

UNDERSTANDING **Water**

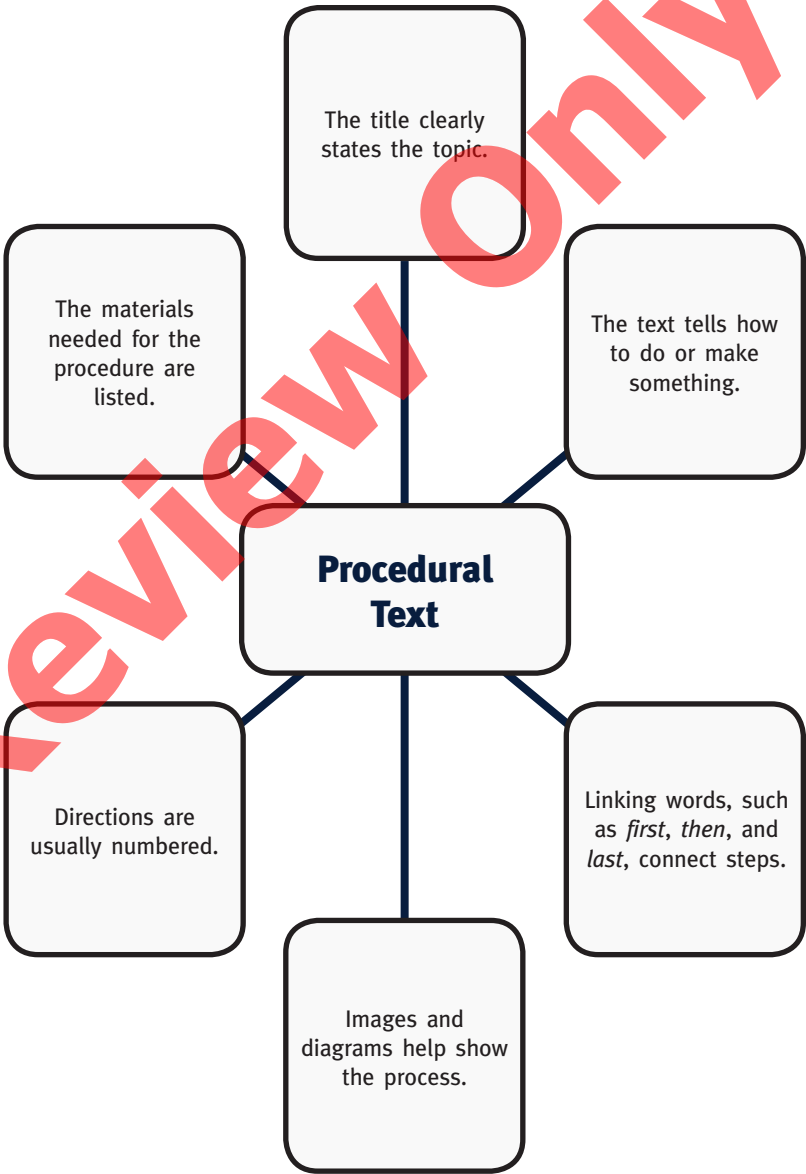
by Kimberly Feltes Taylor

How can people
get enough clean
drinking water
to survive?

Level	V/60
Lexile®	940L

Procedural Text

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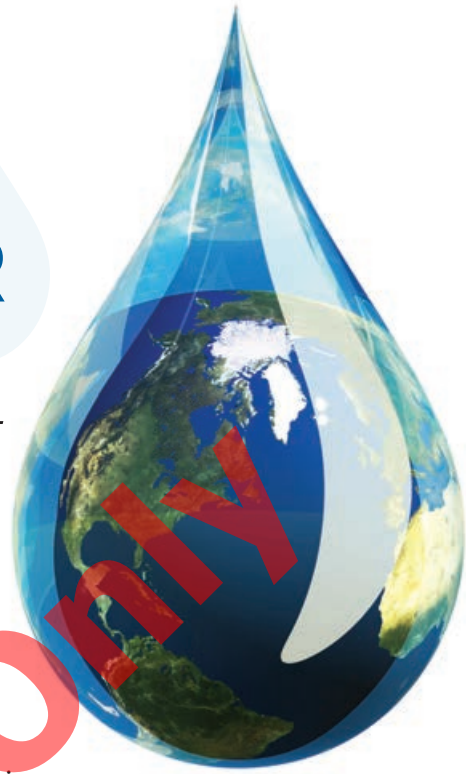
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W A T E R

— Essential to Life —



All living things need water to survive. Up to 60 percent of an adult human body is water. The human brain is more than 70 percent water, and the human lungs are more than 80 percent water. The human body relies on water to carry minerals to all the cells and carry dangerous toxins out of the body. Although human beings can survive for several weeks without food, the average human can only survive a few days without water. Water is essential to survival.

If a person does not have access to clean, fresh drinking water, then that person can experience certain health problems. In some parts of the world, drinkable water is difficult to obtain. During times of drought, water can be in short supply. After major storms or earthquakes, water supplies can be contaminated. When drinkable water is scarce, people's health suffers.

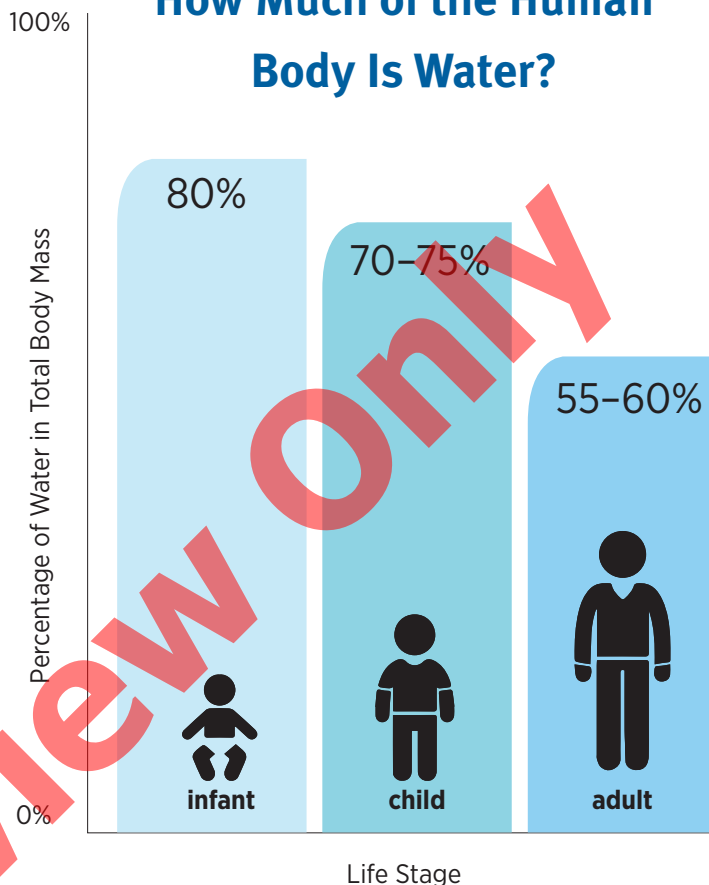
Many hikers carry bottles of safe drinking water. If not, they must filter or sterilize water they find before it is safe for drinking.



What happens when a person runs out of water? What types of water are safe for humans to drink? Can a person drink any water found in a lake, river, or stream?

This book takes an in-depth look at how water moves through Earth's atmosphere. This book considers the differences between **fresh water** and **salt water** and how people can remove, or extract, salt from salt water in order to make water safe to drink. Lastly, this book includes several activities and experiments you can conduct to explore water, salt water, and drinkable water.

How Much of the Human Body Is Water?



▲ Humans have different levels of water in their bodies, depending on age.

From the Source: How Much Water Do Humans Need?

According to the National Academies of Science, Engineering, and Medicine, the average adult should get about 2 liters (about 0.5 gallon) of water each day. Some of this water can be obtained from food. Getting less water than this can cause dehydration. This is because the average adult excretes, or releases, about 2.5 liters (about 2/3 of a gallon) of water every day.



◀ Two liters of water is equal to about eight 8-ounce cups of water.

8 cups

WATER BASICS

Water is a colorless, odorless liquid that covers nearly three quarters of Earth's surface. Water only has a taste if it contains a high salt or mineral content. All seven of Earth's oceans contain salt water. Fresh water can be found in rivers and lakes, frozen in glaciers and icebergs, and in other sources. In addition, fresh water is constantly cycling through Earth's atmosphere as water vapor, clouds, and precipitation.

▲ **Water exists naturally on Earth in all three states: solid (ice), liquid, and gas (water vapor).**

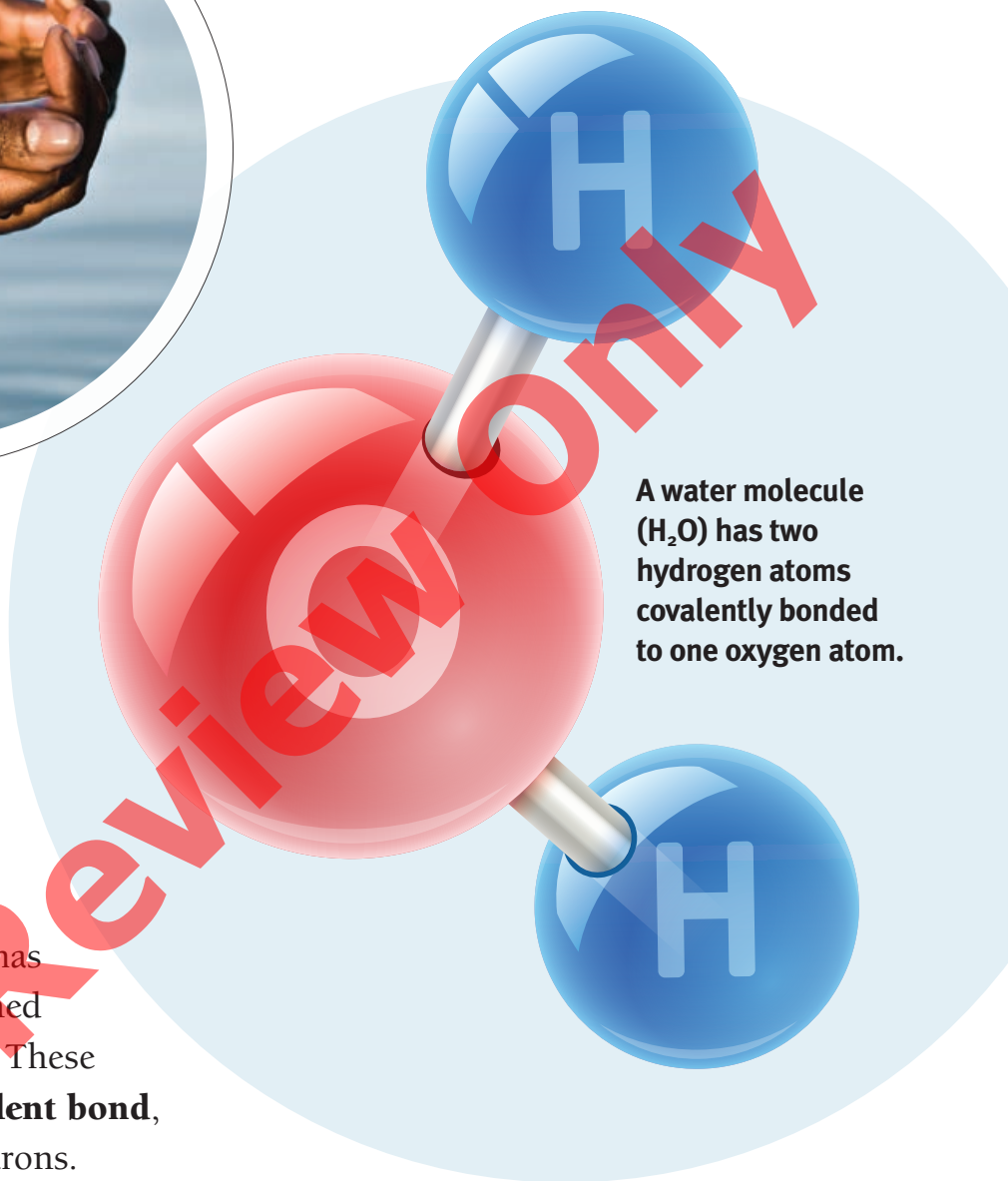
Because all living things need water to survive, water is a precious resource. Water supports plant and animal life, but it can also corrode the hardest steel, erode massive rocks, and more. Furthermore, most water in its natural state can be unsafe for people to drink. This is either because of its salt content or because of bacteria and other microorganisms that live in water that can harm people.



The Structure of Water

All of water's properties are due to its molecular structure. Each molecule of water has two hydrogen atoms joined to a single oxygen atom. These three atoms form a **covalent bond**, meaning they share electrons.

Because of the way the atoms bond, the oxygen atom has a slightly negative charge and the hydrogen ends of the molecule have a slightly positive charge. This causes the hydrogen atoms in one water molecule to be attracted to the oxygen atoms in other water molecules.



This makes water an extremely stable substance. It also gives water the ability to **dissolve** other substances, like sugars and salts, with ease. This is why water is known as the universal **solvent**.



The Water Cycle

Water is always moving through the air, land, and sea and through the bodies of living things. The water that comes out of the faucet will soon flow back into the ground, into streams, and into the ocean. It will eventually evaporate back into the air and then fall to the ground as rain, snow, hail, or sleet. This continuous process is called the water cycle. The water cycle has no starting or ending points.

The sun heats water on Earth and causes some water to **evaporate**, or turn into vapor. Water evaporates from oceans, lakes, rivers, and streams. It also evaporates from soil and transpires from trees and plants, releasing water vapor back into the air.

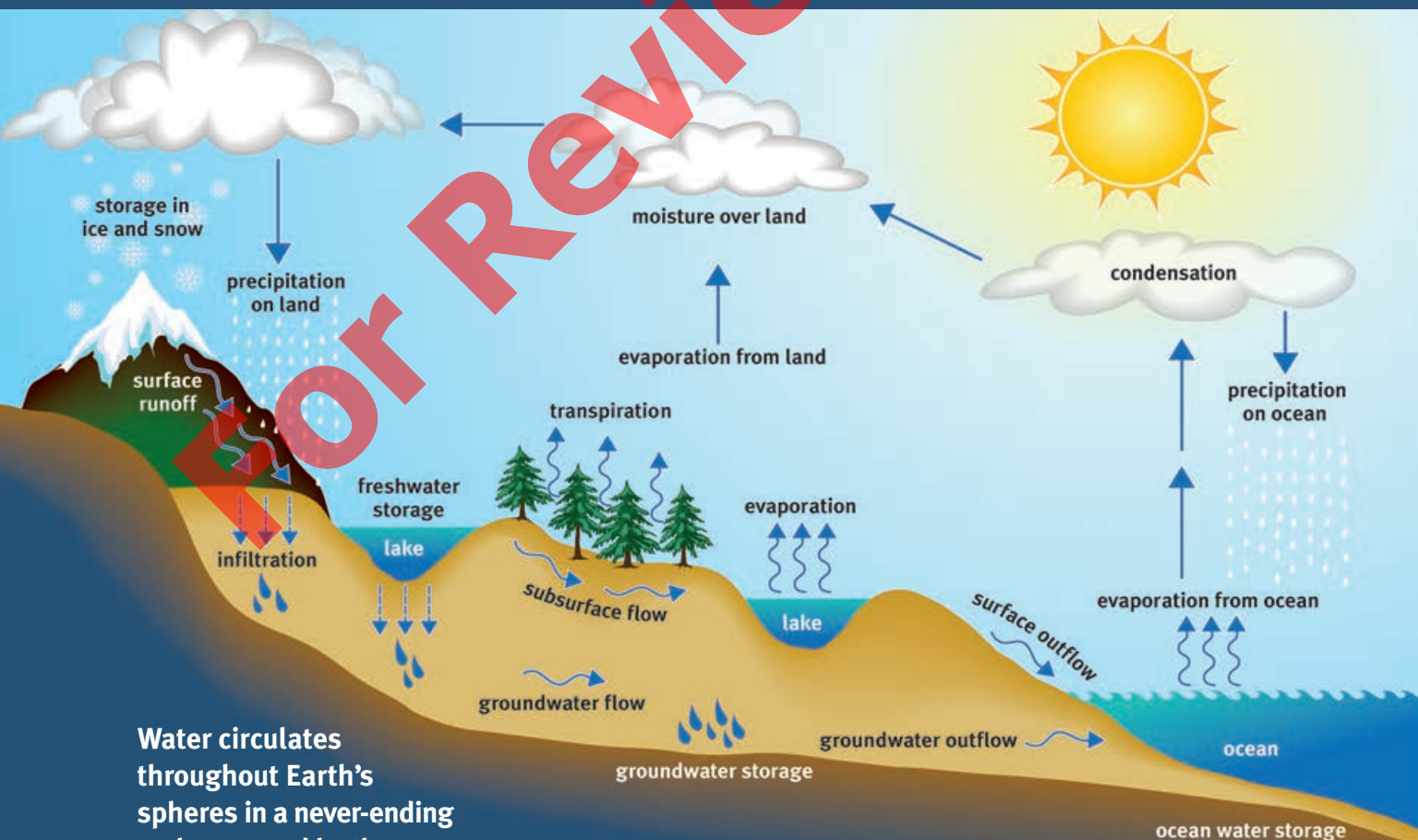
As water vapor rises, it cools, causing **condensation**. The water vapor condenses into tiny water droplets, and these form clouds in the atmosphere.

The **density** of water droplets in the atmosphere builds up until Earth's gravity pulls the water back to Earth as **precipitation**. Depending on the air temperature, precipitation falls as rain, sleet, snow, or hail. Some precipitation falls directly into bodies of water. Other precipitation falls on land, where the water is absorbed by the soil or flows as **runoff** into various bodies of water. In certain climates, falling snow adds to glaciers. Glaciers also melt, releasing fresh water into the ocean, rivers, or groundwater.



The water cycle is the process by which water moves through Earth's lithosphere (Earth's outer shell), atmosphere (gaseous layer that surrounds Earth), and biosphere (all living things on Earth). The total amount of Earth's water is about 1.2 billion trillion liters (326 million trillion gallons). The amount of water on Earth never decreases or increases as water moves through the water cycle. However, different bodies of water can shrink or expand.

The Water Cycle



Water circulates throughout Earth's spheres in a never-ending cycle powered by the sun.

Fresh Water Versus Salt Water

Because of water’s unique ability to be a solvent, different things can dissolve in it. One common mineral that dissolves in water is salt. Around the world, there are bodies of water that contain significant amounts of salt. Salt water—as the name suggests—has a much higher level of **salinity** than fresh water. Fresh water may contain traces of salt, but the world’s oceans are an average of 3.5 percent salt.

There are other differences between fresh water and salt water. Salt water has a lower freezing point. Fresh water freezes at 0 degrees Celsius (32 degrees Fahrenheit), and salt water freezes at about –2 degrees Celsius (28.4 degrees Fahrenheit). Salt water also has a higher density than fresh water. A cup of salt water has more mass than a cup of fresh water—because the cup of salt water has the water plus the dissolved salt. Because salt water is denser, it has more **buoyancy** than fresh water. An object that sinks in fresh water may float on salt water.

Four Bodies of Water by Salinity (Examples of Bodies of Water with High Salinity Levels)



▼ a swimmer floating in the Dead Sea



Great Salt Lake, United States

27%*

The Dead Sea

The Dead Sea is in the Middle East and surrounded by the countries of Israel and Jordan. It is one of the saltiest bodies of water on Earth. People can float in it without any effort.

Pacific Ocean

3.5%

*Some parts of the Great Salt Lake have a salinity as low as 6 percent.