

# A Dozen (cheap, easy) Experiments and Demonstrations with Water

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## A. Introductory Demonstration:

Show a globe to the class. 70+% water. But, almost none of it is useful for us other than for shipping or recreation.

Have a 2 gallon bucket of water. Pour out two cups in another container and then pour salt into the original 1+ gallons. That's salt water. We can't drink it. We can't water our crops with it.

Pour 1.5 cups of the fresh water into a jar of ice cubes. That's Antarctica, Greenland and other locations where the water is frozen. (glaciers)

Pour most of the rest into a jar of loose dirt. That's polluted water and water that is underground, mostly unreachable.

The rest, about a tablespoon, represents freshwater lakes, rivers, and available groundwater. The great lakes are about a half-teaspoon.

## B. A micro look/freezing water

A water molecule is made of two Hydrogen atoms and one Oxygen atom. They are a specific shape and held together by covalent bonds. These bonds are very strong. Neighboring water molecules are held together by **hydrogen bonds**. They are much weaker.

Air molecules are widely spaced and zip around at about 1000mph.

Water molecules are tightly packed but can slide past one another.

Molecules in a solid cannot move around, but they can vibrate.

When water freezes, the molecules form a lattice structure, and take up a bit more space than they did when they were in liquid form.

Homework!! Freeze water in a plastic bottle or freeze a can of pop.

## C. Role play water molecules, both liquid and freezing.

## D. Molecules Moving Demonstration

Carefully place 1 or 2 drops of food coloring in a glass of water. Without any stirring or agitation, the movement of the water molecules will move the dye around and color the water.

.....extension.....use hot water and compare the results with ice cold water. The dye will move around much faster.

## E. Cohesion/Surface Tension Experiment

Because water molecules are attracted to each other, they can pile up on a penny. Using a dropper and a dry penny, carefully add water, drop by drop, and see how much you can put on the penny. Observe the shape of the piled up water from the side.

E. Explanation. The "skin" on the water is called **surface tension**, caused by the attraction of the molecules to each other. When this surface tension is no longer strong enough to hold all the water in, a lot of water spills off. The molecules pull each other along, like people holding hands. This "holding on" tendency (remember the hydrogen bonds?) is called "**cohesion**". That's what siphoning water counts on.

## F. Siphoning through a cloth

Place a glass with some water in it next to and above an empty glass. Place a strip of absorbent cloth from one glass to another. The water will go up and over, eventually emptying the higher glass. Why? Once some of the water is absorbed and goes over the lip of the higher glass, it pulls the rest of the water along. The water goes up the cloth through "**capillary action**", moving up through the little gaps because it is attracted to the cloth (**adhesion**).

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- G. Adhesion also causes a **meniscus** on water in a tube. The water is attracted to the glass and actually moves away from the middle.
- H. Water density. A hard boiled egg will float in salt water, but sink in fresh water. Salt water is denser (thicker) than fresh water. This is one of the causes of ocean currents.
- I. Liquid to gas = evaporation  
Gas to liquid = condensation  
Liquid to solid = freezing  
Solid to liquid = melting  
**Gas to solid or solid to gas = sublimation!! frost, snowflakes, mothballs**

There are lots of simple demonstrations and experiments with these physical changes.

- J. When salt water evaporates, the salt stays behind. Otherwise, we'd have salty rain. The baby food jar and salty stick is an experiment that shows adhesion, Cohesion, capillary action, and evaporation. It also takes weeks and involves dissolving salt, saturation points, and measuring.
- K. Osmosis! Make two little volcanoes with potato halves. In one caldera, put some sugar. Leave the other one empty. Place the potato/volcanoes in some water. They respond differently.
- L. Refraction!! Prisms!
- M. Celery/White carnations in colored water. Do your school colors!!