may lie hundreds of meters deep.
103. An aquifer is an underground layer of rock or sediment that holds water.
104. It is very common for people to tap groundwater in aquifers by drilling a well into the earth,...
105. ... and pulling the water to the surface.
106. **Graphic Transition – Saltwater**

Video Script

107. If you have ever taken in a mouth full of water while swimming in the ocean, you know that ocean water tastes salty.
108. Over time the oceans have accumulated materials from the land containing many minerals and salts.
109. The oceans are much bigger than bodies of freshwater.
110. Compared to lakes and ponds, oceans have large strong currents, ...
111. ... and tidal movements which cause water levels to rise and fall daily.
112. The immense size of the ocean
113. ...combined with many different types of environments, provide homes to a wide variety of plants and animals.
114. Animals that live in the oceans have developed ways to survive in saltwater.
115. This is just a sampling of some of the characteristics of saltwater.
116. **Graphic Transition – Summing Up**
117. During the past few minutes we have discussed how water plays a vital role in our everyday lives.
118. We saw how water is made of two hydrogen atoms and one oxygen atom.
119. We explored how water can exist as a solid, a liquid, or a gas.
120. And we discussed the various steps in the water cycle including evaporation, condensation, and precipitation.
121. Finally, we investigated some of the features of freshwater...
122. ... and saltwater.
123. So, the next time you drink a glass of water ...
124. ... swim in a lake
125. ... or look up at the clouds, ...
126. ... think about some of the things we discussed during the past few minutes...
127. ... you just might think about water a little differently.

Fill in the correct word to complete the sentence. Good luck and let us get started.

1. _____ occurs when liquid water changes into a gas.
2. _____ form as a result of condensation.
3. The continual movement of water between earth and the atmosphere is the _____.
4. _____ is found beneath Earth's surface.
5. The oceans consist of _____.

Answers can be found on page 13.

Answer Key to Student Assessments

Pre-Test (p. 15)

1. true
2. false
3. false
4. true
5. true
6. Water sources such as lakes and the oceans serve as places where large amounts of water evaporates, changing into water vapor. As the water vapor rises, it cools and eventually condenses forming clouds. In the clouds water droplets or ice crystals eventually become heavy enough to fall in the form of precipitation.
7. Saltwater has a light salt content, whereas freshwater is not salty. This makes saltwater unsuitable for drinking, whereas freshwater is. Saltwater is found primarily in the oceans, whereas freshwater is found in lakes, rivers, and ponds.
8. c. gas
9. b. ice
10. a. water cycle
11. a. condensation
12. b. groundwater

Post-Test (p. 16)

1. true
2. true
3. false
4. false
5. true
6. Examples of daily activities using freshwater include bathing, brushing teeth, washing dishes, washing clothes, and flushing the toilet.
7. Water sources such as lakes and the oceans serve as places where large amounts of water evaporates, changing into water vapor. As the water vapor rises, it cools and eventually condenses forming clouds. In the clouds water droplets or ice crystals eventually become heavy enough to fall in the form of precipitation.
8. b. oxygen
9. a. evaporation
10. d. condensation
11. b. freshwater
12. a. saltwater

Video Review (p. 17)

1. You have probably used water many times today. For example, you have taken a drink of water, brushed your teeth, taken a shower, put on clean clothes that were washed with water, and given your pets a drink.
2. The glass of water will turn into solid ice.
3. They are all forms of precipitation that fall from the sky.
4. Examples of standing water are lakes and ponds.

Video Quiz (p. 17)

1. **Evaporation** occurs when liquid water changes into a gas.
2. **Clouds** form as a result of condensation.
3. The continual movement of water between earth and the atmosphere is the **water cycle**.
4. **Groundwater** is found beneath Earth's surface.
5. The oceans consist of **saltwater**.

Answer Key to Student Activities

Vocabulary (p. 18)

1. precipitation
2. freezing
3. oxygen
4. water cycle
5. natural resource
6. groundwater
7. freshwater
8. melting
9. saltwater

Water is a **natural resource** that is very important for life on Earth. Water is the result of hydrogen and **oxygen** combining. Water can exist in three different forms: solid, liquid, and gas. When water changes from a solid into a liquid, it is **melting**. The process of water becoming a solid is called **freezing**. Evaporation, condensation, and **precipitation** are the three stages that water goes through in the **water cycle**. There is a lot more **saltwater** on the earth than **freshwater**, which is what people and animals need to drink. Freshwater can be found not only in streams and rivers, but in the ground. This water is called **groundwater**.

The Water Cycle (p. 19)

1. Water from the bottom of the jar evaporates. When the water vapor comes in contact with the cooled plastic, it condenses forming water droplets. When the plastic is touched, water droplets fall symbolizing precipitation.
2. The ice cubes create a cool surface upon which water vapor condenses.
3. Water evaporating from puddles, the formation of clouds, and falling precipitation are all examples of the water cycle working around us.
4. While water is abundant on Earth, freshwater is less abundant. Readily accessible freshwater in some places such as deserts, is a valuable natural resource that needs to be conserved.

Water Trivia (p. 21)

Answers are provided following the questions.

Freshwater vs. Saltwater (p.22)

1. The saltwater tastes salty and may even look a little cloudy compared to the freshwater.
2. The wood block sat a little higher in the saltwater. This is because saltwater is a little denser than freshwater.
3. The egg sank in freshwater because freshwater is less dense than saltwater.
4. A ship will float slightly higher in saltwater because it is denser than freshwater. The increased density causes the boat to sit higher.
5. Saltwater in the oceans does freeze at a slightly lower temperature because the salt in it causes it to have a lower freezing point.

Aquifers (p. 24)

1. The different layers of sand, clay and gravel represent different layers in the earth. The water is trapped in the sand represents an aquifer.
2. Groundwater is water found beneath the surface of the earth.
3. Groundwater is commonly drawn from beneath the surface via wells drilled into the earth.
4. Harmful pollutants including chemicals and agricultural runoff spilled on the surface may seep down into the earth where it may eventually mix with groundwater.
5. Groundwater pollution can be prevented by not spilling pollutants on earth's surface, and also by not placing pollutants in old wells.

Pre-Test

Name _____

Write true or false next to each statement.

1. _____ We use water everyday.
2. _____ The chemical formula for water is NH_3 .
3. _____ Melting is the process of liquid water turning to water vapor.
4. _____ Rain, sleet, and snow are different examples of precipitation.
5. _____ The water cycle is constantly occurring all around us.

Write a short answer for each of the following.

6. In a few sentences, briefly describe the water cycle using the words: water source, evaporation, condensation, clouds and precipitation.

7. Describe two differences between freshwater and saltwater.

Circle the best answer for each of the following questions.

8. Water can exist as a solid, liquid, and a(n):
a. evaporation *b. atom* *c. gas* *d. rock*
9. Freezing is the process of liquid water changing into:
a. molecules *b. ice* *c. water vapor* *d. air*
10. The continual movement of water from Earth, to the atmosphere, and back to Earth is called the:
a. water cycle *b. solar system* *c. changing of states* *d. force of gravity*
11. The process of water vapor changing to liquid water is:
a. condensation *b. evaporation* *c. precipitation* *d. sublimation*
12. Water which lies below Earth's surface is called:
a. ice *b. groundwater* *c. polluted* *d. saltwater*

Post-Test

Name _____

Write true or false next to each statement.

- _____ Almost all living things need water to survive.
- _____ The chemical formula for water is H₂O.
- _____ Evaporation is the process of water vapor changing into liquid water.
- _____ About 25% of Earth is covered by water.
- _____ Lakes are examples of standing freshwater.

Write a short answer for each of the following.

6. Describe three ways you use freshwater everyday.

7. Use the terms: water source, evaporation, condensation, clouds, and precipitation to describe the different steps in the water cycle.

Circle the best answer for each of the following questions.

8. Water is made of two atoms of hydrogen and one atom of:

a. nitrogen

b. oxygen

c. helium

d. iron

9. Water in puddles eventually disappears due to:

a. evaporation

b. freezing

c. precipitation

d. condensation

10. Clouds form as a result of the process of:

a. evaporation

b. freezing

c. precipitation

d. condensation

11. Only about 3% of the earth's water is in the form of:

a. saltwater

b. freshwater

c. water vapor

d. snow

12. The oceans are made up of:

a. saltwater

b. water vapor

c. many large lakes

d. freshwater

Video Review

Name _____

While you watch the video, answer these questions:

You Decide!

1. How many times have you used water today?

You Predict!

2. What will happen to this glass of water if you put it in the freezer overnight?

You Compare!

3. What do rain, snow, sleet, and hail have in common?

You Decide!

4. What are some examples of standing water?

After you watch the video, test your knowledge with these questions.

1. _____ occurs when liquid water changes into a gas.
2. _____ form as a result of condensation.
3. The continual movement of water between earth and the atmosphere is the _____.
4. _____ is found beneath Earth's surface.
5. The oceans consist of _____.

Vocabulary

Name _____

Use these words to fill in the blanks next to the sentences below.

Words

precipitation natural resource groundwater freshwater water cycle
saltwater freezing oxygen melting

- _____ Water that falls to Earth's surface from clouds.
- _____ This is the process of water changing into ice.
- _____ This combined with two hydrogen atoms forms a water droplet.
- _____ Includes three steps: evaporation, condensation, and precipitation.
- _____ Anything that is taken from the earth and used by people.
- _____ Water that is stored below the surface of the earth.
- _____ The type of water found in rivers, lakes and streams and is used for drinking by people.
- _____ This is the process of water changing from a solid to liquid.
- _____ The most abundant type of water and is found in oceans.

Use the correct word from above to complete the sentences in the following paragraph.

Water is a _____ that is very important for life on Earth. Water is the result of hydrogen and _____ combining. Water can exist in three different forms: solid, liquid, and gas. When water changes from a solid into a liquid, it is _____. The process of water becoming a solid is called _____. Evaporation, condensation, and _____ are the three stages that water goes through in the _____. There is a lot more _____ on the earth than _____ which is what people and animals need to drink. Freshwater can be found not only in streams and rivers but in the ground. This water is called _____.

The Water Cycle

Name _____

Directions: Read the information, make the water cycle in the jar, and answer the questions on the following page.

Have you ever wondered where the water you brushed your teeth with this morning came from? Or have you ever wondered where rain goes once it hits Earth? Where does rain and snow come from? These questions can be answered by understanding the water cycle. Water covers about 70% of Earth's surface and surrounds us in the form of water vapor. Water is everywhere!

New water is not created but continuously cycled from place to place in different forms. The **water cycle** involves the continual movement of water from oceans and freshwater sources to the atmosphere, then eventually falling back to Earth in the form of rain, sleet, snow, or hail. Three main steps make up the water cycle. **Evaporation** is the process by which liquid water changes to water vapor. This commonly occurs over oceans, lakes, and rivers. Plants also give off water vapor. When water vapor rises into the atmosphere it cools and eventually condenses into clouds. **Condensation** is the process of water vapor changing into liquid water. Clouds are made up of millions of tiny water droplets. When these water droplets become too heavy, they fall in the form of precipitation. **Precipitation** is the process of water falling to Earth in the form of rain, snow, sleet or hail. When precipitation hits Earth it may flow across the land as **surface runoff**. Eventually, it collects in streams, rivers, lakes, or the ocean. Here it eventually evaporates, starting the water cycle all over again.



The Water Cycle

Name _____

Water cycle in a Jar:

Materials:

clear glass jar or plastic jar
plastic wrap
rubber band
hot tap water
ice cubes
pencil



Directions:

1. Fill the jar 1/3 full of very hot tap water (**Caution: Be Careful** – as a precaution, your instructor should fill the jars for you).
2. Put the plastic wrap over the mouth of the jar and secure it with a rubber band.
3. Place 2 ice cubes on top of the plastic wrap.
4. Observe the changes that occur over the next 10 to 15 minutes.
 - a. What is the cloudy layer forming on top of the jar?
 - b. Why does this layer form?
5. After 10 minutes observe the area under the plastic without lifting the jar.
6. Tap the top of the jar with a pencil. What happens to the water?

Questions:

1. How does this activity illustrate the water cycle? Use the terms evaporation, condensation, and precipitation in your answer.
2. What role did the ice cubes serve?
3. List two common everyday examples of the water cycle.
4. If the water cycle exists, why do we need to conserve water?

Water Trivia

Name _____

Materials: 30 index cards per group

Directions:

1. In small groups, study the list of water trivia questions.
2. On the front of each index card write one question from the questions list, and write the answer on the back of the card.
3. In your group, practice quizzing each other with the water trivia flashcards.
4. After practicing; your teacher will set up a water trivia bee. He/She will pose water trivia questions to each team. You can discuss the possible answers with you team before giving your final answer. Have fun!

Questions:

1. What is the total amount of water used to manufacture a new car, including new tires? (39,090 gallons/car or about 148,151 liters)
2. How many households use private wells for their water supply? (17,000,000 households)
3. Water is the only substance found on Earth naturally in three forms. (true - solid, liquid, gas)
4. Does water regulate the earth's temperature? (yes, it is a natural insulator)
5. How long can a person live without food? (more than a month)
6. How long can a person live without water? (approx. one week)
7. How much water must a person consume per day to maintain health? (2.5 quarts or about 2.4 liters from all sources, i.e. water and food)
8. How much water does a birch tree give off per day in evaporation? (70 gallons or about 265 liters)
9. How much water does an acre of corn give off per day in evaporation? (4,000 gallons or 15,160 liters)
10. How many miles of pipeline and aqueducts are in the USA and Canada? (approx. one million miles or enough to circle the earth 40 times)
11. What were the first water pipes made from in the USA? (fire charred bored logs)
12. How much water is used to flush a toilet? (2-7 gallons or about 7.6-26.5 liters)
13. How much water is used in the average five-minute shower? (25-50 gallons or about 95-189.5 liters)
14. How much water is used to brush your teeth? (2 gallons or about 7.6 liters)
15. How much water is used on the average for an automatic dishwasher? (9-12 gallons or 34- 45.5 liters)
16. On the average, how much water is used to hand wash dishes? (20 gallons or about 76 liters)
17. How many community public water systems are there in the United States? (56,000)
18. How much water does the average residence use during a year? (107,000 gallons or about 405,530 liters)
19. How much water does an individual use daily? (50 gallons or about 189.5 liters)
20. What does a person pay for water on a daily basis? (National average is 25 cents)
21. How much of the earth's surface is water? (about 70%)
22. Of all the earth's water, how much is ocean or seas? (97%)
23. How much of the earth's water is suitable for drinking water? (1%)
24. Is it possible for me to drink water that was part of the dinosaur era? (Yes)
25. How much does one gallon of water weigh? (8.34 pounds or 3.75kg)
26. How many gallons of water would it take to cover one square mile with one foot of water? (219 million gallons or about 830 million liters)
27. How much water is in one cubic foot? (7.84 gallons or about 29.7 liters)
28. What is the longest river in the world? (Nile River 6,671 km or about 4,136 miles)
29. How much of the human body is water? (66%)
30. How much of a tomato is water? (95%)
31. What is the wettest place on Earth? (Mount Waialeale, Hawaii 1,680cm or 655 inches rain/year)
31. What is the largest ocean? (Pacific Ocean)
32. What is the deepest lake? (Lake Baykal. 5,314 feet or 1,620 meters)
33. At what temperature in Celsius does water freeze? (0 degree Celsius)

Freshwater vs. Saltwater

Name _____

Over 70% of Earth's surface is covered by water. Oceans, lakes, streams, and rivers hold water on the surface. Perhaps you have had the chance to swim in a lake, as well as the ocean. If you have, then you know there are some big differences between these two different bodies of water. Lakes, ponds, rivers and streams contain freshwater. Our bodies need freshwater to survive. In fact, a large percentage of our body is made up of freshwater. Oceans are made up of saltwater. Where freshwater rivers gradually mix with salty ocean water, a mixture called brackish water forms. Let's take a look at some of the differences between freshwater and saltwater.

Materials:

2 tall glasses
tablespoon
salt
small piece of wood
permanent marker
egg

Directions:

1. Label one glass "freshwater" and the other "saltwater."
2. Fill each glass with equal amounts of water.
3. Place two tablespoons of salt in the glass labeled saltwater. Make sure you remember which glass contains the salt. Stir it for a couple of minutes.
4. Carefully study each of the glasses and record your observations in the data table.
5. Put your finger in the freshwater and taste it. Do the same with the saltwater. Record your observations of taste in the data table.
6. Take the small block of wood. Gently and slowly place it in the glass of freshwater. Mark a line on the side of the wood where the water touches it.
7. Place that same block of wood in the saltwater glass. Observe the location of the line compared to the water level. Record your observations in the data table.
8. With the egg on the spoon, gently lower it into the glass of freshwater. Record your observation.
9. Gently lower the egg into the saltwater. Record your observation.

Freshwater vs. Saltwater

Name _____

	Freshwater	Saltwater
Looks		
Smell		
Taste		
Wood block		
Egg		

Questions:

1. Compare the look, smell, and taste of saltwater and freshwater.
2. How did the wood block float in the saltwater compared to the freshwater? How can you explain the difference?
3. Why do you think the egg floated in the saltwater and not in the freshwater?
4. Do you think there is any truth to the statement that a ship will float higher in saltwater than in freshwater? Explain your reasoning.
5. Saltwater freezes at a lower temperature than freshwater. Why do you think this is the case?

Aquifers

Name _____

Many people throughout the world obtain their drinking water from underground sources called aquifers. An aquifer is an underground layer of rock or sediment that holds water. Many towns and cities may tap into large underground aquifers. Whereas individual homes in rural areas often drill a single well into an aquifer to obtain water.

Aquifers are recharged with water that seeps down from the surface. If harmful substances called pollutants are mixed in with groundwater, the aquifer may become polluted. If this occurs, the water drawn from the aquifer may cause health problems in people who drink the water. Create your own aquifer in a cup!

Materials per student team:

one wide, clear plastic cup
modeling clay
small pebbles (aquarium gravel works well)
light colored sand
glass of water
straw
food coloring

Directions:

1. Carefully pour about one centimeter or a little less than $\frac{1}{2}$ inch of sand into the bottom of the cup.
2. Slowly pour water on the sand until it is saturated. Make sure there is no water standing above the top of the sand.
3. Take the modeling clay and flatten it into a relatively thin, half circular disk.
4. Place the half circle of clay over the sand layer. Tightly press the clay against one side of the cup creating a seal. The clay represents an impermeable layer, also called a confining layer.
5. Slowly pour a little water onto the clay. Notice how some water stays on top of the clay, and some water flows into the sand below.
6. Next, pour a layer of small pebbles into the cup about $2\frac{1}{2}$ centimeters or one inch thick.
7. Now, pour a little more water over the pebbles. See how the water percolates through the pebbles. This adds to the amount of groundwater in the earth.
8. Take your straw and with a slow circular motion, place it through the different layers of earth in the glass until you hit the bottom.
9. Slowly sip from the straw until the water slowly comes up. **Stop** before the water gets near your lips. This represents a well drawing water from an aquifer.
10. Drip a few drops of food coloring next to the side of the cup. The food coloring represents pollution seeping into the earth. Watch it for several minutes as it slowly enters the aquifer.
11. After the food coloring has seeped to the bottom, slowly draw water up through the straw. **Stop** before it reaches your lips. What do you notice that is different about the color of the water? What does this mean about drinking water?

Aquifers

Name _____

Directions: Answer the questions below using the information given and your observations.

Questions:

1. Describe how your aquifer in a cup represents a real aquifer in the earth.

2. What is groundwater?

3. How is groundwater commonly taken from the ground?

4. What are some ways groundwater can become polluted?

5. How can the pollution of groundwater be prevented?