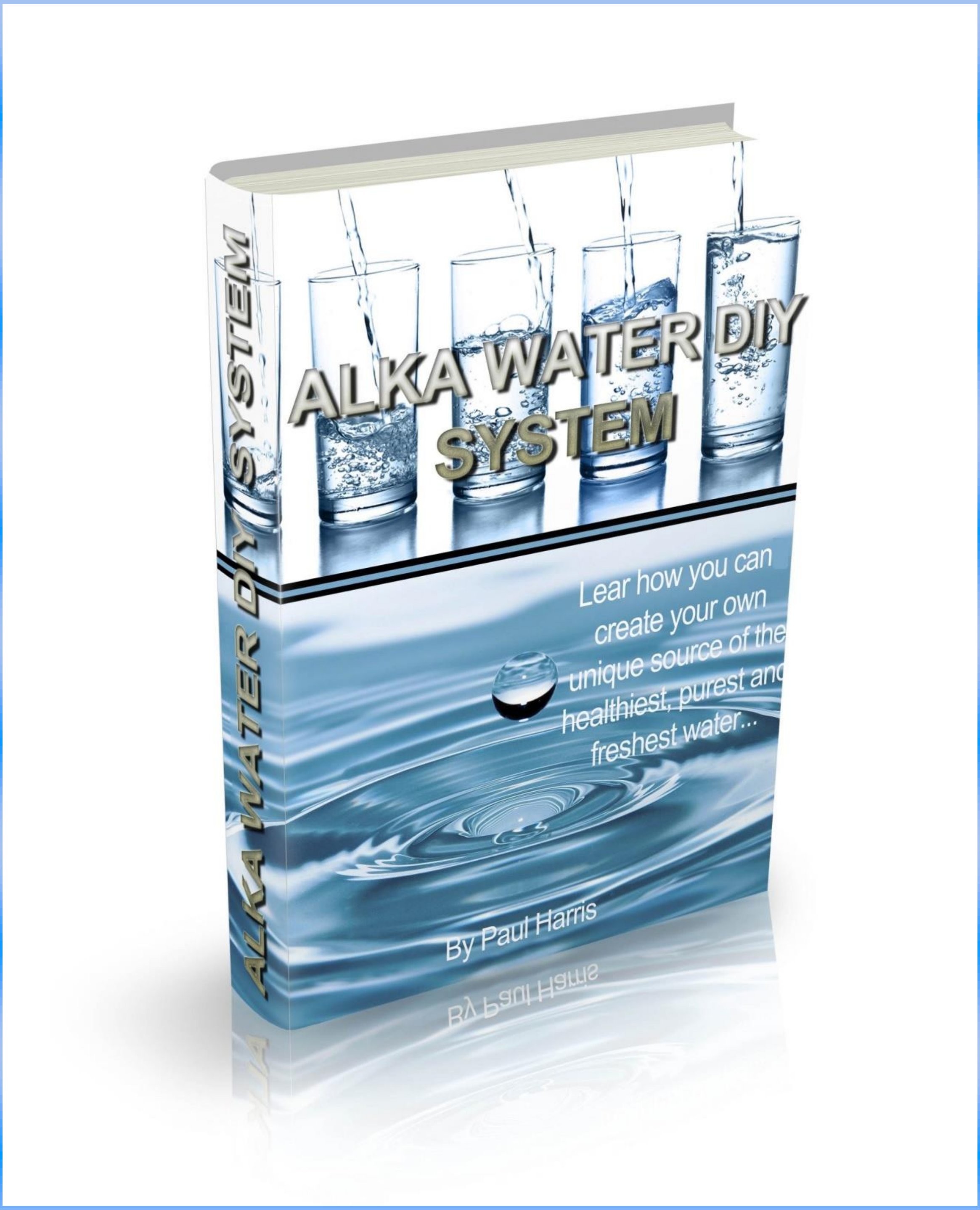
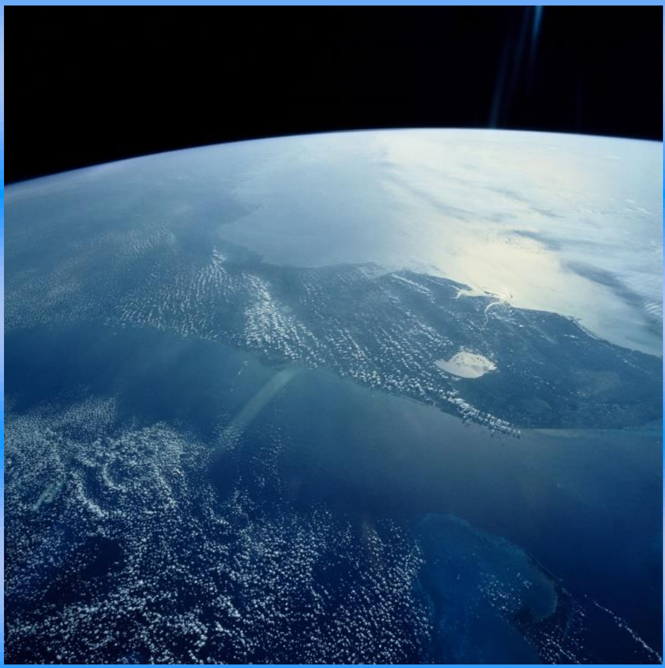
ALKA WATER DIY



The science of water

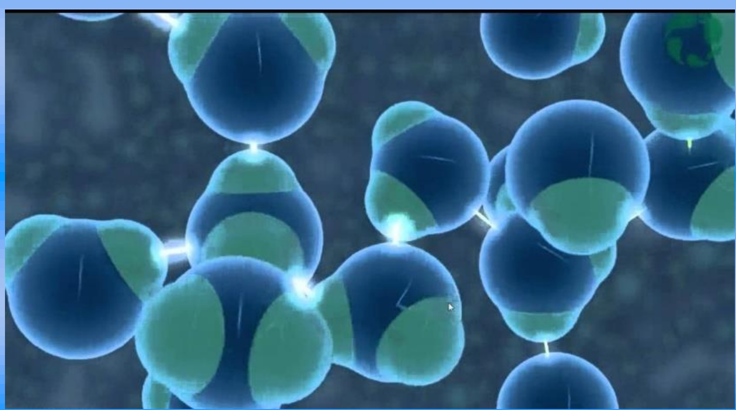
Pour yourself a glass of water and you could be drinking some of the same molecules that passed through the lips of Julius Caesar, Joan of Arc, Martin Luther King, or Adolf Hitler. Indeed, since the human body is about 60 percent water you might even be drinking a tiny part of one of those people! Water is one of the most amazing things about Earth; without it, there would be no life and our planet would be a completely different place. One of the truly amazing things about water is that it's never used up: it's just recycled over and over again, constantly moving between the plants, animals, rivers, and seas on Earth's surface and the atmosphere up above. Let's take a look at this life-giving liquid and find out what makes it so special!

What is water?



We can answer that question in many different ways. Water is what wets windows when it rains, what we drink when we feel thirsty, and what covers about 70% of Earth's surface. But what exactly is it?

Chemically speaking, water is a liquid substance made of molecules—a single, large drop of water weighing 0.1g contains about 3 billion trillion (3,000,000,000,000,000,000,000) of them! Each molecule of water is made up of three atoms: two hydrogen atoms locked in a sort of triangle with one oxygen atom—giving us the famous chemical formula H2O. The slightly imbalanced structure of water molecules means they attract and stick to many different substances. That's also why all kinds of things will dissolve in water, which is sometimes called a "universal solvent". Water can even dissolve the solid rocks from which our planet is made, though the process does take many years, decades, or even centuries.

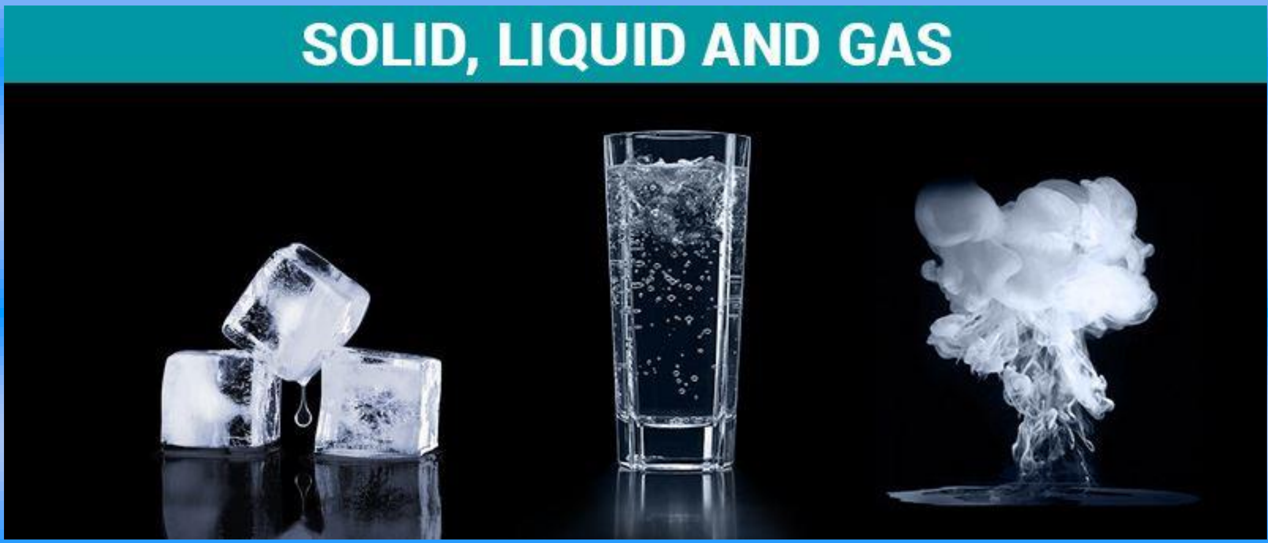


Most of the water in our world is a combination of "ordinary" hydrogen atoms with "ordinary" oxygen atoms, but there are actually three different isotopes (atomic varieties) of hydrogen and each of those can combine with oxygen to give a different kind of water. If deuterium (hydrogen whose atoms contain one neutron and one proton instead of just one proton by itself) combines with oxygen, we get something called heavy water, which is about 10% heavier than normal water. Similarly, tritium (hydrogen with two neutrons and one proton) can combine with oxygen to make something called superheavy water.

Water has no end of amazing properties. It comes in three wildly different kinds, it's heavy, it expands in a funny way, it can climb up walls, and... oh let's find out more!

Water, ice, and steam

One of the unique things about water in the world around us is that it exists in three very different forms (or states of matter as they are known): solid, liquid, and gas. Ordinary, liquid water is the most familiar to us because water is a liquid under everyday conditions, but we're also very familiar with solid water (ice) and gaseous water (steam and water vapor) as well.



Converting water between these three different states is remarkably easy. All you have to do is change its temperature or pressure. Take some ice and heat it up and you'll soon have a pool of liquid water. Carry on heating it and the water will evaporate and become steam. It takes a terrific amount of energy to turn ice into water and water into steam because you have to physically rearrange the structure of the substance in each case and push the molecules further apart. That's why kettles take so long to boil. (There's an easier way to turn water from a solid or liquid into a gas and that's simply to leave it out in the open air; gradually, the more energetic molecules in the water will escape and turn into a cool vapor up above it.)

When you heat water to make steam, there comes a point where you keep heating the water but the temperature doesn't increase. The energy you supply seems to be vanishing into thin air, but it's actually pushing apart the molecules in liquid water and turning them into a gas.

In the process, that energy is becoming locked inside the steam as something called latent heat (the word latent just means "hidden"). Latent heat is like an immense reserve of energy locked in steam that the inventors of yesteryear used to power factory machines and vehicles using their mighty steam engines.

Why does water make pressure?

If you've ever found yourself washing a car with buckets or watering a garden with cans, you'll have noticed just how heavy water can be. That's because it's a relatively dense substance (it packs an awful lot of mass into a relatively small space). Water isn't dense compared to metals such as gold, which is almost 20 times heavier by volume. But it's much heavier and denser than wood and plastic, which is why those things will float. Anything less dense than water floats on it; anything more dense sinks in it.

The weight of water is what causes pressure in the oceans to increase with depth. The deeper you go, the more water there is up above you pressing down—and that makes things particularly challenging for submarine designers and scuba divers. Water pressure increases in direct proportion to your depth, so if you go down 100 meters the pressure is ten times greater than if you go down 10 meters. Just imagine walking on the seabed with lots of buckets of water pressing down on your head. At a depth of about 10 km (6 miles) under the oceans, the pressure is as great as the weight of a fully-loaded articulated lorry pressing down on an area the size of your two feet!

Why does water expand when it freezes?

Everyone knows things get bigger when they get hotter and shrink when they cool. Thermometers tell the temperature that way because the (liquid) mercury metal inside them expands as it heats up and contracts when it cools down. But water is different. Almost uniquely, water expands as it starts to freeze! This amazing trick is called the anomalous expansion of water—and here's how it works.

If you start off with a glass of water and cool it down, the molecules start to move closer and lock together. But at a temperature of about 4°C (39°F), the molecules are as close as they can possibly get. In other words, the water has reached its maximum density. If you keep on cooling it down, the molecules rearrange themselves into a slightly more open structure. This means ice is a little bit less dense than freezing water and that's why ice floats on water that's the same temperature. That's extremely important for fish and all kinds of other river and sea creatures, because it means they can survive in winter in the liquid water underneath solid frozen ice.

Unfortunately, people don't always find the anomalous expansion of water so helpful. If the water pipes running under your home freeze solid in winter, the water inside them will turn to ice that takes up more volume—causing the pipes to burst open and then leak when the ice thaws out. Why don't we simply use stronger pipes? It wouldn't make much difference: water expands with incredible force when it freezes and even very thick metal pipes would still burst.

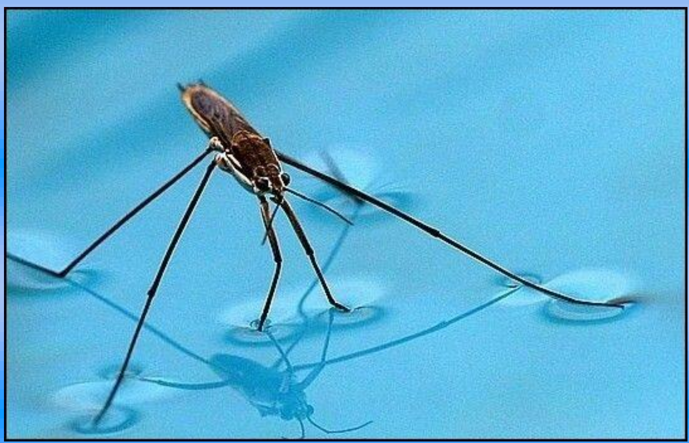
Why does water take so long to heat up?

Has that kettle boiled yet? Well tell it to hurry up—I'm dying for a cup of tea! It may be a nuisance if you're cooking or making drinks, but the length of time it takes water to absorb heat is very useful to us in other ways. Water has a high specific heat capacity and that means it can hold or carry more heat per kilogram (or pound) than virtually any other substance. That's why we use water in heating systems such as radiators, because each litre of water that trickles through the pipes carries and delivers more heat. Of course the drawback is that the water takes some time to heat up in the first place—but on the other hand, the water in your bathtub will stay hotter, longer for exactly the same reason.

If you like swimming outdoors, high specific heat capacity explains why, in some parts of the world, seas, lakes, and rivers aren't as warm as you think in the early summer: huge volumes of water take a long time to heat up after a cold winter and spring. By the same token, the water will still be warm enough for swimming in chilly parts of Europe well into the fall (autumn) when the air temperature has already started to plunge.

Why can insects walk on water?

You've probably seen insects that can walk on water. They're supported by a kind of invisible "structure" on the surface known as surface

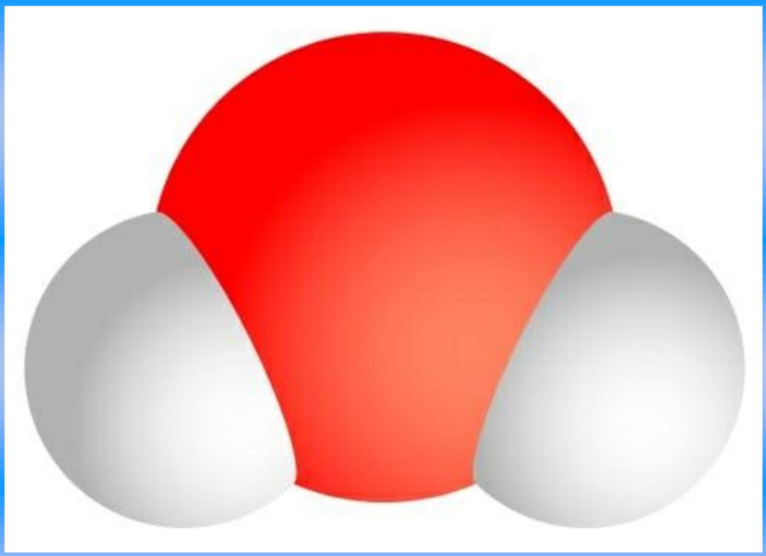


tension. It happens because water molecules attract very strongly to one another—that's also why water forms droplets on windows rather than spreading out in a perfectly thin film, as oil would. Imagine all the drops in a basin full of water trying to attract one another. Effectively, they're "linking arms" and forming an invisible skin on the surface that's strong enough to support things like needles and razor blades that are heavy enough to sink. All kinds of insects, including spiders, pondskaters, and water boatmen, use surface tension to move across water. In theory, you could walk on water too if you could spread your weight across a big enough area to take advantage of surface tension.

How does water climb up a tube?

Put some water in a glass and you'll see that it doesn't form a perfectly straight surface: it actually climbs up the glass slightly more at the edges, forming a downward curving surface called a concave meniscus. The thinner you make the glass (that is, the smaller the diameter it is), the more the water will climb. Put water in a narrow glass rod and you can make it climb up quite a distance. This is known as capillary action or capillarity. It's how blood moves through our veins and how water is sucked up through the stems of plants and trees. Capillarity helps a large oak tree to suck up something like 380 liters (100 gallons) of water each day!

Why is water...?



What makes water do all these things? It's actually the way the hydrogen and oxygen atoms are arranged inside water molecules. They're in a sort of triangle with the two small hydrogen atoms on one side and the much larger oxygen atom on the other. This creates an imbalance in the electrons shared by the molecules in the bonds that hold them together, making the oxygen end of each water molecule slightly negatively charged and the hydrogen end slightly positively charged. We say water molecules are polar: like a magnet, they have two different ends or poles. The positive, hydrogen end of one water molecule will attract to the negative, oxygen ends of other water molecules. This is what makes water molecules stick together in their unique way—and that, in turn, explains all their properties, from anomalous expansion and surface tension to high density and specific heat capacity.

Water in our world

So much of Earth is covered in water that the planet could easily be called Aqua or Oceanus. Apart from the water on the surface (in oceans, rivers, lakes, and creeks), there's also a vast amount of water swirling around in the atmosphere (in clouds, mist, and fog) and plenty more trapped in rocky underground reservoirs called aquifers. Earth's water—perhaps its most unique feature—was formed after the Big Bang (the explosion that created the Universe about 13.7 billion years ago). About

4.6 billion years ago, when our solar system was created, a mixture of hydrogen and oxygen atoms joined together to make clouds of hot steam that eventually cooled to form water, which fell to Earth as rain, formed the oceans and carved the continents into shape.

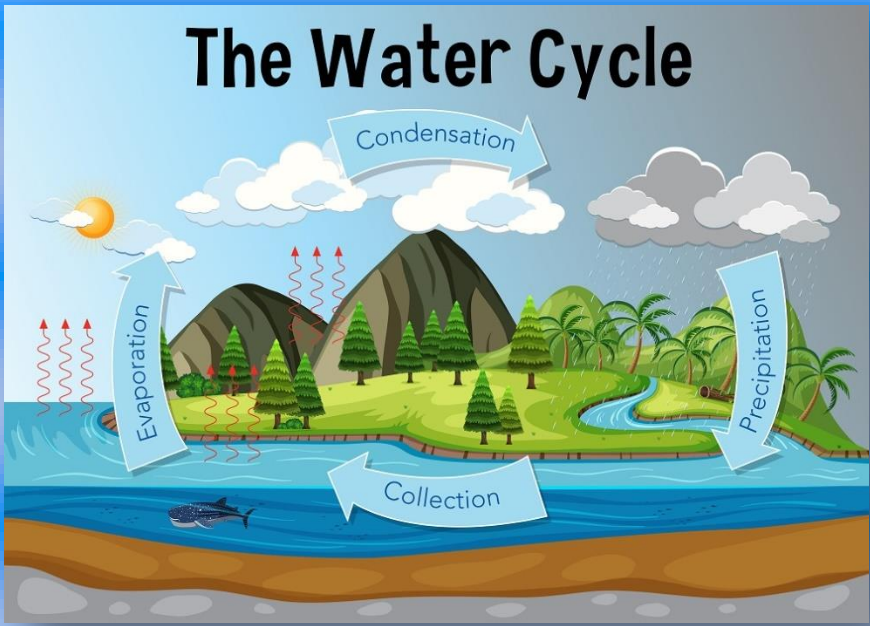
Water for life

Life began on Earth about a billion years later (3.6 billion years ago), initially in the oceans. Although many species now live on land, they still need water to live and grow: humans, for example, could go without food for about two months, but we'd die of thirst if we went more than

a week or so without a drink. Typically we need at least 2 liters of water a day to survive, though we get much of this from things we eat as well as things we drink. Eggs are about three quarters water, for example, while fruits such as oranges and melons are over 90 percent water.

We drink only about 1 percent of the water we consume each day and use the other 99 percent (about 250 liters a day) to feed things like baths, showers, washing machines, lawn and garden sprinklers, hosepipes for washing cars, and flush toilets. A clothes washing machine can easily use over 100 liters in an hour by repeatedly rinsing your laundry to remove detergent. Lots of products we'd never normally associate with water consume vast amounts of the precious liquid during their manufacture. About 570 liters of water is used making a thick Sunday newspaper, for example.

To people in developing countries, many of whom lack access to running water, all of this would seem amazingly wasteful. As Earth's population grows and each person needs more and more water, the pressure on our planet's water resources will grow too. Theoretically, on a planet covered with water, supplies should never run out—but most of Earth's water is salty and undrinkable. Turning it into usable freshwater means using costly, energy-hungry desalination plants. The growing pressure on water has led some politicians to speculate that wars may be fought over scarce water supplies before the end of the 21st century.



There's a lot of talk about recycling to help the environment but water is one thing we recycle without even thinking about it. Every time we flush a toilet or empty a washing-up bowl down the drain, the water we've used disappears down waste pipes, passes through the sewerage and wastewater system, and reappears (hopefully) as good as new in our rivers and seas. Admittedly, water pollution is still a very serious problem, but one thing we can count on is that water will constantly circulate between Earth's surface and the atmosphere up above in the never-ending water cycle. Water's been circulating round our planet for billions of years—and it's not about to stop anytime soon!

Saving water

Next time you're flushing your toilet, washing your car, firing the sprinkler over your garden or cleaning your windows, spare a thought for the 2.2 billion people (29 percent of the world's population) who still have no safe supply of clean water and the 4.2 billion people (55 percent of the population) who don't have proper sanitation. Imagine how people in some remote village in Africa would feel if they could see you squandering gallons of sparkling, clean, highly treated water that you're not even going to drink.

On one level, this is an utterly ludicrous comparison: even if you save water, it doesn't help people in Africa one iota. But on another level, conserving water is incredibly important: as global warming and climate change kick in, virtually all of us will find our water resources under much greater pressure. Saving water obviously saves water, but it also saves energy (because cleaning water is very energy intensive), protects rivers (because water ultimately comes from there), and helps the environment on which we all depend. If you're billed for every unit of water you use, saving water also helps your pocket. That's why many people are interested in greywater: a way of collecting and recycling some of your household water and using it for less important things like flushing the toilet.

What is greywater?

According to the US Environmental Protection Agency (EPA), a typical family can use an astonishing 1100 liters (300 gallons) of water a day in total. Even allowing for cooking and hand-washing, where we need to use clean water, there's a huge mismatch between how much water we use in total and the amount we need that has to be scrupulously clean. Greywater systems try to address this.

Greywater (sometimes spelled graywater in the United States) is the idea of having two separate household water systems. First, you have a normal household water supply of clean, fresh water (sometimes called whitewater or mains water), which you use for drinking, cooking, and so on. But you also have an extra tank that collects the used water from your bath tub, shower, clothes washing machine, (and sometimes your outside roof). This is your greywater. It's used for flushing the toilet (automatically), but you can also use it for washing the car, watering the garden, and anything else that doesn't need absolutely clean water. Sometimes water from the kitchen sink (dark greywater) is reused too, but it's more contaminated and unhygienic than water from your bath or shower. Water from the toilet (known as blackwater) is never reused:

it's discharged to the sewer in the usual way. Trials by the UK's Environment Agency (a similar organization to the US EPA) have found that systems like this can save 5–36 percent of total household water consumption, though much less (a maximum of about 20 percent) in efficient new homes.

Advantages and disadvantages of greywater systems

Greywater sounds like a brilliant idea—for all sorts of reasons. First, it reduces the fresh water you need to consume, so it could help to cut your water bill. If you're consuming less water, the sewage and wastewater plants have to recycle less (using less energy) and less water has to be removed ("abstracted") from rivers—so greywater is also good for the environment. If you have a septic tank, switching to greywater reduces the amount of water you're passing through the tank for treatment, extending its life.

But there are disadvantages too. First, the cost of installing a greywater system can be significant compared to the savings in water bills you actually make. More seriously, storing used water as greywater allows microorganisms to breed—especially if it's warm water to begin with—and that can present a health hazard. So graywater has to be stored carefully with hygiene in mind, typically either filtered before being stored, chemically disinfected, or stored for only relatively short periods of time (greywater systems automatically flush their tanks and refill with clean white water if they're unused for too long) to reduce the chance of bacterial contamination.

Alternatives to greywater

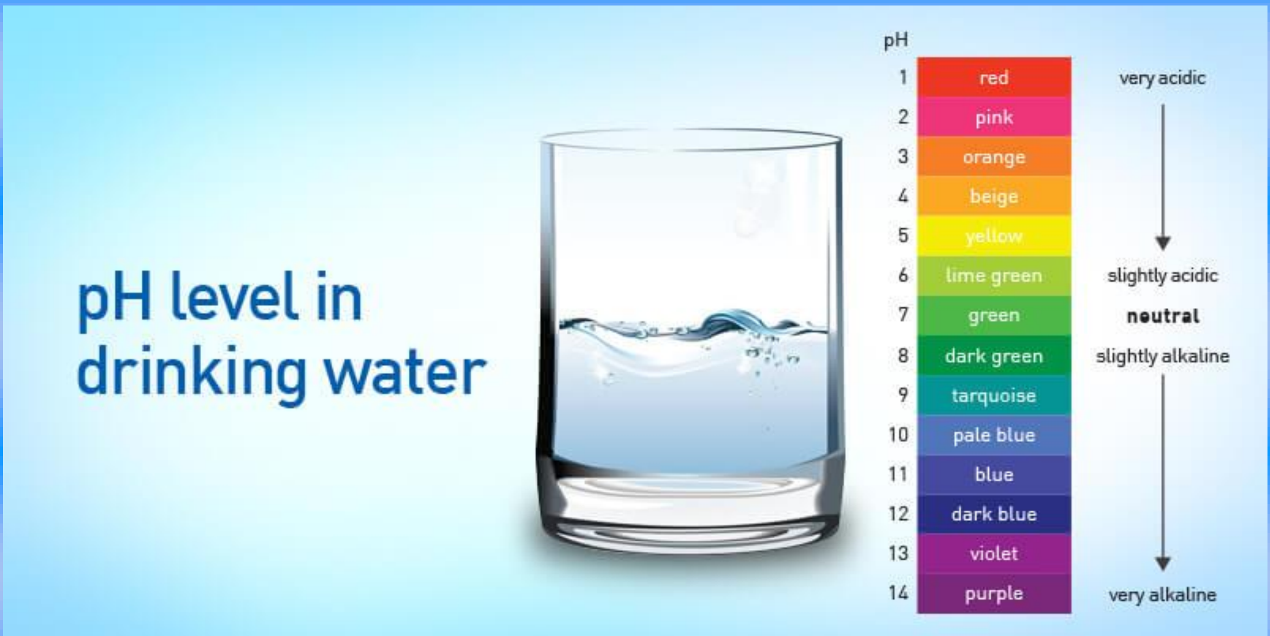
Purification, disinfection, and periodic draining clearly reduces the benefit of having a second water system—so much so that, for small households, there may be no benefit at all. You can probably achieve greater savings more quickly and economically simply by using fresh water more carefully: by flushing your toilet less often (or converting to a water-saving dual-flush), turning off the faucet (tap) while you brush your teeth, installing a low-flow shower nozzle (one that mixes a lot of air with the water), using a water butt to collect rainfall for your garden, and so on. Water savings like this are really easy to make; many are instant and free. One really good way to save water is to ask your utility company to install a water meter on your property (if you don't have one already). Seeing how much water you use each month or quarter (and how much it costs, on your bill) really focuses the mind on making savings—and you can see just how effective you're being.

Environmentalists tend to see things a little bit differently. The very concept of wasting a resource as precious as water is galling to people who truly value the planet, so some green-minded people insist on installing greywater systems in eco-homes as a matter of principle. Environmentalists or not, the message is clear: in a world of growing water scarcity, all of us have a responsibility to use this important resource more carefully. It's worth bearing mind that in the future, saving water may not be a matter of choice.

What is alkaline water?

You may have heard various health claims about alkaline water. Some say it can help slow the aging process, regulate your body's pH level, and prevent chronic diseases like cancer. But what exactly is alkaline water, and why all the hype?

The “alkaline” in alkaline water refers to its pH level. The pH level is a number that measures how acidic or alkaline a substance is on a scale of 0 to 14. For example, something with a pH of 1 would be very acidic and something with a pH of 13 would be very alkaline.



Alkaline water has a higher pH level than regular drinking water. Because of this, this is why it can neutralize the acid in your body.

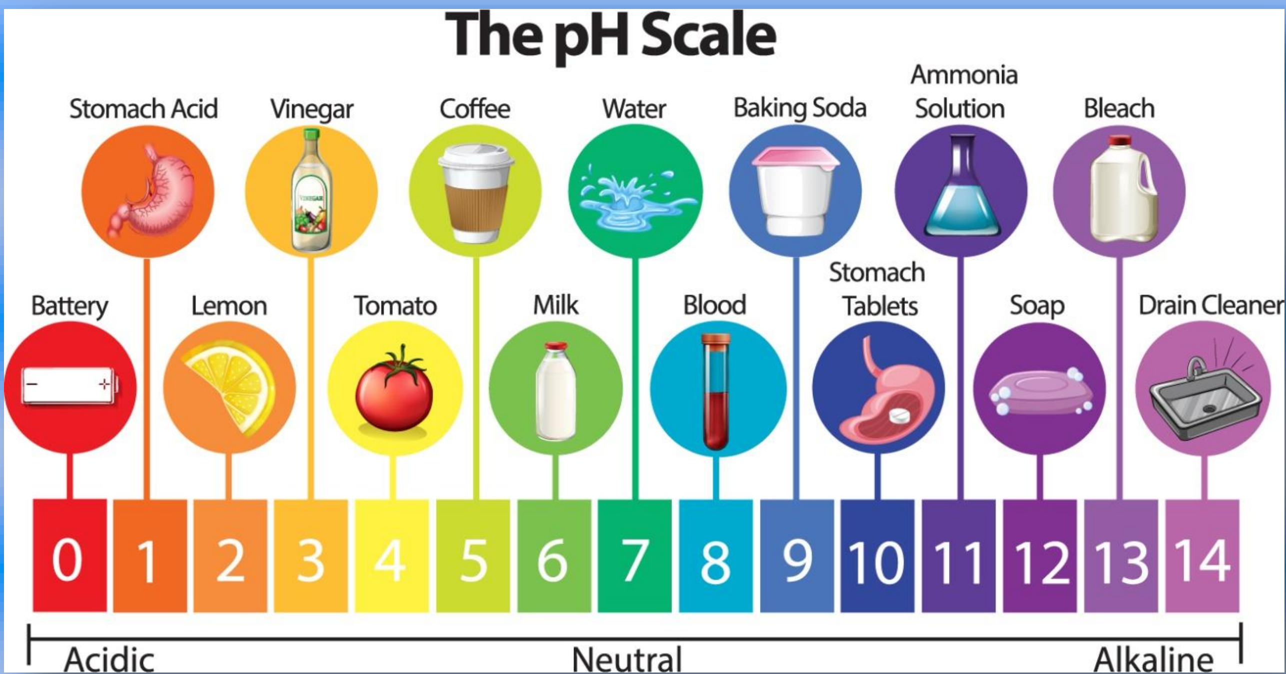
Normal drinking water generally has a neutral pH of 7. Alkaline water typically has a pH of 8 or 9. However, pH alone isn’t enough to impart substantial alkalinity to water.

Alkaline water must also contain alkaline minerals and negative oxidation reduction potential (ORP). ORP is the ability of water to act as a pro- or antioxidant. The more negative the ORP value, the more antioxidizing it is.

Water is a combination of hydrogen and oxygen. That's why you call it H2O. Water's pH level determines how acidic it is and ranges from 0 to 14. A pH of 7 is considered neutral. That “seven” number is considered neutral or balanced between acidic and alkaline. If water is below 7 on the pH scale, it's "acidic." If it's higher than 7, it's "alkaline."

EPA guidelines state that the pH of tap water should be between 6.5 and 8.5. Still, tap water in the U.S. tends to fall below that -- in the 4.3 to 5.3 range -- depending on where you live.

Bottled water falls under different standards depending on whether it claims to be alkaline. Bottled alkaline water has a pH level above 7. In some cases, manufacturers use a special device to change the chemical makeup of the water. Other times, they add nutrients to the water to change its pH.



For comparison, orange juice has a pH of 3.3 and black coffee is about a 5. Pure water has a neutral pH of 7. But tap water in the U.S. tends to fall below that -- in the 4.3 to 5.3 range -- depending on where you live.

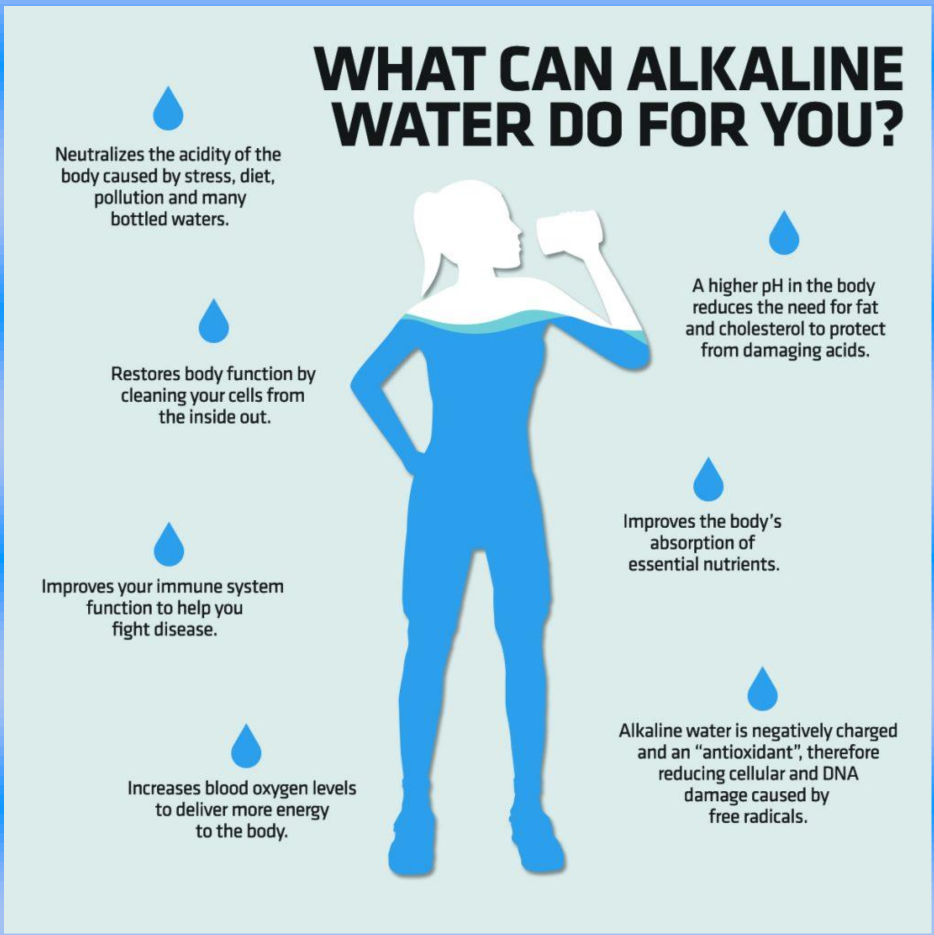
Checking the Health Claims

Alkaline water's increased hydrogen provides greater hydration than regular water, especially after a hard workout.

Regular drinking water with a pH below 7 creates too much acid in your blood and cells. Plain water's low pH is the cause of all sorts of health problems, from osteoporosis to cancer.

Water that is more alkaline supposedly reduces acid in the bloodstream and:

- Improves metabolism
- Increases energy
- Slows aging
- Improves digestion
- Reduces bone loss
- High-pH water say it also has the power to starve cancer cells.



Next we will present an easy method to obtain Alkaline water with a simple device:

Tools needed

1. Hole Saw

2. Exacto Knife

3. Shape Marker

4. Hand Drill

Materials needed

1. 2 identical plastic recipients – any size

2. 2 rubber gaskets

3. 1 shutoff valve

4. 2 stainless steel strips

5. 12 volt supply

6. 2 water taps – different colour

How to Build Alka Water DIY – Step-by-Step Guide

Materials Needed:

- **Two (2) three-gallon BPA-free water jugs** (heavy plastic, preferably transparent for easy monitoring)
- **Two stainless steel bolts** (serving as electrodes, must be corrosion-resistant)
- **1.5-inch plastic coupling** (for connecting the two jugs, ensuring proper water flow)
- **A standard household sponge** (acts as a semi-permeable membrane, must be clean and non-toxic)
- **Rubber or plastic table mat** (to cut into gaskets for sealing connections)
- **A 16-volt AC adapter** (200 milliamp, such as an old Radio Shack adapter, providing low-voltage current)
- **Plastic tubing or drain hose** (optional, for controlled draining of acidic water)
- **pH test strips** (for testing water acidity and alkalinity)
- **Drill with various drill bits** (to create holes for coupling and electrodes)
- **Rubber gloves** (for handling electrical components safely)
- **Protective eyewear** (to prevent accidental splashes while handling liquids)
- **Measuring tape or ruler** (for accurate placement of holes and components)
- **Silicone sealant** (optional, to further prevent leaks around gaskets and coupling)

Step 1: Preparing the Water Jugs

1. **Select two three-gallon BPA-free plastic water jugs.** These must be sturdy and food-safe.
2. **Drill holes for the coupling:**
    - Mark the center of each jug where the two will be connected.

- Use a drill to create an opening slightly smaller than the **1.5-inch plastic coupling** to ensure a snug fit.

3. **Insert the plastic coupling:**
   - Push the coupling into the drilled holes.
   - Place rubber gaskets (cut from the table mat) around the edges.
   - Use silicone sealant if needed to create a watertight connection.
4. **Prepare the semi-permeable membrane:**
   - Cut a household sponge to fit inside the coupling.
   - Place the sponge inside the coupling, ensuring it allows controlled water flow.

Safety Tips:

- Ensure the jugs are clean and dry before assembly.
- Avoid inhaling plastic shavings while drilling.

Step 2: Installing Electrodes

1. **Drill electrode holes:**
   - Near the top of each jug, drill a small hole for the stainless steel bolts.
   - These will serve as the **electrodes** for the ionization process.
2. **Insert the stainless steel bolts:**
   - Insert one bolt into each hole.
   - Secure with a nut on the inside of the jug to hold it in place.
3. **Mark the positive and negative sides:**
   - The **positive bolt** (acidic side) will be on one jug.
   - The **negative bolt** (alkaline side) will be on the other jug.
   - Label these clearly to avoid miswiring.

Safety Tips:

- Wear rubber gloves when handling metal parts to avoid minor cuts.
- Do not over-tighten the bolts, as this may crack the plastic.

Step 3: Connecting the Power Supply

1. **Use a 16V AC adapter (200mA) as the power source.**
2. **Connect the adapter's positive wire to the positive electrode** (acidic side) and the negative wire to the negative electrode (alkaline side).
3. **Ensure all connections are tight and secure.** Loose connections

may cause inefficient ionization.
4. **Double-check polarity** before turning on the power.

Safety Tips:

- Ensure hands are completely dry before handling electrical components.
- Keep the power supply away from direct contact with water.
- Use a power strip with a surge protector for added safety.

Step 4: Filling the System with Water

1. **Pour clean, filtered water into both jugs.**
2. **Ensure water covers the electrodes completely but does not overflow.**
3. **Turn on the power supply** and allow the ionization process to begin.
4. **Let the system run for 12-24 hours** for full separation of acidic and alkaline water.

Safety Tips:

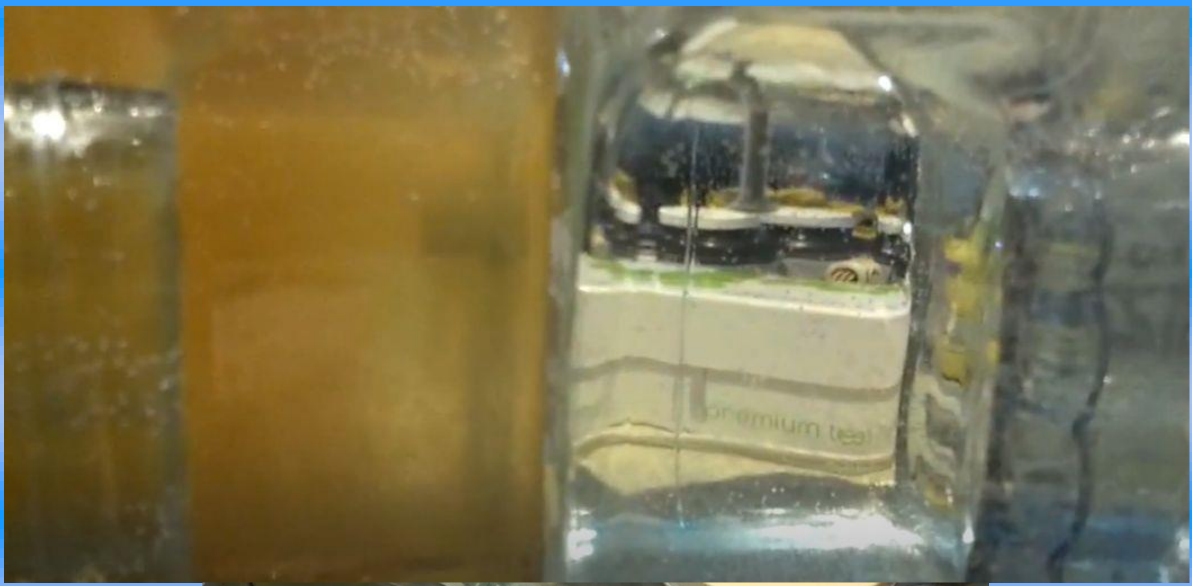
- Keep children and pets away while the system is running.
- Place the jugs on a stable surface to prevent tipping.

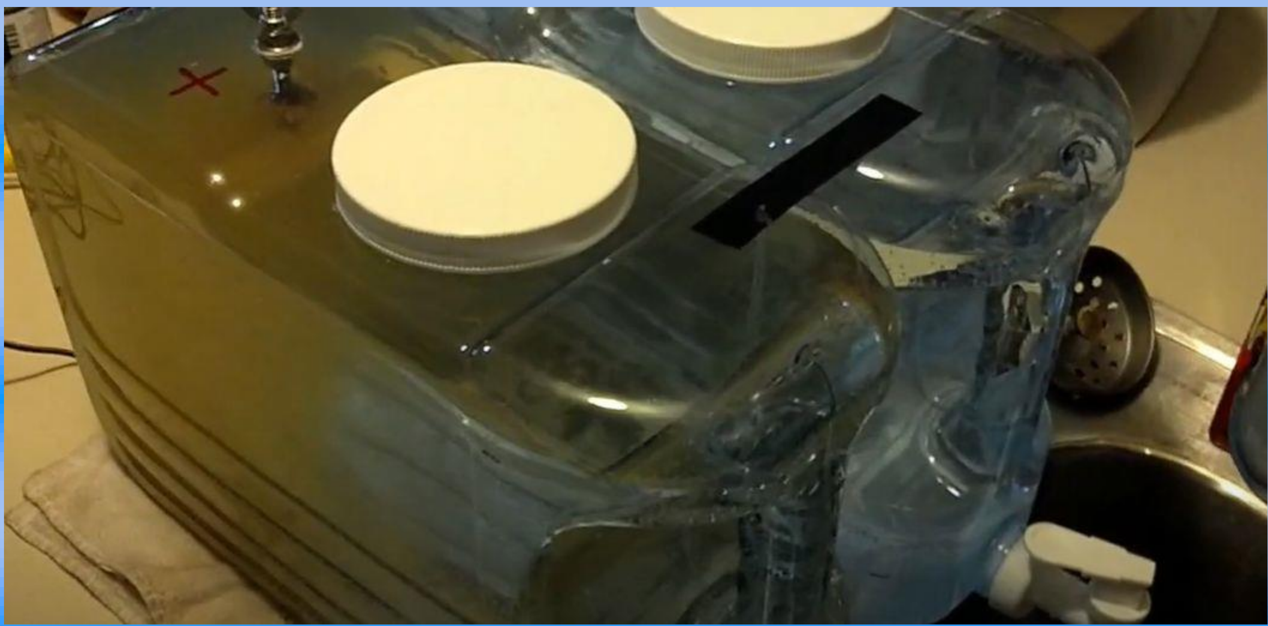
Step 5: Observing the Water Separation

1. **After 12-24 hours, check the jugs:**
    - The **acidic side will appear murky** with sediment.
    - The **alkaline side will remain clear.**
2. **Perform a pH test:**
    - Dip pH test strips into both jugs.
    - **Acidic water:** pH below 7 (should turn yellow/orange).
    - **Alkaline water:** pH above 7 (should turn blue/purple).

Safety Tips:

- Do not consume water before pH testing.
- Avoid direct contact with acidic water, as it may irritate sensitive skin.





Step 6: Draining the Acidic Water First

1. **Drain the acidic water before the alkaline water.**
   - This prevents cross-contamination.
2. **Use a drain hose or pour carefully into a sink or garden.**
   - Acidic water can be used for watering plants.
3. **Once the acidic water is below the coupling level, drain the alkaline water.**
   - This ensures only pure alkaline water remains.

Safety Tips:

- Never mix acidic and alkaline water after separation.
- Dispose of acidic water properly and avoid splashes.

Step 7: Storing and Using the Alkaline Water

1. **Pour the alkaline water into BPA-free plastic or glass containers.**
2. **Refrigerate for better taste and longevity.**
3. **Consume as needed for hydration and potential health benefits.**

Safety Tips:

- Always use clean, sterilized containers to prevent bacterial growth.
- Store in a cool, dark place if refrigeration isn't available.

Final Notes:

- **Replace the sponge membrane periodically** for continued efficiency.
- **Monitor sediment levels** and clean the system as needed.
- **Cold alkaline water tastes better** than room temperature.
- **Check electrical connections regularly** to ensure proper function.

By following these detailed steps, you can create a simple, effective, and safe alkaline water system at home without spending hundreds of dollars on commercial ionizers!

Enjoy living your healthy life!