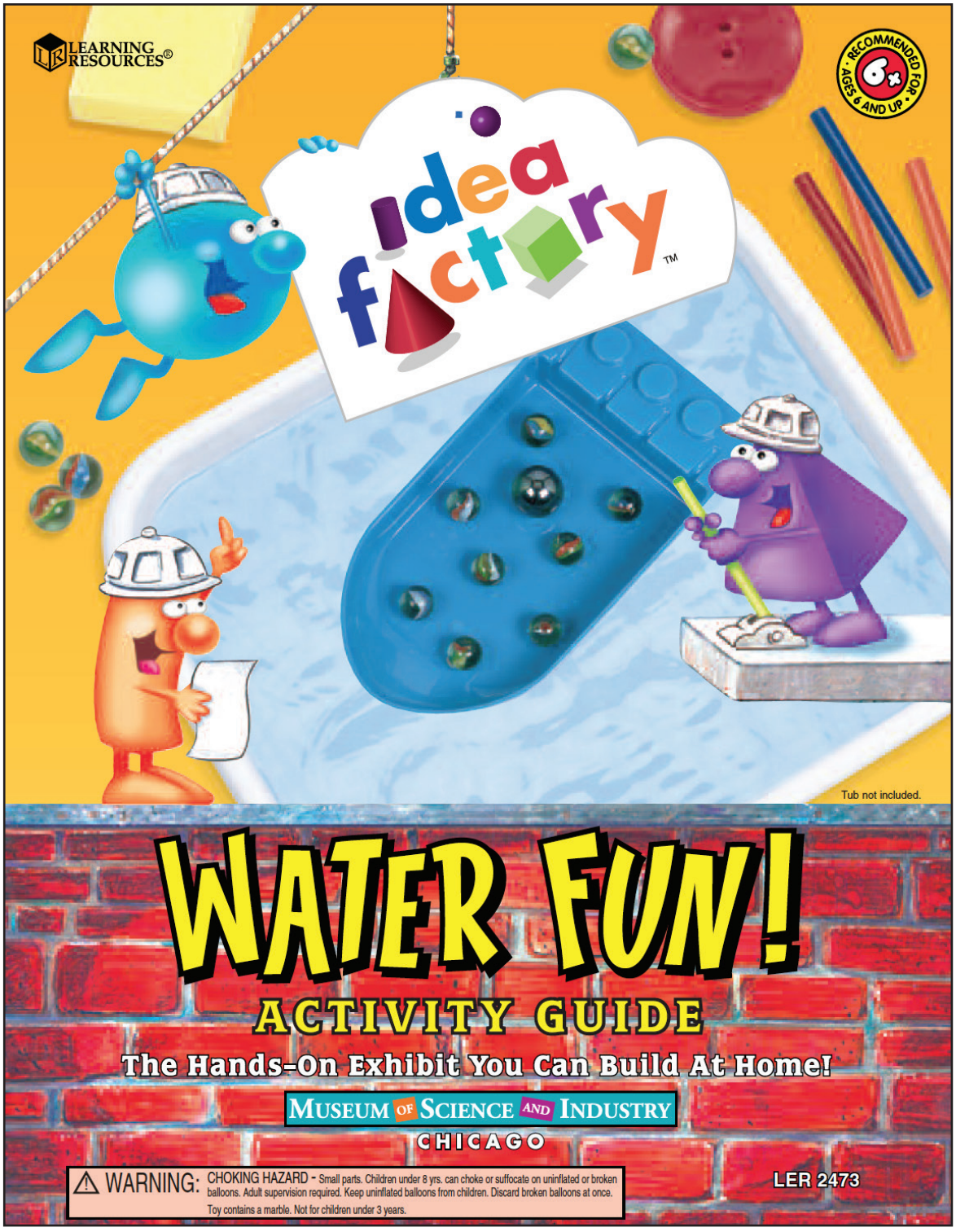
Learning Resources®

Summer Brain Gain Activities
Idea Factory: Water Fun!



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Summer Brain Gain Activities
Idea Factory: Water Fun!

A NOTE TO PARENTS

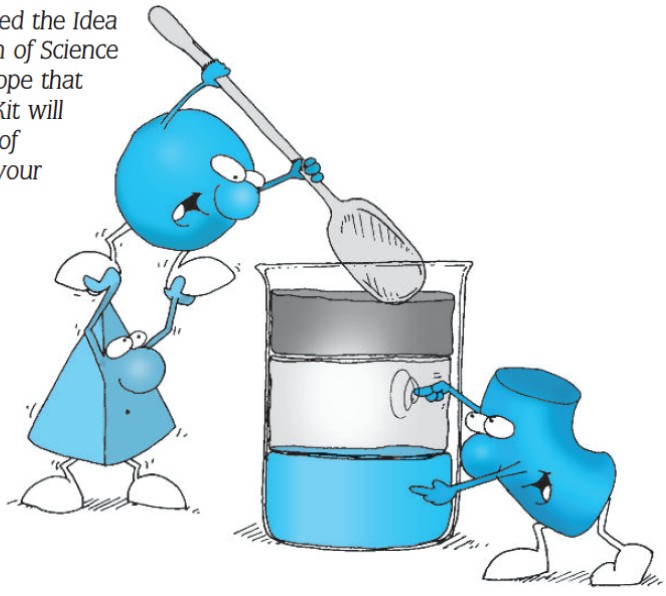
Welcome to the **Idea Factory**™*, a wonderfully fun and whimsical place developed specifically for infants through 10-year-olds at the Museum of Science and Industry in Chicago. At the Idea Factory, children experiment and test their own theories about construction, simple machines, light, color, motion, magnetism, balance, air, and water.*

Like the exhibit, this kit is designed to engage children in the process of discovery through creative play and hands-on exploration. We encourage parents and children to use this activity guide as a starting point for open-ended experimentation.

The guide includes 12 activities and dozens of additional extension activities designed to stimulate ideas about the properties of water. Each activity also includes a "What's The Big Idea" section with a more in-depth explanation of the scientific principle being explored.

Activities are designed for children ages 6 to 10. They are organized to build upon each other; the first several activities introduce basic properties of water and are more simple in nature. Older children may be familiar with these concepts. If so, encourage them to explore the extension activities. Likewise, younger children need extra help performing some of the activities toward the back of this guide. By being involved, you can give children a chance to discuss their results and relate what they're learning to everyday science.

Whether or not you have visited the Idea Factory exhibit at the Museum of Science and Industry in Chicago, we hope that your Idea Factory Water Fun Kit will bring the fun and excitement of discovering and learning into your own home!



WATER SHAPES

Water is a liquid, and a liquid changes its shape easily. How can you change water's shape?

Set It Up

Materials:

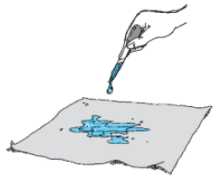
beaker
tall, short, skinny, and wide containers
balloon
eyedropper
waxed paper
paper towel
sponge
spoon

Be sure to work over a sink, a tub, or another area that you can get wet.

Test It Out

- *Pour water into a beaker. What shape is the water? Pour the water into a different-shaped container. How does the water's shape change? Does it seem like there is more or less water now? Why do you think so?*
- *Have an adult help you fill a balloon part-way with water and tie it closed. What gives the balloon its shape? How can you change this shape? Test it out!*

- *What is water's shape when it is not in a container? Test it out! Use an eyedropper. Drip water on waxed paper, a paper towel, a sponge, and anything else you choose. What happens to the water drops on different surfaces? Why do some disappear?*
- *Make a puddle on a piece of waxed paper. How can you move the puddle around? Try using your hands, a spoon, an eyedropper, your breath, or any other "tools." Which works best?*

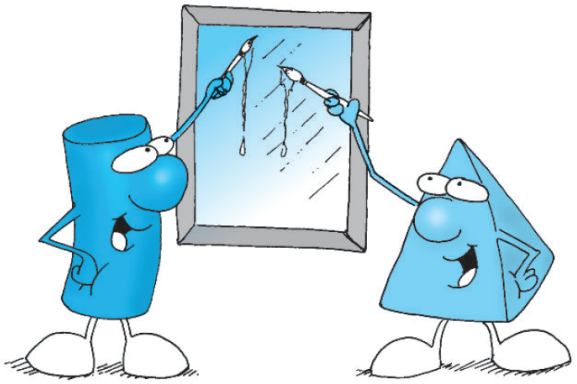


- *What other ways can you make water change shape? Test it out! As you pour water, place an object in its path. Try your finger, a spoon, a paper towel, or whatever you choose. Change how fast or slow you pour. How can you make water splash, drip, run, shake, or squirt?*

Try This, Too!

- *Here are some other experiments to try with water.*
  - *Fill a container with water. Add water, one drop at a time. What does the surface of the water do? Drop in a heavier object, such as a penny or a marble. What does the water do? Drop in a really heavy object (one that can get wet!). What happens to the water level?*
  - *Place two drops on a piece of waxed paper. Try to push them together. Can you pull them apart? Try it!*
  - *Make water music! Crumple a piece of aluminum foil and put it in the sink. Change the flow of water to see how it sounds as it hits. What other water music can you make?*
  - *Blow air bubbles under water with a straw.*
  - *What other ideas can you think of to try?*

- *Compare water's shape to the shape of other liquids. Play with vegetable oil, soda pop, dishwashing liquid, and any other liquids you choose. Then, run a liquid race! Use paintbrushes to splash each liquid near the top of a mirror. Which liquid reaches the bottom of the mirror first?*



What's The Big Idea?

Water is a liquid. When poured into a container, it spreads out to fill the lowest part of the container. Alone, small amounts of water pull together to form round drops. Water, like all materials, is made up of tiny parts called **molecules**. *The molecules "stick" together inside a drop. Drops "stick" together to form a puddle. Drops can change shape if they touch a material that "pulls" on the molecules in the water. This is how water gets absorbed.*

WATER AND ICE

When water freezes, it becomes a solid called ice. How is ice different from water?

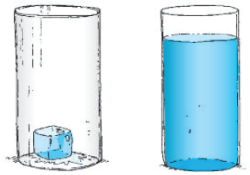
Set It Up

Materials:

ice cubes
2 glasses
waxed paper
film canister with lid

You will need to make ice cubes ahead of time for this activity. Also, part of this activity takes a few hours to complete.

Test It Out



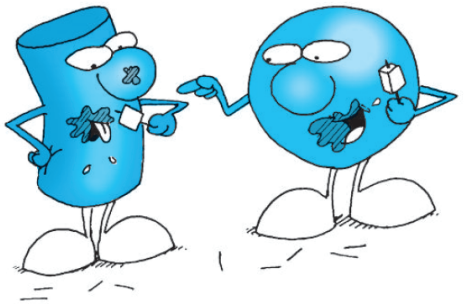
- *Place an ice cube in a glass. Fill a second glass with water.*
- *Dry your hands. Touch the ice. How does it feel? Touch the water. How does it feel? What do you see when you try to look through the ice and when you look through the water? How are water and ice shaped differently?*
- *What will happen if you add the ice to the water? Test it out! Try to make the ice cube sink. Is this easy or hard to do? What guesses can you make about ice's weight? Watch the ice in the water. Where is the ice "going"?*

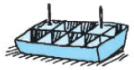
- *Place two ice cubes on a piece of waxed paper. Leave one whole. Have an adult help you break another into pieces. Which one melts faster? How can you make the ice melt more slowly or quickly?*

- *What happens as water changes into ice? Test it out! Fill a film canister all the way with water. Carefully place it in the freezer. Rest the lid upside down on the canister. What do you think will happen? Check the canister in a few hours. How do the results compare to your prediction? What do you think will happen if you let the ice melt inside the canister?*

Try This, Too!

- *Here are some other tricks to try with water and ice.*
- *Mix food coloring with water. Pour the colored water into an ice tray. Make ice cubes. Drop them into a clear glass of warm water.*
- *Make ice treats! Mix powdered fruit drink with water. Pour the drink into an ice tray. Cover the tray with plastic wrap. Poke toothpicks in the middle of each section of the tray. Place the tray in the freezer.*
- *Add a solid object, such as a raisin, to water before freezing it. What happens when you put this ice cube in water?*
- *Soak other things, like a sponge or paper towel, and freeze them.*
- *Make "icebergs." Have an adult help you fill some balloons with water. Place the balloons in a bowl in the freezer. When the water has frozen, peel away the balloon. Place the icebergs in water. Watch how they melt.*
- *Find out if other water mixtures take the same time to freeze as pure water. Fill one section of an ice cube tray with plain water. Fill other sections with water mixtures. Try adding salt, cooking oil, jelly…whatever you can imagine! Take the tray out every hour to see how your mixtures freeze.*





What's The Big Idea?

Water can change its **state**, *or form, if it loses enough heat. It becomes a solid called* **ice**. *Ice does not flow. It holds its own shape. How does water turn into ice? The tiny moving parts, or molecules, inside water slow down as they lose heat, finally joining together in a special pattern.* **Density** *is a measure of how "tightly packed" molecules are inside an object. Most liquids are more dense when they're solid. However, ice is less dense than water, because the pattern of its joined molecules allows for more space between molecules than there is when water is a liquid. Ice floats on water because it is less dense! Also, solid ice takes up more space than liquid water does.*

MISSING WATER

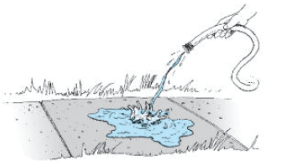
Water can become an invisible gas that goes into the air. How do you know when water turns into a gas?

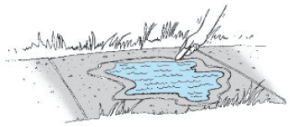
Set It Up

Materials:
chalk
beaker
bowl

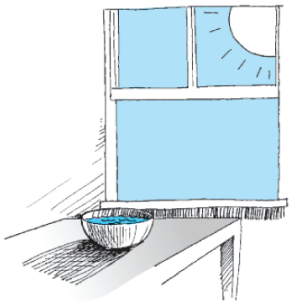
Pick a sunny day to do the first part of this activity outside. The rest of this activity takes a day or so to complete.

Test It Out



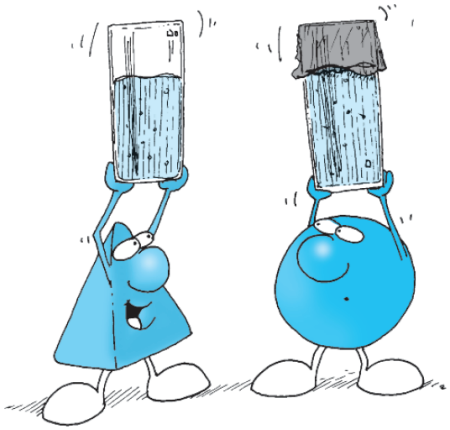


- *Splash some water on the sidewalk. Draw an outline around the shape of your wet spot with a piece of chalk.*
- *How will the shape change over time? Test it out! Wait 15 minutes. Check your spot again. Draw an outline around it. What do you notice?*
- *Keep checking your spot every 15 minutes. What happens? Where do you think the water is going? Why?*
- *Try another water experiment. Fill a beaker to the 400 mark with water. Pour the water in a bowl. Place the bowl in a sunny window. Leave the bowl sit overnight. How much water is left in the bowl? Test it out! Pour the water from the bowl into the beaker. How much do you have? Why do you think so?*



Try This, Too!

- *Does water "disappear" at the same rate no matter what? Here are a few ways to test out this question. For each test, fill two glasses with equal amounts of water. Leave the glasses overnight, then check the water levels.*
  - *Place both glasses in a sunny spot. Cover the top of one glass with plastic wrap.*
  - *Place one glass in a sunny spot and one in a shady spot.*
  - *Pour a layer of cooking oil on top of the water in one glass. Place both glasses in the same spot.*
  - *Wrap black construction paper around one glass. Place both glasses in the same spot.*
- *Do other liquids disappear at the same rate as water? Try to find out!*



What's The Big Idea?

When liquid water changes to a gas, the change is called **evaporation**. *In its gas form, water is called* **vapor**. *Evaporation is always happening. It usually takes place at water's surface. Water molecules are always moving, and some move faster than others. If they move with enough speed to escape into the air, they become water vapor. The more surface a body of water has, the quicker the evaporation. The more heated the water becomes, the faster the molecules move, and the quicker the evaporation. As water vapor cools, it turns back into water droplets. Did you see water droplets form in any of your tests?*

FLOW ON THROUGH

If you poke a hole in a container of water, the water flows out. How can you change how fast water flows through a hole in a container?

Set It Up

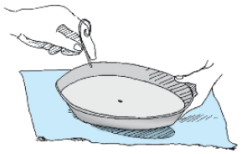
Materials:

towel
aluminum foil pan
paper clip
pen

Cover a flat surface with a towel. Place a foil pan, right side up, on the towel.

Straighten out a paper clip. This is your "hole poker."

Test It Out



- *Poke a hole in the middle of the pan as shown. Have an adult help you.*
- *Hold the pan over a sink or tub. Pour water into it. Does the water empty quickly or slowly?*
- *How can you make the water go faster? Test it out! Make your hole bigger. Use a pen point. Pour water into the pan again. What happens?*

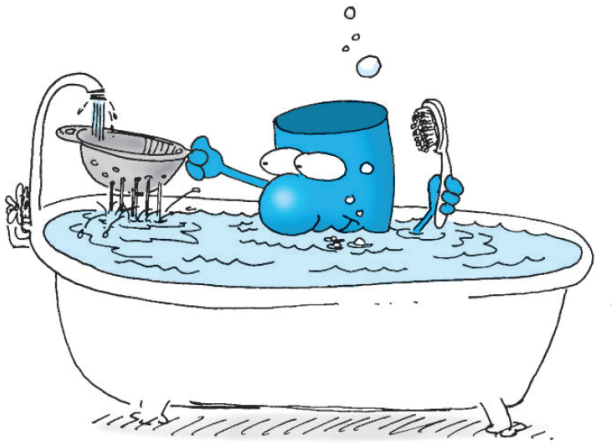
- *Make a circle of small holes around your big hole. Use your hole poker. How do you think the water will flow from these holes? Test it out! Were you right?*
- *Make all your holes the same size with a pen point. Pour water into the pan. How does the water flow now? When does the water stop flowing?*

- *Fill your pan again. Watch the water flowing. When does the water flow in streams: when the pan is full or nearly empty? When are there more water drops? When does water flow the fastest? The slowest? Why do you think so?*

Try This, Too!

- *Use the other foil pans in your kit to play with water flow. Here are a few ideas to try.*
  - *Try poking just a few holes, or as many as you like.*
  - *Make the holes really close together, or far apart.*
  - *Change the shape of the pan's bottom. Push it in. Or, press it down to make it more bowl-shaped.*
  - *Try to make most of the water flow through a hole you choose. What size should it be compared to your other holes?*
  - *What other ideas can you think of to try?*

- *You also can run water through other objects. Pick ones that already have holes. Use a strainer, a flyswatter, a cheesecloth, or anything else you like. Try adding solid objects, like beans or rice. Can you design holes that hold solids back, but let water flow through?*



What's The Big Idea?

If you pour water, it naturally flows downward. It is being acted on by **gravity,** *a downward pull that comes from Earth. So, when you poke a hole in a container, the water flows down through it. If the water flows slowly, it forms round droplets. If it flows quickly, the droplets "stick" together as a stream. Sometimes, streams stick together to form a larger stream, too. Large holes allow more water to move through at a faster speed. Small holes allow less water through. It drips through at a slower speed.*

WATER'S SKIN

Water droplets "stick" to each other at the water's surface to form a "skin." How can you see the effects of this skin?

Set It Up

Materials:

quarter
paper towel
eyedropper
dishwashing liquid

Place a quarter on a paper towel. Place the paper towel near the edge of a table, or somewhere you can line up your eye with the quarter as you look at it.

Test It Out

- *Fill an eyedropper with water. Hold the eyedropper over the quarter. Squeeze out one drop of water. What shape is the water when it lands on the quarter?*

- *Add a second drop of water to the quarter. What happens? Predict how many drops of water you can place on the quarter before the water spills over.*

- *One by one, add water drops to the quarter. As you do, line up your eye with the quarter. What shape is the top of the drop? Keep watching the top. How does its shape change?*

- *How close did your prediction come to the actual number of drops you added?*

- *Dry off the quarter. Use a paper towel to coat one side of the quarter with dishwashing liquid. Squeeze a drop of water onto the quarter. What happens to the drop? How many drops do you think you can add this time? Test it out! What ideas do you have about the way dishwashing liquid changes water's skin?*

Try This, Too!

- *Try these tricks with water's skin.*
  - *Fill a tall, thin glass to the rim with water. Predict how many pennies you can add to the glass before it overflows. Gently slide each penny into the glass. How did the results compare to your prediction?*
  - *Gently place a plastic berry basket on top of water in a bowl. Look at the spaces in the basket that touch the water.*
  - *Rest a needle on a small piece of bath tissue. Gently rest the tissue on top of water in a bowl. Wait a few minutes. What happens?*
  - *What other ideas can you think of to try?*

- *Try these tricks with soapy water.*
  - *Repeat the tricks above. At the end, add a drop of dishwashing liquid. What happens?*
  - *Fill a bowl with cold water. Sprinkle pepper on the water. Add a drop of dishwashing liquid. What happens? Try this with a match stick in place of the pepper. Then try using a small tinfoil square. Use clean, cold water each time.*

What's The Big Idea?

Water's tiny parts, or molecules, naturally "stick" to each other. On the surface, water molecules stick very strongly to the molecules beside and beneath them. They do not stick as strongly to the air molecules above them. This creates a stretchy "skin" called **surface tension**. *Surface tension can hold many water drops together in one giant drop on a quarter's surface before the giant drop breaks. When you add dishwashing liquid, you weaken the sticking action between water molecules. The giant drop of water breaks sooner.*

FLOATERS AND

Objects get an upward "push" from water. If this "push" is strong enough, objects float. If not, they sink. Which objects float or sink?

Set It Up

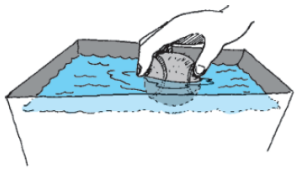
Materials:

marble
eyedropper
chunk of soap
paper clip
drink cup
wooden peg
aluminum foil pan
sponge
film canister
piece of fruit
other household items (that can get wet)

Fill a sink or tub with water. Be sure to fill it deep enough—about up to your elbow.

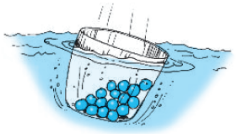
Test It Out

- *Collect objects you can drop in the water. What sizes and shapes are the objects you collected? What is each made of? How are the objects alike? How are they different?*
- *Which objects do you think will float or sink? Test it out! Make two groups: floaters and sinkers. One by one, drop the objects in the water. Do your results match your predictions?*
- *Push one of your floaters under the water. Can you feel the water pushing back? What happens when you let go of a floater?*



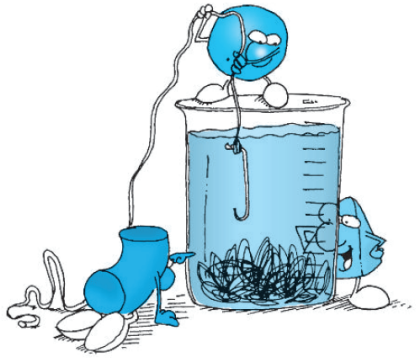
- *How can you make a sinker into a floater? Test it out! Fill a balloon with air. What makes a balloon a good floater? Tape a sinker to the balloon. Drop the balloon and its load in the water. What happens?*

- *What other ways can you turn sinkers into floaters? Try changing their shape. Try combining them with a floater. What ways can you turn floaters into sinkers? Try adding weight. Try changing their shape. What works?*



Try This, Too!

- *Boats are good floaters. Make your own boat from aluminum foil. Here are a few ideas to try with a boat.*
  - *See how much weight you can add to your boat before it sinks.*
  - *Place the weight in different places. Try spreading the weight throughout the boat, too.*
  - *Make your boat a better floater.*
  - *Test how your boat moves when you make waves.*
  - *What other boat tricks can you think of to try?*
- *Test yourself as a floater or sinker! The next time you are in the shallow end of a pool, see if you can float. See if you can sink. Play with body position. Can you hold onto something to help you float?*
- *Go fishing! Bend a large paper clip to make a hook. Tie it to a string. Bend more paper clips into weird shapes. Let them sink. Can you catch these "fish" with your hook?*



What's The Big Idea?

An object placed in water pushes down on the water below it. The water pushes up on the object, too. If water's upward push is stronger than the object's downward push, the object floats. Otherwise, the object sinks.

Whether an object floats depends on its **density**. *Density is a measure of how "tightly packed" materials are inside an object. Less dense objects float in more dense liquids. For example, wood is less dense than water, so wood floats. An object's shape also can help it float. For example, a boat floats because it has a lot of space inside for air, which is less dense than water.*

FLOAT THAT LOAD

When a boat carries a load, water's upward push must support the load, or it sinks. What is the best way for a boat to carry a load?

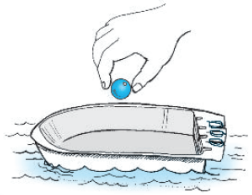
Set It Up

Materials:
plastic boat
marbles
modeling clay

Float the boat in water. Try to sink the boat by pressing on it with your hand. How does pressing on different parts of the boat change your results?

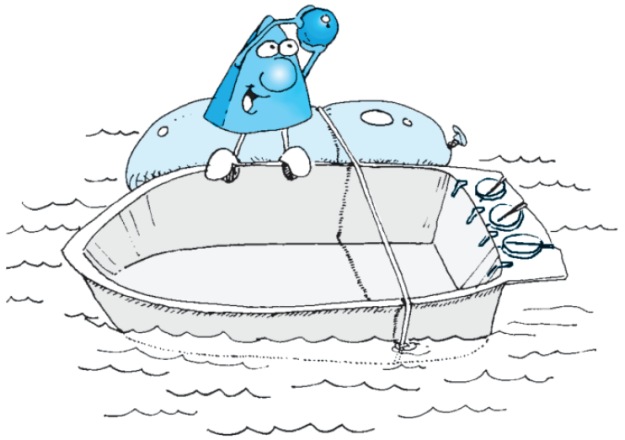
Test It Out

- *Drop a marble into your boat. Where does the marble roll? Drop another marble into the boat. Where does this marble roll?*
- *How many marbles do you think you can load on your boat before it sinks? Test it out! Add marbles one at a time. How close was your guess? What part of the boat sank first?*
- *What would happen if the marble load was spread out instead of bunched together? Test it out! Make three walls inside your boat as shown. Use pieces of clay.*
- *Add marbles to the boat. Where should you place the marbles to keep your boat afloat? Does your boat hold more or fewer marbles before sinking?*
- *Add a fourth wall to the boat as shown. Add marbles again. How should you place the marbles to keep your boat afloat? Count how many marbles you can add before your boat sinks. Which design works best? Why do you think so?*



Try This, Too!

- *Here are some experiments to try with boat loads.*
  - *Try other designs to keep a marble load from rolling around in your boat. Use clay or any other objects you choose.*
  - *Place tape over one end of a tissue paper tube. Stand the tube, tape side down, in your boat. How many marbles can you stack inside the tube before the boat sinks? Does it matter where you place the tube? What happens if you lay the tube on its side and load marbles?*
  - *Blow up a balloon part-way. Attach it to one side of the boat. Wrap a large rubber band around the boat and the balloon. Load marbles into the boat. Let them roll. Does the balloon keep the boat afloat with a heavier load? Will you get the same results if you place the balloon inside the boat?*
  - *What other ideas can you think of to try?*



What's The Big Idea?

When a boat sits in the water, its downward push, or weight, is equal to the upward push from water, or **buoyancy**. *If weight is added to one point of the boat, it sits differently in the water. That point of the boat sinks lower in the water as the extra weight gives an extra downward push. Eventually, water rushes in, which* **capsizes** *the boat. When the load is spaced evenly, more weight can be added before the whole boat sinks low enough in the water to allow water to rush in.*

STEER CLEAR

A sailboat has a rudder on the back for steering. How does water "push" against a rudder to move a boat in different directions?

Set It Up

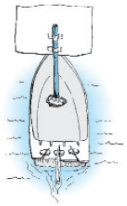
Materials:

straw
pre-cut sail
clay
2" X 3" piece from a cardboard juice carton
plastic boat
tape

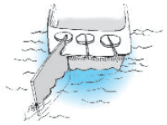
Tape one end of a straw to the middle of the pre-cut sail. Place a ball of clay in the center of the boat. Push the straw into the clay to hold up the sail. Float your boat in a bathtub.

Test It Out

- *Blow on the sail. What path does the sailboat travel? Try making the boat sail right, then left, then forward. Play with the position of the sail, and how you blow on it. How can you steer your boat the best way?*
- *Can you steer the boat without moving the sail? Test it out! Add a rudder to the sailboat. Push a 2" x 3" cardboard piece into the middle slot at the back of the boat as shown. This is your rudder. Position the sail as shown.*



- *Where do you think the boat will go when you blow on the sail? Try it. Were you correct?*
- *Move the rudder to the left slot as shown. Where will the boat go when you blow on the sail? Try it.*

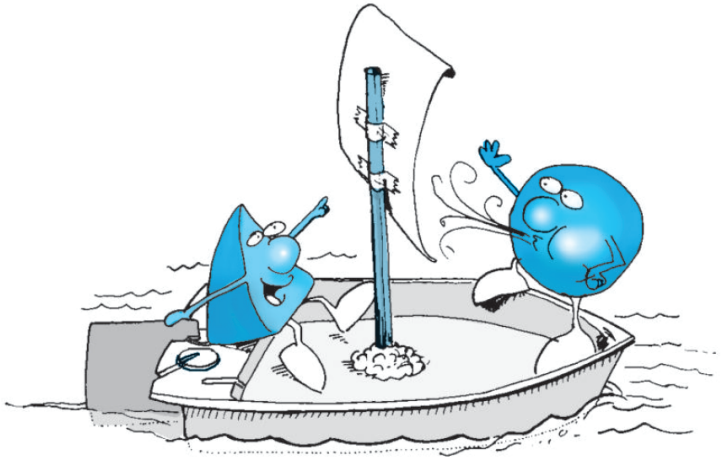


- *Move the rudder to the right slot as shown. Blow on the sail. Where does the boat go?*

- *Wiggle the back of the boat in the water, with and without the rudder. What difference do you feel? What ideas do you have about how a rudder works in the water to help steer a boat?*

Try This, Too!

- *Here are some moves to try with your sailboat.*
  - *Play with different combinations of sail and rudder angles.*
  - *Raise the rudder in its slot so it just touches the water. How does this affect the way the rudder works?*
  - *Try blowing the boat backwards with the rudder in each position.*
  - *What other moves can you think of to try?*
- *Play with your boat's design. Try different-shaped sails. Try different-shaped rudders. Try adding a load to your boat. How do these things change the way your boat moves when you blow on the sail?*



What's The Big Idea?

A sailboat is steered by the **pressure** *(pushing action) of water against the rudder. When the rudder is in the middle position, water pushes with equal strength against either side. The boat sails straight ahead. When the rudder is angled to the left (placed in the left-hand slot), water pushes harder from the left. This causes the boat to swing into a left turn. When the rudder is angled right (placed in the right-hand slot), water pushes harder from the right. The boat swings into a right turn.*

LIQUID LAYERS

If water's upward push can support an object, the object floats. If not, it sinks. How does water's upward push act on other liquids?

Set It Up

Materials:

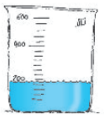
beaker
syrup
cooking oil
water
wooden peg
plastic button
marble
carrot stick
spoon

Cover your work area in case you drip or spill.

Look at your beaker. Find the 200, 400, and 600 number marks.

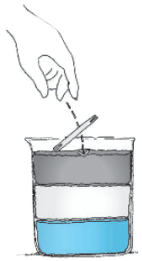
Test It Out

- *One at a time, rub syrup, cooking oil, and water between two fingers. How does each one feel? Which one do you think is the thickest? The thinnest?*



- *Pour the syrup in the beaker until it reaches the 200 mark. What will happen if you add oil to the syrup? Test it out! Pour oil up to the 400 mark. What happens?*

- *What will happen if you add water? Test it out! Pour water up to the 600 mark. What do you see? Which liquid can water support? Which liquid sinks below water?*



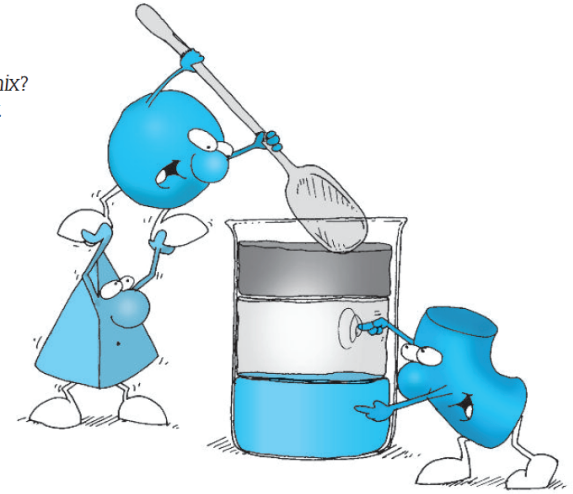
- *How will solid objects float on or sink through your liquids? Test it out! Drop a wooden peg in your beaker. What happens?*
- *Predict what will happen when you drop in a button, a marble, and a carrot stick. Do the results match your predictions?*
- *Can you make your objects float or sink in a different way? Test it out! Use a spoon to poke each object down or scoop it up. What happens?*

Try This, Too!

- *Would your activity turn out differently if you made the following changes, one at a time? Try it!*
  - *Pour your liquids in a different order.*
  - *Pour your liquids in different amounts.*
  - *Use different liquids.*
  - *What other things can you think of changing?*

- *Try dropping other objects in your liquids to see how they sink or float. Here are some objects to try.*
  - *piece of fruit*
  - *paper clip*
  - *birthday candle*
  - *paper towel ball*

- *Can you make the liquids mix? Here are some things to try.*
  - *Stir the liquids.*
  - *Add salt.*
  - *Add dishwashing liquid.*



What's The Big Idea?

Different liquids have different **densities.** *In addition, some liquids do not naturally mix with other liquids. In this activity, the syrup, oil, and water have different densities. They do not naturally mix, either. As a result, when poured into the beaker, they sink and float according to their densities. Syrup has the greatest density, so it sinks to the bottom. Oil has the least density, so it floats on top. Water is in between. When solid objects are added, they sink until they reach a liquid with a density greater than theirs.*

WATER VOLCANO

If you mix hot and cold water, the hot water rises, and the cold water sinks. How can you use this fact to create an underwater volcano?

Set It Up

Materials:

glass beaker
food coloring
spoon
2 marbles
film canister
aluminum foil
rubber band
pen

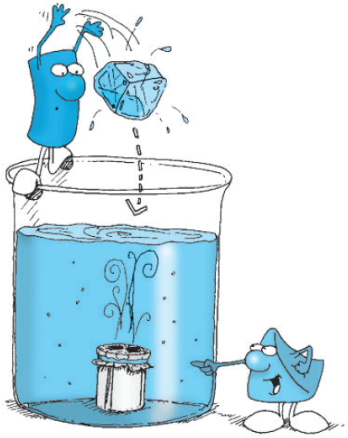
Have an adult help you heat a glass of water until it is hot. It does not have to be boiling.

Test It Out

- *Fill a beaker most of the way with cold water.*
- *Squeeze a few drops of food coloring into the glass of hot water. Stir the coloring into the water with a spoon.*
- *Drop two marbles into a film canister to add weight. Fill the canister with the hot colored water. Then, cover the canister with aluminum foil. Wrap a rubber band around the top of the canister to hold the foil in place.*
- *Place the canister in the beaker of cold water. What do you think will happen if the colored water comes out of the canister? Test it out! Use a pen to poke two holes in the foil.*
- *Where does the warm water go? How do you know? Keep watching. Count to 20. Where is the warm water now? Count to 20 again. What is happening? Why do you think so?*
- *Take the canister out of the beaker. Pour the water out of the canister. How does the water look and feel? How does the water in the beaker look and feel?*

Try This, Too!

- *Here are some tricks to try with your water volcano.*
  - *Once you "start" your volcano, put an ice cube in the beaker.*
  - *See what happens when you put cold water in the canister and hot water in the beaker.*
  - *Add food coloring of a different color to the beaker water than you use for the film canister. Watch the colors mix together.*
  - *Put a layer of cooking oil on top of the beaker water before you "start" your volcano.*
  - *What other ideas can you think of to try?*
- *Place two clear glasses side by side. Fill one with hot water and one with cold water. Drop food coloring in each. Watch for differences in how the color mixes.*
- *Look for other differences between hot water and cold water. For example, try mixing hot chocolate or sugar in cold water. Then try it in hot water. What happens? Try floating an egg in cold water and in hot water. Does it float in the same spot?*



What's The Big Idea?

When water is heated, its molecules move more quickly. The molecules need more space to move around, so the water **expands**, *or spreads out. Molecules in hot water are not as "tightly packed" as molecules in cold water. So hot water is less dense than cold water. As a result, hot water floats on top of cold water. You see this when the colored (hot) water rises to the top of the clear (cold) water. As the hot water cools, it sinks and mixes with the beaker water.*

EYEDROPPER SUBMA-

Water pressure increases as water squeezes into a smaller space. How can increasing water pressure move a "submarine"?

Set It Up

Materials:

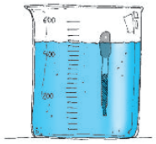
beaker
eyedropper
empty 2-liter plastic bottle with cap

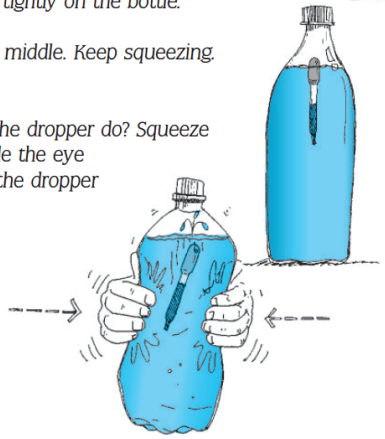
Be sure to work over a sink or a tub.

Practice using the eye dropper. Take in water and squirt it out. This is your "submarine."

Test It Out

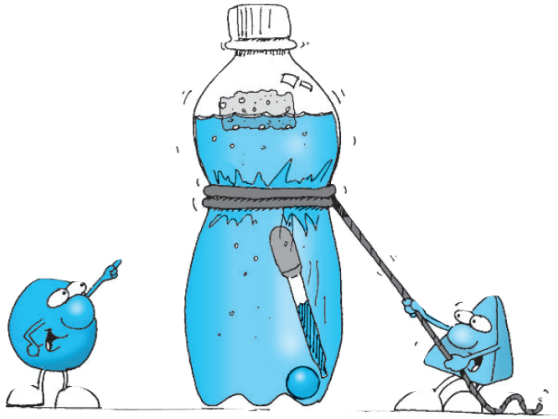
- *Fill the beaker with water. Drop in the eyedropper. What happens? Try to make the eyedropper sink. How can you do it?*
- *Fill the dropper part way, so it barely floats. How much water is in the dropper? What else is in the dropper?*
- *Fill a plastic soda bottle three-fourths full with water. Drop in the half-filled dropper. Screw the cap tightly on the bottle.*
- *Squeeze the bottle's sides at the middle. Keep squeezing. What does the dropper do?*
- *Let go of the bottle. What does the dropper do? Squeeze again. Watch the water line inside the eye dropper. How does it change as the dropper moves?*
- *Can you squeeze the bottle anywhere to make the "submarine" dive? Test it out! Can you make the diver stop in the middle?*





Try This, Too!

- *How can you play with the way your dropper dives? Here are some things to try.*
  - *Add weight to the dropper. Try clay or a large paper clip.*
  - *Fill the dropper with something other than water. Try syrup or cooking oil.*
  - *Leave the cap off the bottle.*
  - *Put less water in the dropper.*
  - *What other ideas can you think of to try?*
- *Play a submarine game. First, add objects to your bottle. Choose ones that float and ones that sink. You might add a paper clip, a marble, a wooden peg, and a small piece of sponge. Players take turns making the submarine dive. If the submarine hits an object as it dives or comes to the surface, the player gets a point. (Hint: Tilting the bottle may help.) The first player to get 5 points is the winner.*



What's The Big Idea?

In this activity, the bottle is filled with water and air. The dropper also contains water and air. When you squeeze the sides of the bottle, you make the space inside the bottle smaller. As air and water are squeezed into a smaller space, the **pressure** *inside the bottle increases. The extra pressure forces water into the eyedropper. This squeezes the air in the dropper into a smaller space. The dropper gets heavier and sinks. When you stop squeezing, the pressure decreases. The extra water leaves the dropper. The air inside the dropper spreads out. The dropper gets lighter and floats.*

TUBE TRICKS

A plastic tube can be used to pump water up and down. How can you use a tube to pump water from one bowl into another?

Set It Up

Materials:
plastic tube
2 large bowls
chair

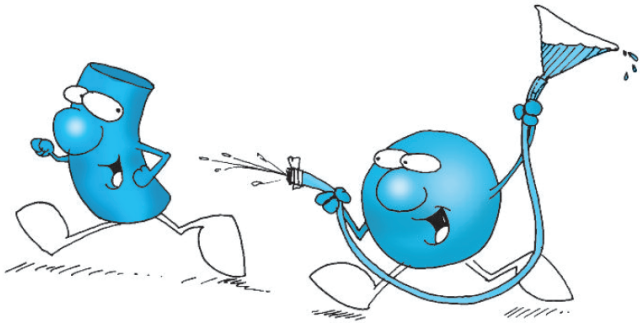
Work in an area that you can get wet. Practice moving water through a tube. Play with how you hold the tube to see what happens to the water inside it.

Test It Out

- *Work with a partner. Fill one bowl with water. Leave a second bowl empty.*
- *How can you move water from one bowl to another using the tube? Test it out! Place the tube and bowls any way you want. Is moving water through the tube easy or hard to do?*
- *Now, place the full bowl on a chair. Place the empty bowl on the floor in front of the chair.*
- *Dunk the tube in the bowl of water. Hold it all the way under. Watch for air bubbles to stop coming out.*
- *Have your partner place a thumb over one end of the tube, then lift it out of the water. You hold the other end under the water.*
- *Have your partner point his or her end of the tube into the empty bowl. What will happen when your partner moves his or her thumb away? Test it out! What do you see? Which direction does the water move out of the bowl on the chair? Which direction does the water move into the bowl on the floor? When does the water stop moving?*

Try This, Too!

- *Will this activity turn out the same way if you change each of the following things, one at a time? Try it!*
  - *When water starts flowing, see if you can make it stop. Try lifting one end of the tube out of the bowl on the chair. Or try raising one end of the tube higher than the other end.*
  - *Try placing the two bowls at the same level to start.*
  - *Try placing the empty bowl higher than the full bowl to start.*
- *Make a water fountain! Do this outside. Cover one end of the tube with masking tape. Have an adult poke a hole in the tape. Place a funnel in the other end of the tube. Hold the taped end of the tube so it is higher than the funnel end. Have a partner pour water into the funnel to fill the tube. Now, lower the taped end of the tube below the funnel end. What happens?*
- *Play with other "tubes." Move water through a straw or a hose. What ideas do you have about how you are able to use these tubes to move water?*



What's The Big Idea?

The water pump in this activity is called a **siphon**. *A siphon works because water naturally flows to its lowest point possible. When you fill the tube with water, and hold one end at a lower point (over the empty bowl), the water flows out that end of the tube. The other end is still underwater. Think of the water in the full bowl and the water in the tube as one "piece" of water. The water gets "sucked" up into the tube in a vacuum-cleaner motion. It keeps flowing until there is none left to suck into the tube. This activity will not work if the open end of the tube is held higher than the underwater end. It will not work if the underwater end of the tube is lifted from the water, either. Air replaces water and "breaks" the piece of water.*