



## January 2010 – Properties of Water

Do you ever wonder why some things sink and some float? Why does a penny sink but a bottle cap float? Why does ice float in water? Keep reading to discover why!

### Sinking & Floating Science Projects

#### Sink or Float?

You probably already know that some things will float in water and some will not. Do you know why that is? Sometimes the best way to find out if something will sink or float is just to try it-- and that is exactly what you'll do in this experiment! Gather up some objects from around your house to test their sinking or floating abilities. Make sure all of the items you pick can get wet!

#### What You Will Need:

- a large container of water (or fill up a sink or bathtub)
- lots of small objects of different weights and materials (plastic, metal, wood, foil, Styrofoam)
- a few larger objects
- [worksheet](#) (see below)
- pen

#### What To Do:

1. Look at the objects you collected. Draw a picture of each one in the boxes on the left side of the worksheet.
2. Make a *prediction* about each object - do you think it will sink or float in the tub of water? (To make a prediction means to say what you think will happen.) Mark your prediction on the worksheet for each item (circle float or sink).
3. Drop the objects into the water one at a time. Watch what happens to each one. Did you predict correctly? Circle "float" or "sink" next to each object on the sheet to show the *results* of your experiment.

#### What's Happening?

Even though some of your items seemed very light (things like a paperclip or a button), they still sank in the water. Some objects that might have seemed sort of heavy (like a wooden block) probably floated. That is because whether an object sinks or floats in water doesn't just depend on its weight or size. It also depends on its **density**. Density is a measure of how solid something is. All things are made up of tiny particles called molecules. If the molecules inside

an object are very close together, the item is solid, or dense. If the molecules are farther away from each other, the object is less dense, or less solid. An example of a very dense item is a penny. A cork is less dense.

A penny, paperclip, or button sank because the materials they are made of (metal for a paperclip and penny, plastic for a button) had more density than water. (Their molecules are closer together than water molecules are.) A cork, piece of wood, or Styrofoam floated because those materials have less density than water. All the objects that were less dense than water floated in the water! Objects that were more dense than the water sank.

## Liquid Density

Do you know why oil floats on water? Would an object that sinks in oil be able to float in water? Try this experiment to find out and learn more about density.

What You Will Need:

- 1-cup glass measuring cup
- vegetable oil
- water
- food coloring
- corn syrup
- small objects (we used a raisin, grape, cork, button, penny, screw, and piece of wax)

What To Do:

1. Fill the cup with water to the 1/3 mark. Add 2 or 3 drops of food coloring.
2. Add 1/3 cup of corn syrup so that the level of liquid in the cup rises to the 2/3 cup mark.
3. Add 1/3 cup of oil to fill the cup to the 1 cup mark.
4. Watch what happens. The layers should separate so that the corn syrup is on the bottom, the oil is on top, and the water is in the middle.
5. Guess where each of your objects will land when dropped into the cup, then test them out one at a time.



What's Happening?

The corn syrup was the most dense liquid, so it sank to the bottom of the cup. The water was less dense than the corn syrup, but more dense than the oil, so it settled on top of the corn syrup. The oil was the least dense, so it floated on top of the water!

The objects that you dropped into the cup had different densities. Each object sank into the cup until it got to a liquid that was more dense than it. The cork was not very dense at all, so it floated on the surface of the oil. The wax fell into the oil, but not all the way to the water, so it was more dense than the cork, but not as dense as water. The grape and the raisin fell to the bottom of the water layer, but not into the corn syrup. That means that they were less dense

than the corn syrup, but more dense than the water! The penny and screw were very dense; they sank all the way to the bottom of the corn syrup!

## Fun Facts

- Ice floats on water because it is less dense than water.
- Buoyancy also happens in the air, allowing things like hot air balloons to float. Hot air is less dense than cold air, so it rises up above the cold air, pushing the balloon with it!

## Silly Science

- What did the hot water say to the cold water?
  - *You look ice today!*
- Why did the tea kettle stop steaming?
  - *Because it ran out of gas!*
- Knock knock  
Who's there?  
Water  
Water you want?

## Way Cool Websites

- [Drop the objects](#) into the water to see if they will sink or float.
- Melt the ice, make it freeze again, then watch it turn to steam in this [interactive lab](#).

## Teacher Tidbits

### The States of Matter

All things are made up of matter, and there are three different forms that matter can exist in--solid, liquid, and gas. Some matter can change from one state to another when the temperature changes. When an object is a solid, its molecules are arranged in a pattern and don't move very much. In a liquid, molecules are farther apart from each other and move around instead of sticking together. The movement is what makes a liquid be fluid and take the shape of a container it is in. The molecules in a gas are even further apart and move very quickly with no pattern at all. Go [here](#) to see what the molecules of substances look like as a solid, liquid, and gas.

Some substances can have two or more different states of matter. For example, peanut butter does not flow like a liquid. It acts more like a solid even though it is very soft. However, if you use heat to melt peanut butter, its state will change and it will flow like a liquid!



### Properties of Water

Water is a very impressive and unique substance. It is the only natural substance that can exist in all three states of matter at the temperatures normally found on Earth. Water is usually a liquid, but when it gets to 32° Fahrenheit (F), it freezes into ice. Ice is the solid state of water. When water

reaches 212° F, it boils. When it begins to boil, some of the water turns into steam. Steam is the gas state of water, and is also called water vapor. There is a lot of water vapor in the air we breathe.

Water is something that all living things need in order to stay alive. A human can live for several weeks without food, but only for a couple days without water. Water makes up about 70% of our bodies, so going long periods of time without drinking any water will make you dehydrated and could make you very sick.

Most substances are more dense when they are solid than when they are in liquid form, but ice is actually less dense than liquid water! This means that ice floats on top of water, instead of sinking. This is a very good thing, because otherwise lakes and ponds would freeze completely in the winter and the animals in the water couldn't survive.

Another interesting property of water is its surface tension. Surface tension is sort of like a thin invisible skin on the surface of water. It can keep a paper clip from sinking into a cup of water when you lay it gently onto the water. If you fill a glass up to the very brim and then slowly pour in even more water, you can see surface tension in action. The water will bulge above the rim of the glass allowing you to add more water than you might think possible before it overflows! To learn more about surface tension, check out [these experiments](#).

## **Buoyancy**

When an object is added to a liquid, the object pushes the liquid out of its way to make room. To see this in action, fill a glass measuring cup with 1 cup of water and then set an egg into the cup. See how the level of the water rose above the 1 cup mark? That is called *displacement*, because the water was displaced, or pushed out of the way, by the egg.

When an object is in water, the water around it pushes against the object and tries to push it up. The force of the water that pushes on the object is called **buoyancy** (say BOY-AN-SEE). If the object weighs less than the amount of water that is pushed aside (displaced) by the object, it will float. If it weighs more than the amount of water that it pushes aside, it will sink!

When the weight of an object is spread out over a larger distance, more water is pushing against it and supporting the weight than if the object is smaller. Buoyancy is the force that keeps heavy boats and ships floating instead of sinking! You can see how this works with a ball of clay. If you roll clay into a ball and put it in the water, it will probably sink. Try flattening it out in a boat shape to see if you can get it to float.

## **Density**

If a piece of wax sinks through oil but floats on water, does this mean its density changes? No, an object's density stays the same, but different liquids often have different densities. For example, water is more dense than oil, so oil will float on top of water. (Oil and water can't mix together, so oil will always stay on top.) The way an object acts in liquids that have different densities can be different. An object that floats in oil might still sink in water, even though the object itself doesn't become more or less dense. To see the different densities of some liquid and solid objects, perform the "Liquid Density" experiment above.

## Science Words

**Density** - a measure of how solid something is, or how tightly the molecules in a substance are "packed" together. If they are very tight, the object is very dense. If they are looser, the object is less dense.

**Buoyancy** - the force of water that pushes up on an object, making it able to float.

## Printable Worksheet

Use this worksheet with the "Sink or Float?" project above to encourage kids to make predictions, perform tests, and record their results. To test even more objects, print out multiple copies. Fruits and vegetables are also fun things to test for floating abilities. Discuss why some things that are filled with air float in water (here are some ideas - a rubber duck, a hollow plastic ball or tennis ball, a bell pepper, and a empty glass bottle or jar with a lid).

