Chapter 4
Water Properties

6th grade – 12th grade

Chapter Objective

Students will learn about the many unique qualities of water through both scientific and artistic investigations.

Supported Standards

Supported Standards: Wisconsin Department of Public Instruction / Standards for Science / 2017

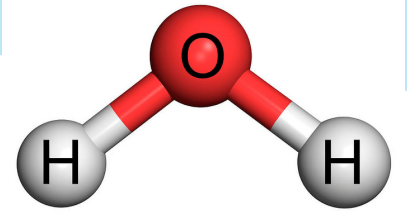
Standard SCI.LS2: Students use science and engineering practices, crosscutting concepts, and an understanding of interactions, energy, and dynamics within ecosystems to make sense of phenomena and solve problems.

Wisconsin Department of Public Instruction / Standards for Art and Design / 2019

Art and Design (AA)

Standard AA 1: CREATE—Students will generate, develop, and refine artistic work.

Standard AA 3: RESPOND—Students will critically interpret intent and meaning in order to evaluate artistic work. (1. Describe; 2. Analyze; 3. Interpret; 4. Inquire; or 5. Evaluate)



Water is a necessity for all life on Earth. It is present in the atmosphere, and is even present inside our bodies. We use it every day in everything we do.

The formula for water is H2O, which means that two hydrogen (H) atoms and one oxygen (O) atom combine to form one molecule of water. Water exists in three different states on Earth—solid (ice), liquid (water), and gas (water vapor/steam).

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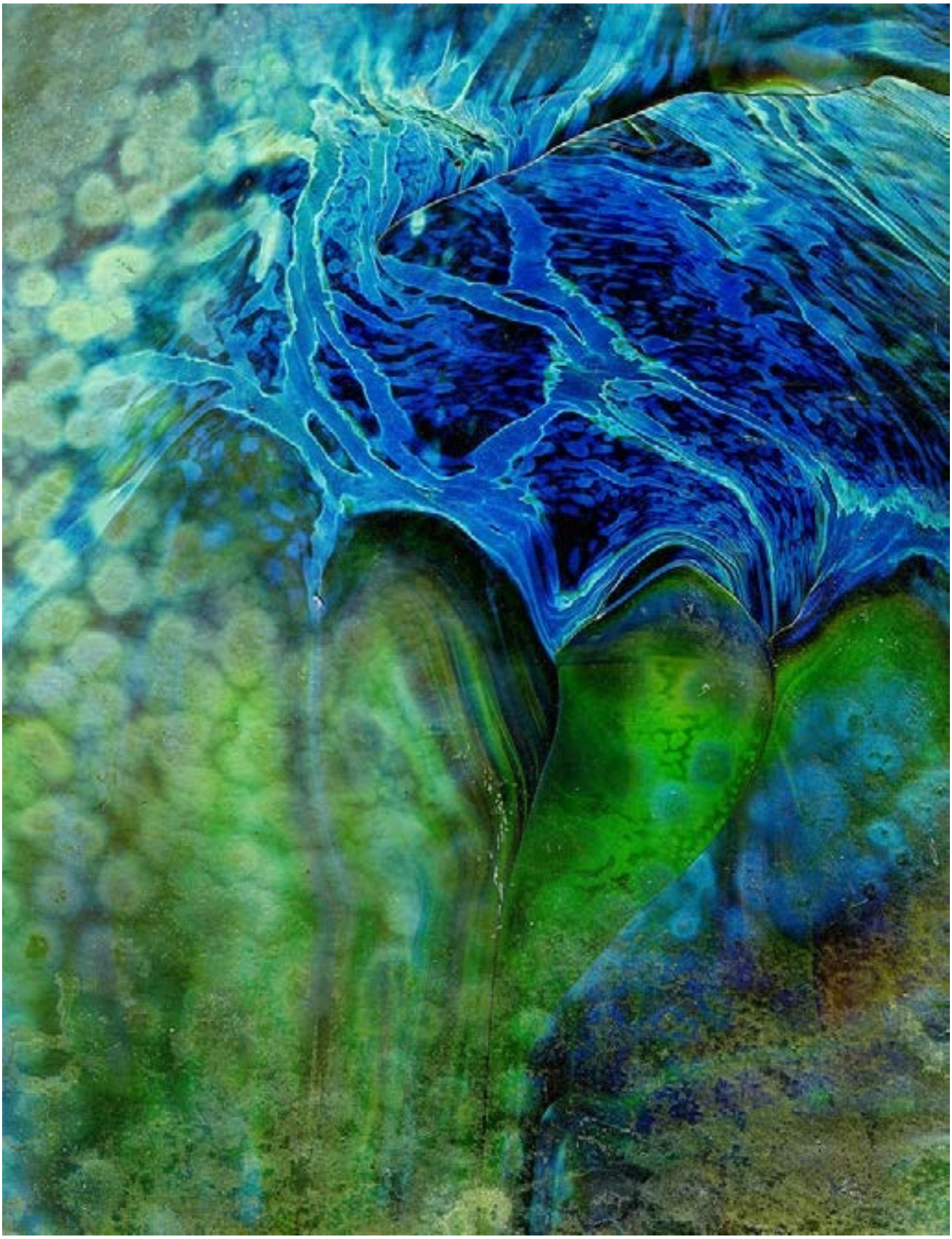
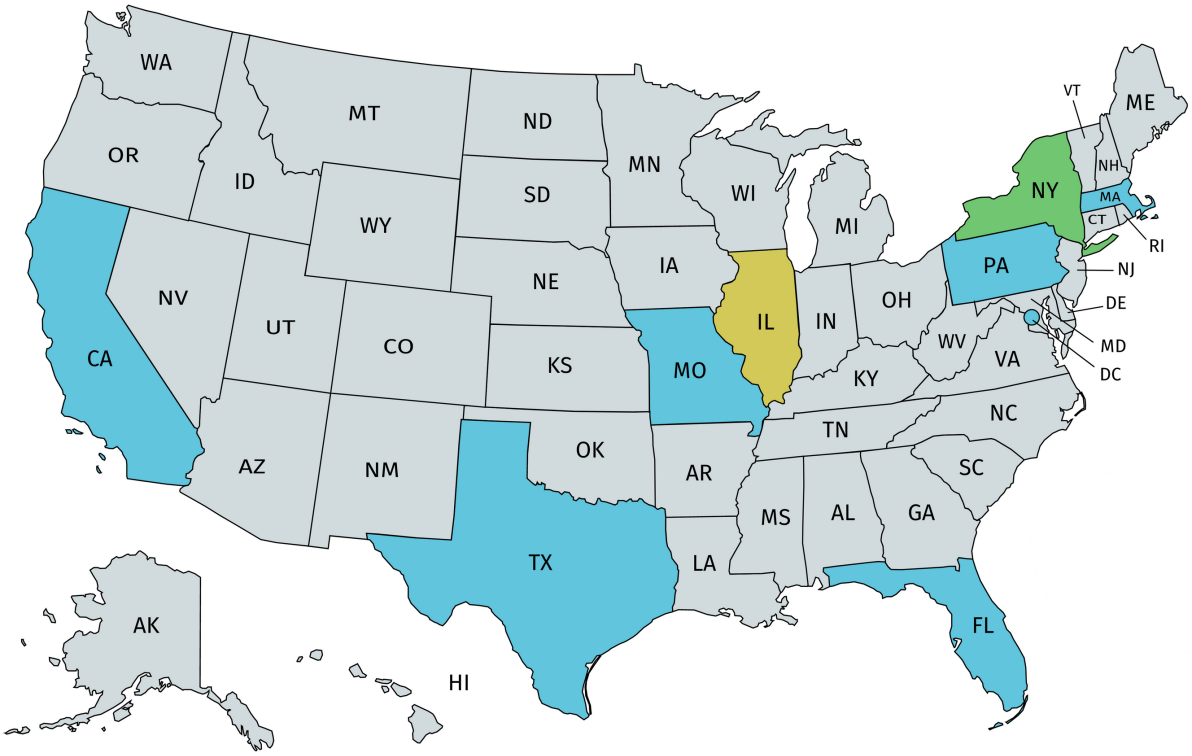


John D'Agostino (American, b. 1975), *The Arms of Undertow*, 2008. Digital print on canvas, 30 x 24 in (76.2 x 61 cm). Gift of the artist, Collection of the Haggerty Museum of Art, Marquette University, 2009.5.1.

Art in Context

Use this map with your students to explore John D'Agostino's life and work.



John D'Agostino was raised in Queens, New York, U.S.A.

D'Agostino received a B.S. from Northwestern University, Illinois, U.S.A.

Where in the U.S.A. is D'Agostino's art?

* What is an undertow? Why do you think D'Agostino titled his artwork *The Arms of Undertow*? Create your own undertow painting.

Roy Lichtenstein (American, 1923 – 1997), *Morton A. Mort*, 1980. Woodcut with embossing, 22 3/4 x 32 1/2 in(57.78 x 82.55 cm). Museum purchase with funds from Mrs. Jean Messmer in memory of Dr. Charles Clemens Messmer, Collection of the Haggerty Museum of Art, Marquette University, 2012.3.

Art in Context

Use this timeline with your students to explore Roy Lichtenstein's life and work.

1923

Roy Lichtenstein was born in New York City, New York, U.S.A., on October 27, 1923

1940

Lichtenstein studied painting and drawing at the Art Students League of New York with Reginald Marsh the summer before he studied at The Ohio State University.

1943–1945

Lichtenstein's studies were put on hold and he was drafted for WWII. He sketched throughout his time in Europe, seeing action in France, Belgium, and Germany as part of the infantry.

1946

Lichtenstein completed his BFA at The Ohio State University and was invited to join the faculty as an instructor.

1949

While teaching at The Ohio State University, Lichtenstein received his master's degree.

1960

September 1960, Lichtenstein became an assistant professor at Douglass College in New Brunswick, New Jersey.

1990

Lichtenstein created three major series involving his interest in solving pictorial problems.

1997

On September 29, 1997, Lichtenstein died in New York City, New York, U.S.A.

Learn more about Roy Lichtenstein using National Galleries Scotland's learning resource.

Watch this video to learn more about Lichtenstein here.

Frank Paulin (American, b. 1926), *New York (Central Park, man in boat)*, 1956. Gelatin silver print, 11 x 14 in (27.9 x 35.6 cm). Gift of Bruce and Silke Silverstein, Collection of the Haggerty Museum of Art, Marquette University, 2009.15.17.

Art in Context

Use this timeline with your students to explore Frank Paulin's life and work.

1926

Paulin was born in Pittsburgh, Pennsylvania, U.S.A., in 1926.

Fun Fact: A. A. Milne publishes his first collection of stories about Winnie-the-Pooh in 1926.

1942

Paulin joined Whitaker-Christiansen Studio based in Chicago at 16 years old as an apprentice in photography and fashion illustration.

1944

Paulin joined the army in 1944 and spent two years in Europe during WWII as a member of the Signal Corps. While in Germany, he took photographs of the wartime devastation.

1946

Paulin enrolled at the Institute of Design in Chicago in 1946. By the end of the 1950s he also studied at the New School in New York under the art director Alexey Brodovitch.

1953

Paulin continued work as a freelance fashion illustrator in New York. Most of his time was spent with work, so he walked the streets at night and became interested in street and documentary photography.

1957

Paulin's first solo show was held at the iconic Limelight Gallery.

2003

A book was published about Frank Paulin titled *Frank Paulin: Out of the Limelight* by author Max Kozloff and contributed to by Massimo Vignelli. The book features his artwork created over four decades.

Frank Paulin's work has been exhibited in many well-known institutions, such as the Milwaukee Art Museum, Museum of Modern Art, Whitney Museum of American Art, and the Yale University Art Gallery.

Watch this interview with Frank Paulin to learn more about his work here.

Barbara Morgan (American, 1900 – 1992), *Mono Lake*, 1931. Woodcut, 10 5/8 x 13 in (26.99 x 33.02 cm). Gift of Lloyd and Janet Morgan, Collection of the Haggerty Museum of Art, Marquette University, 91.3.70.

Art in Context

Barbara Morgan features Mono Lake in a few of her artworks. Mono Lake is a saline soda lake in Mono County, California.

Click here to learn more about the chemistry of Mono Lake.

Watch an interview with the Morgan by Barbaralee Diamonstein-Spielvogel, for the television program "Visions and Images: American Photographers on Photography", 1981.

Experience and Explore

Narrative Storyboard Activity

Warm up: Art is often used to narrate a story. Have students use the Narrative Storyboard worksheet on the next page to create a narrative using Paulin's *New York (Central Park, man in boat)*, 1956.

Make It Personal

Water has many interesting properties:

- Water clings to itself! Water molecules are attracted to one another through cohesion.
- Water is called a polar (like +/- poles of a magnet) compound because it contains oxygen, which holds electrons within a molecule tighter than most other elements.
- Water takes up space. Liquid water takes on the shape of its container. It may look different in a tall thin vase as compared to the same water spilled in a flat puddle, but the volume of the liquid stays the same.
- Water has weight, and the weight of water is responsible for water pressure.
- The way water molecules are attracted to each other and form a bond creates a skin-like barrier between air and the water molecules below called surface tension.
- Solids respond differently when mixed with liquid water. While some dissolve, like sugar and salt, others stay separate, like sand or butter. When substances combine to form a uniform mixture, they are called a solution.

Explore solutions in your classroom with the "To Dissolve or Not To Dissolve" lesson plan here.

Narrative Storyboard Worksheet

Use your imagination to create a narrative around the artwork. What happened before, what happens next?

Beginning	Middle	End
		

Draw images in the large squares, and write descriptions of each part of your story in the rectangles.

Frank Paulin (American, b. 1926), *New York (Central Park, man in boat)*, 1956. Gelatin silver print, 11 x 14 in (27.9 x 35.6 cm). Gift of Bruce and Silke Silverstein, Collection of the Haggerty Museum of Art, Marquette University, 2009.15.17.

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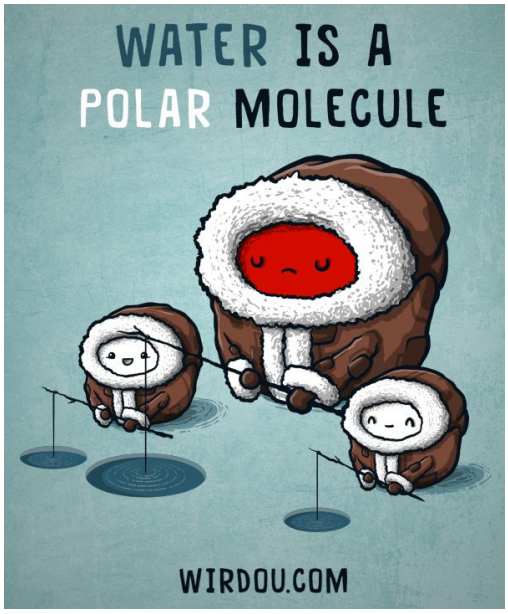
Focusing In Activity

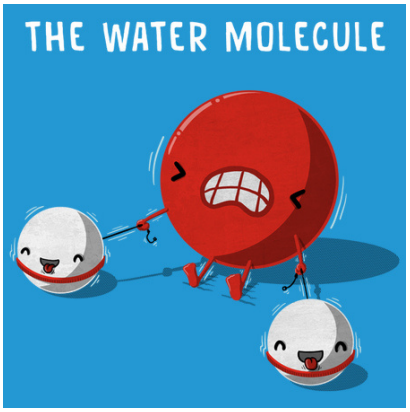
Give students time to look at examples of how scientists depict a water molecule with a partner (page 1).

Next look at some pop culture depictions of a water molecule. Discuss similarities and differences in scientific renderings as a class.

Students will then create their own cartoon version of WATER with a partner, OR do the roll a Water Drop Elf activity on page 15 with your students.

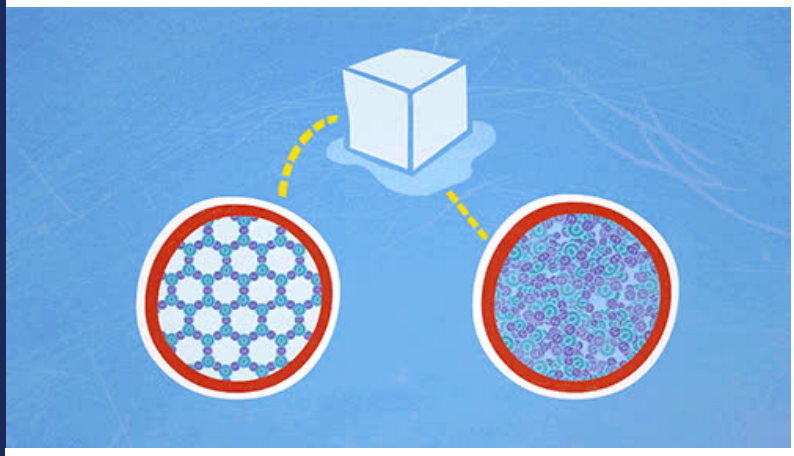
How will you display the final cartoons in your classroom?





Fun Fact

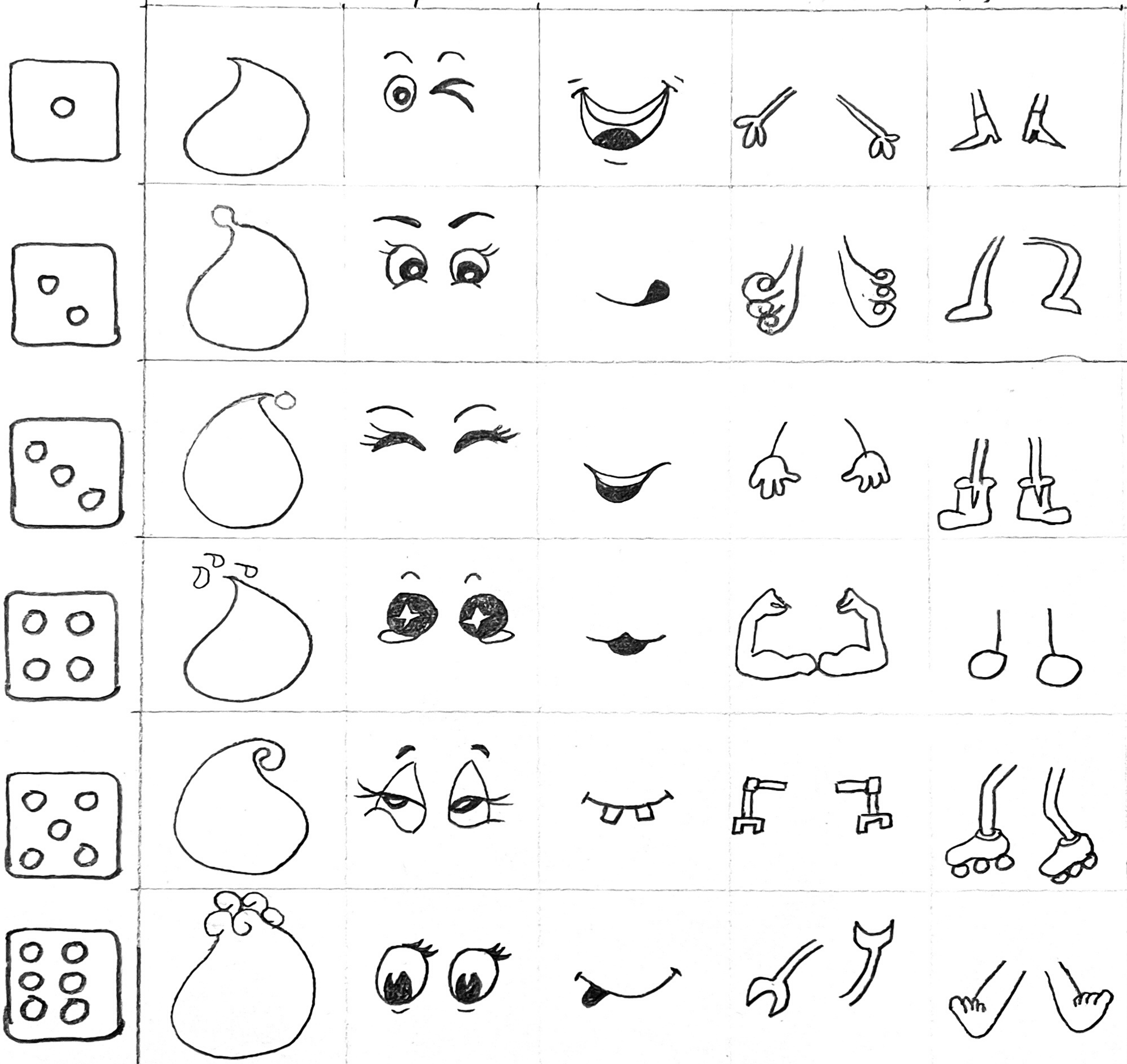
Because water is less dense in its solid state than in its liquid state, ice floats on water. When water solidifies, it forms an open crystalline lattice causing it to take up more volume than the same number of water molecules that randomly tumble together when water is in its liquid form. This is a unique property of water because, for most other pure substances, solids are heavier than liquids.



Click here to see the above image as an animated gif and compare with John D'Agostino, *The Arms of Undertow*, 2008.

Water Drop Elf

1st Roll	2nd Roll	3rd Roll	4th Roll	5th Roll
bodies	eyes	mouths	arms	feet



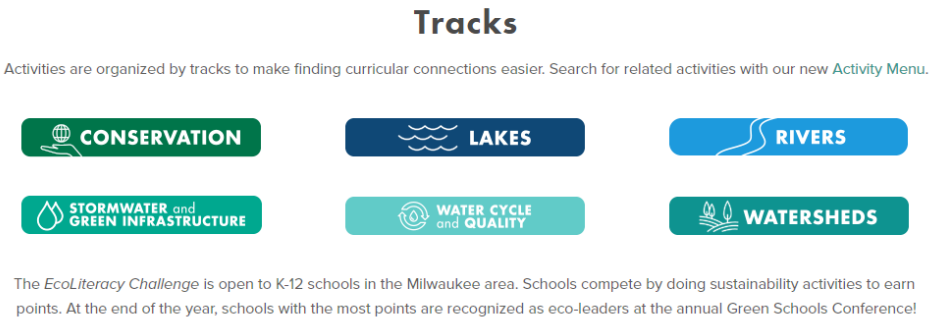
Ask a local expert!

In nature, water is never totally pure. Why? Ask a local expert! Send Mike Dollhopf, Marquette University Water Quality Center, an email at michael.dollhopf@marquette.edu to find out.

Engage and Take Action

EcoLiteracy Challenge

Join the EcoLiteracy challenge with your students or school here.



Deep Dives

Check out a "Properties of Water" lesson plan (5th-7th grade).

Learn more about molecules with Britannica Kids here.

Explore "Water Properties and Facts You Should Know" here.

Ride the Wave

Lessons can be scaffolded to meet the needs of any grade level.

Choose to do one lesson, or all three! Visit the Haggerty Museum of Art's Educators webpage to get started.

Essential Questions:

- What is abstract art?
- How is water depicted in abstract art?