



Smithsonian

All About Water

TCM | Teacher
Created
Materials

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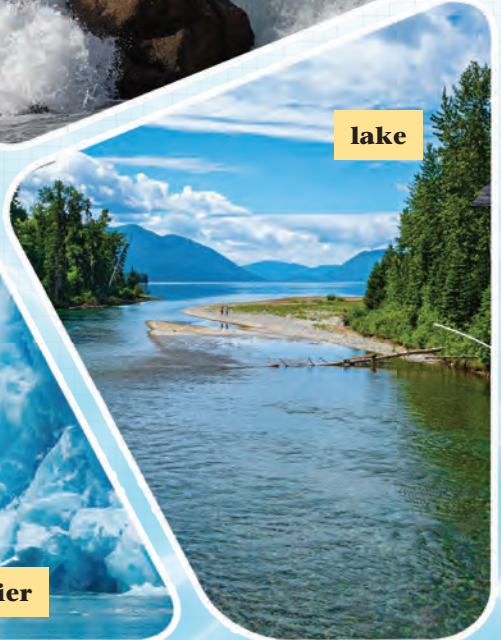
For Review Only

Water, Water, Everywhere

Can you think of one thing that all humans, plants, and animals have in common? Here's a hint: all three need a substance that has no color, taste, or smell.

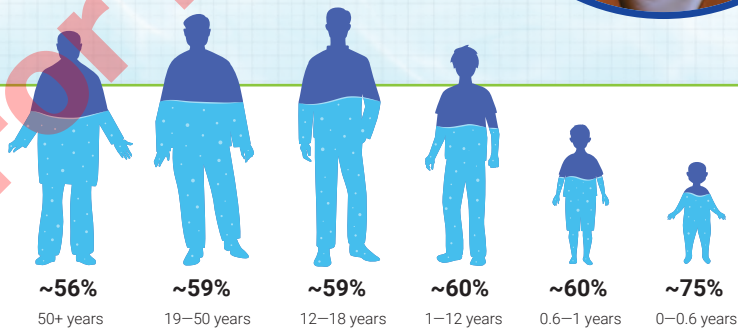
If you guessed *water*, you're right! Most organisms need water to survive. Water is the reason why life can exist on our planet. Many organisms would not be able to function without it.

Around 71 percent of Earth's surface is covered in water. Most of that is salt water, which is the water that makes up our oceans. But fresh water also exists across our planet. Glaciers, lakes, rivers, and more contain fresh water.



Water is a unique substance in nature. It has special properties and behaviors. Water exists in three different states of matter: liquid, solid, and gas. A process called *the water cycle* explains how water moves around Earth. Water is the reason why we experience clouds, rain, snow, and fog. Water also plays a part in shaping landscapes through processes including **erosion**.

Water has countless uses around the world. Scientists have developed ways to turn fresh water into different kinds of drinking water. People use water to cook, clean, bathe, water their plants, and more. In places where fresh water is not readily available, people have special methods of collecting or purifying water. Let's dive in and learn all about water!



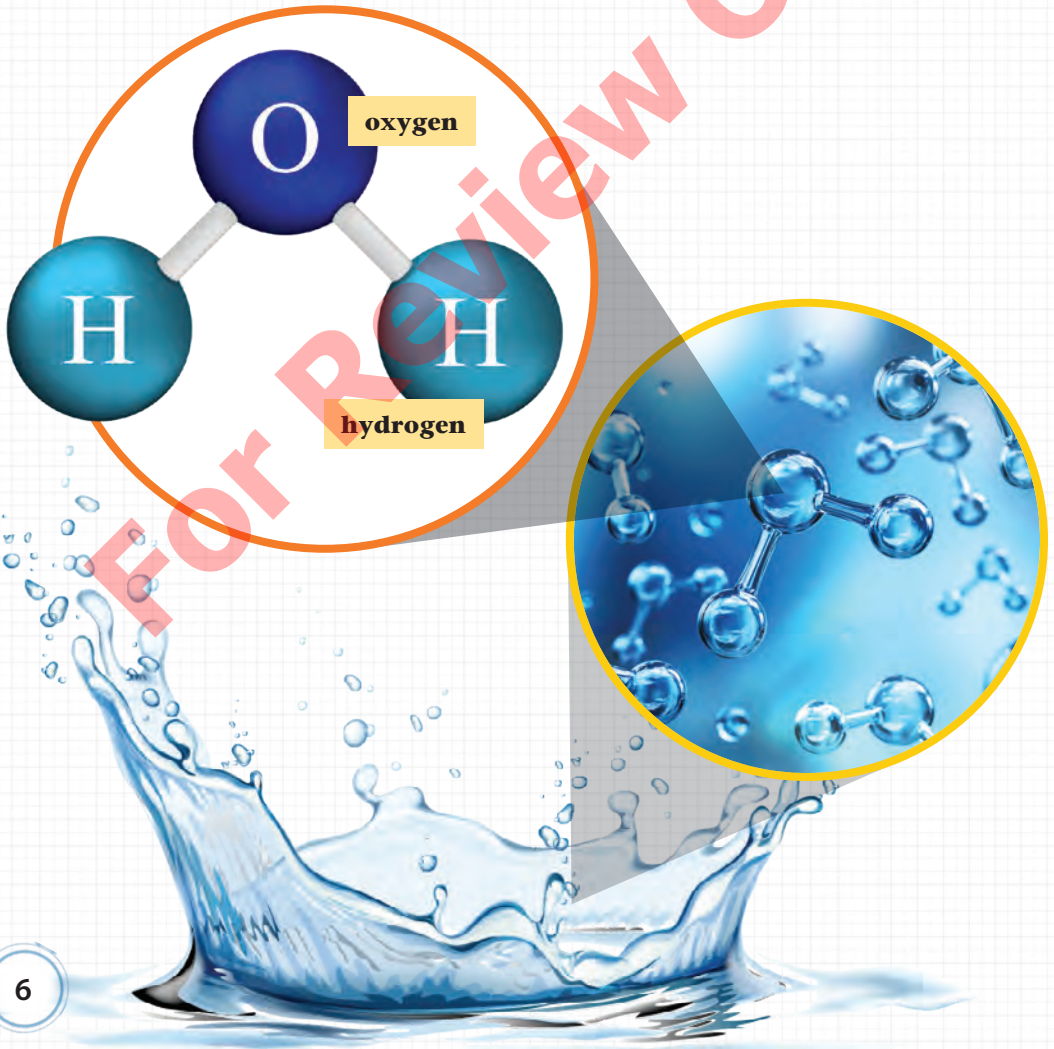
The Stats

All living organisms are made up largely of water. Human babies are about 75 percent water. As they get older, the amount of water that makes up their bodies decreases. Adults are made up of about 55 to 65 percent water. Water is essential for human bodies to function.

Small Wonder

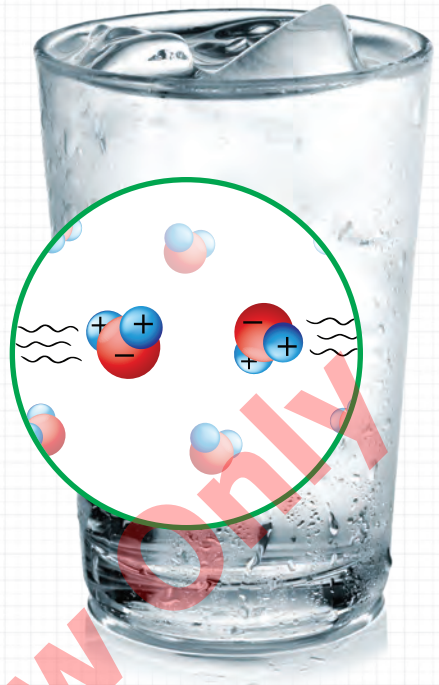
By examining a single water molecule, we can understand what it is made of and why it acts the way it does. Every molecule of water is made up of two elements called *hydrogen* and *oxygen*. Two hydrogen atoms and one oxygen atom combine to form a water molecule. Have you ever seen the symbol H_2O ? This is the chemical formula for water. It represents two hydrogen atoms and one oxygen atom.

Water molecules are incredibly small. In the tiniest drop of water, there are billions of water molecules. This is true for every type of water: fresh water, salt water, or **purified** water.



Behavior

Particles inside the atoms of water molecules have electrical charges that affect how water behaves. The two hydrogen atoms have positive charges. The oxygen atom has a negative charge. Together, these charges act like a magnet. This makes water molecules cohesive, meaning they are attracted to one another. So, in large quantities, such as a bathtub, lake, or ocean, water functions as a whole. It moves together in large or small waves.

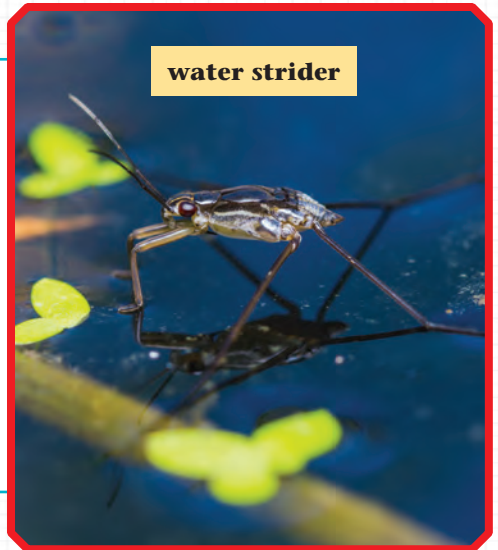


Water molecules are also adhesive. This means that they are drawn to different molecules. This is why water clings to some surfaces. For example, water can collect on the sides of drinking glasses.

Surface Tension

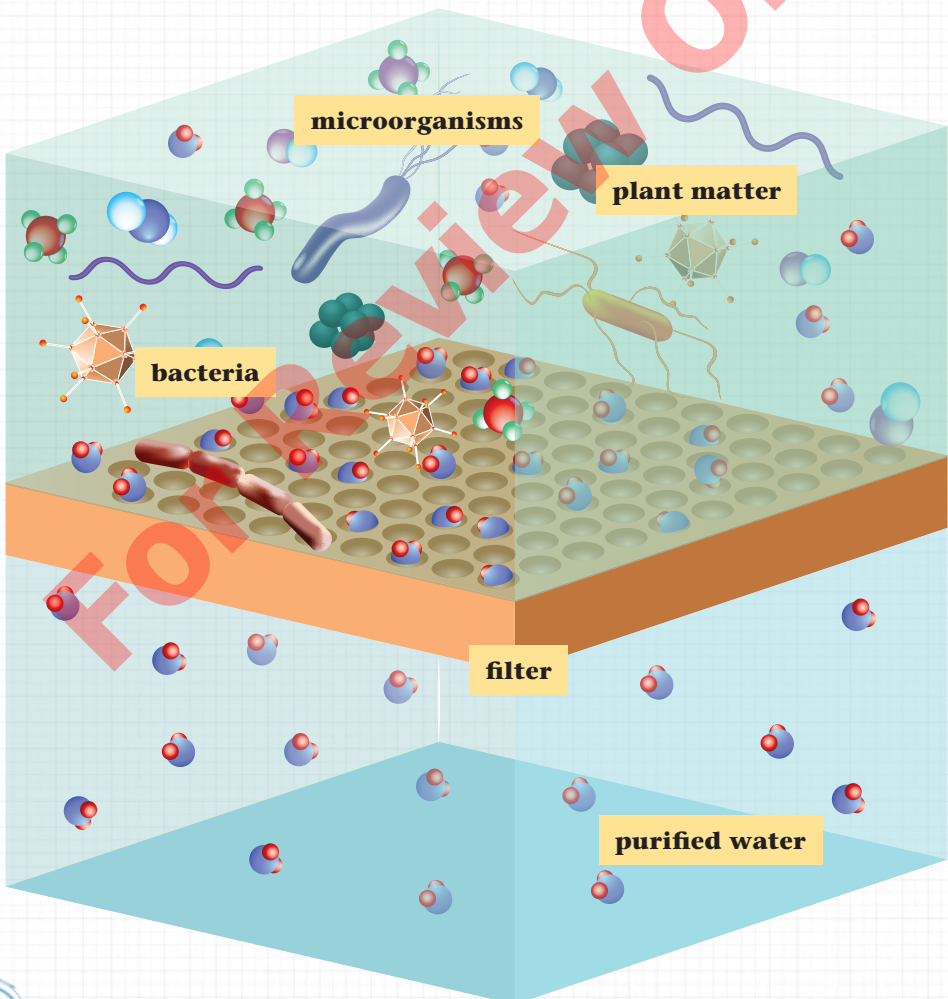
Water has a high surface tension, which means the surface of water is strong. When air is above the water's surface, water molecules only pull down and sideways. This creates resistance, which supports small objects that would usually sink. Thanks to surface tension, tiny insects can rest on top of water.


water strider



Taste and Smell

Pour yourself a glass of water, and take a sip. Do you taste anything? Then, take a whiff of it. Do you smell anything? If you have a glass of purified water, you won't be able to taste or smell anything. But if you have a glass of river water, ocean water, or pond water, that might be a different story. Some fresh water and ocean water sources may contain other substances. Sediment, plant matter, or **microorganisms** may be in these water sources. These substances can affect taste and smell. But in filtered water, all these substances are removed.





Ponds are bodies of water that are smaller than lakes.

Solvent

Water is sometimes called the *universal solvent*. A solvent breaks down and dissolves other substances. Water has the unique property of being able to dissolve more substances than any other liquid on Earth. This is helpful for all life on Earth. Water can dissolve and transport **chemicals**, nutrients, and minerals that are necessary for survival. For example, in the human body, kidneys filter substances from recently eaten food and drinks. Water carries these waste products out of the body.

Not every substance mixes well with water. For example, oil does not combine with water. No matter how hard you shake or stir the mixture, the two substances will separate once you stop.

FUN FACT

Bubbly drinks, such as sodas, are created by adding carbon dioxide gas to water. When the gas is added to water, it creates tiny bubbles. These bubbles fizz and rise to the surface of the drink. They give drinks like sodas their sharp, bubbly taste.



STEAM CHALLENGE

Define the Problem

In our global economy, about one trillion dollars' worth of food is wasted annually. Much of this loss is caused by food spoiling or melting during transportation. Food scientists want to develop more efficient, temperature-controlled storage methods. Your task is to develop a model food storage unit. It should allow frozen items to maintain a frozen state, preventing spoilage or melting.



Constraints: You may only use the materials that are provided to you.



Criteria: Your model food storage unit must be able to open and close for convenience. It must be no larger than 0.6 meters (2 feet) wide and tall. Ice cubes must stay frozen for an extended period inside the unit while it is placed under a heat lamp. You must also have a water collection cup under the ice compartment to collect and measure any runoff.



CAREER ADVICE

from Smithsonian

Do you want to work with water?

Here are some tips to keep in mind for the future.

"Start exploring life in your area, whether it's a local pond, a woodland, or the nearest coastline. Participate in local clean-up projects to learn about the oceans firsthand."

– Dr. Aaron O’Dea, Staff Scientist,
Smithsonian Tropical Research Institute

"A great way to learn is outside the classroom! Learn about the water cycle—it’s the journey water takes to reach your tap. Visit aquariums and marine parks to see marine biology in action."

– Dr. Erin Dillon, Postdoctoral Researcher,
Smithsonian Tropical Research Institute



Read and Respond

1. How do you use water in your everyday life?
2. Where are fresh water and salt water found on Earth?
3. What are the three states of water, and how do they differ?
4. How does the water cycle work?
5. Why is it important to conserve water?
6. What might happen if people experience water scarcity? Explain your thinking.

