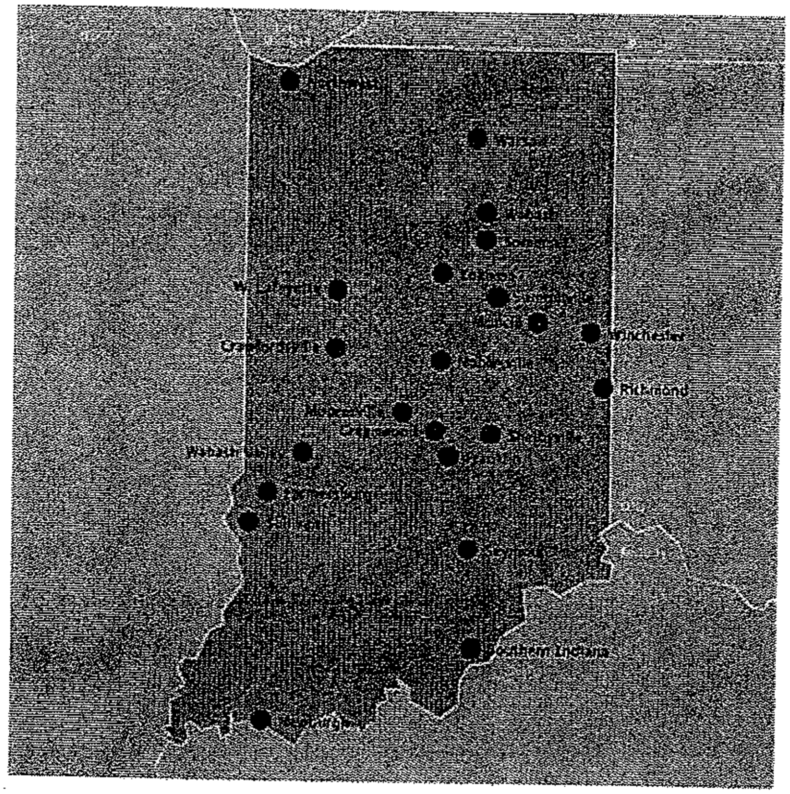
Indiana American Water



19 experiments to help us all keep water, our precious natural resource, safe for all who depend on it

Experiments are a great way to increase knowledge and have some fun. Try these experiments and see if you can answer the questions at the end. Good luck!

1) Foam & Sizzle

NOTE--ADULT SUPERVISION NEEDED FOR THIS EXPERIMENT

Materials:

Tap water; Dry teaspoon; Citric acid powder (which you can get in the canning section of your grocery store), 2 teaspoons; Baking powder, 2 teaspoons; Two dry 8-ounce (1/4 -liter) glasses

Objective: Learn about different chemical properties of water.

Vocabulary word:

Chemical properties of water : characteristics of the elements of water.

Instructions:

1. Put a teaspoon of citric acid powder into each glass.

2. Add a teaspoon of baking powder to each glass.

3. Stir and observe what happens.

4. Then into one of the glasses, add two teaspoons of water.

5. Note what happens to the mixture with water.

How does it work?

As long as the mixture of citric acid and baking soda is dry, it won't mix thoroughly. But by adding water, the two mixtures begin to dissolve and interact (become one solution). Water is the great "dissolver." It can dissolve almost any solid on earth.

Questions to ask:

1. What was the reaction when you added citric acid powder to baking powder?

2. What happened when you added water to the second glass?

2) Water Evaporation

OBJECTIVE: Students will learn how water evaporates

GRADE LEVEL: Kindergarten through second

CURRICULUM AREA: Science, Mathematics

TIME NEEDED: 20 minutes

TEACHERS' NOTES: Evaporation is dependent on the temperature and humidity (water vapor) of the air. Since warm air can hold more water vapor than cold air, water evaporates faster on sunny, dry days.

In fact, storms develop when masses of hot air containing moisture meet cold air. As the hot air mixes with the cold air, the air's capacity for holding moisture decreases. Thus, the water drops from the sky as raindrops (if the air is warm) or snow (if the air temperature is below 32o Fahrenheit [0o Celsius]).

MATERIALS NEEDED: Bucket of water

Sponge for each child

Chalkboard or sidewalk

Hair dryer or fan

ACTIVITY DIRECTIONS: Fill a bucket with water. If the day is warm, go out on the playground for this activity, otherwise use the chalkboard in your classroom. Give each child (if possible) a sponge. Have the children write their name on the sidewalk or chalkboard with the sponge and water. Have each student estimate how many minutes it will take for their names to disappear. If you remain inside, have the students dry the chalkboard with a hair dryer or fan. Be sure to record the students' guesses but don't refer to them again. This exercise allows the students to feel comfortable with the process of math estimation.

EXPANDED ACTIVITIES: Have the students observe puddles on the playground and then lay a piece of string around the circumference of a puddle. Return the next day and have the students look at the puddle again. What has happened to the puddle? You may want to lay a new string around the shrinking puddle to give the students an idea of the amount of evaporation that has taken place.

If you remain inside for this experiment, put some water in a watch glass or on a reused lid. The students can then observe the rate of evaporation in their own classroom.

QUESTIONS TO ASK: Where did the water go from the sidewalk or the chalkboard?

If the weather was rainy or snowy, would the water evaporate at a faster or slower rate?

3) Frozen Solid - Grades K-2

OBJECTIVE: Students will learn that water as ice is a solid

GRADE LEVEL: Kindergarten through second

CURRICULUM AREA: Art

TIME NEEDED: 30 minutes of activity. Full day to see the effects.

TEACHER'S NOTES: Water freezes at 32o Fahrenheit (0o Celsius). Water expands when it freezes. Frozen, or solid, water can break bottles and pipes, and causes cracks in rock and sidewalks. But water as a solid weighs less than water as a liquid. For example, ice usually forms on top of a river. This then creates a blanket-effect below for the fish living in the river. If ice formed on the bottom of the river, some rivers would never melt in the spring. Fish would have to swim on the top of the river and die.

MATERIALS NEEDED:

ξ Various ice or cookie molds
ξ Water
ξ Tempera paint or watercolor paints
ξ Paint brushes for each student
ξ Paper cup of water for each student to use for painting
ξ Cookie sheets
ξ Kitchen mitts to handle the ice
ξ Newspapers

ACTIVITY DIRECTIONS: Pour water in various molds and freeze. After water is frozen, take the ice out of the molds and create frozen sculptures that students can paint either with tempera or watercolor paints.

Then place their sculptures on cookie sheets and newspapers on the window sill. At the end of the day, have the students check on their sculptures. Ask them what happened to their sculptures?

QUESTIONS TO ASK: What happens when water is frozen in ice cube trays?

Do the ice cubes become bigger or smaller?

What part of the sculpture melted first, the part near the window or the part away from the window?

4) Water Is Gas - Grades 2-3

OBJECTIVE: Students will learn that water can be an invisible vapor or gas

GRADE LEVEL: Second and third

CURRICULUM AREA: Art

TIME NEEDED: 20 minutes

TEACHERS' NOTES: Water becomes a vapor when it boils at 212o Fahrenheit (100o Celsius). Even though it is invisible, steam has been used to power large machinery, including steam locomotives and steam turbines for creating electricity. Steam machinery operates by forcing the vapor into a small pipe and concentrating the steam into a small forceful stream of air. This allows the steam to have more power than if it was free-floating.

MATERIALS NEEDED:

- ξ Large pot of hot water
- ξ Kitchen mitts to handle the hot pot
- ξ Cold day (preferable)
- ξ One window
- ξ Windowsill
- ξ Thermometer

ACTIVITY DIRECTIONS: Get a large pot and fill it up with hot water from the faucet. With the thermometer, determine the temperature of the hot water. Then, using kitchen mitts, take the pot to a classroom window. Warn the children to be cautious near the hot water. Then have the children draw a picture, using their fingers, on the steamed window. Watch what happens to the picture.

After the picture has evaporated away, take a temperature reading of the water in the pot.

QUESTIONS TO ASK: Does the picture evaporate right away?

Which side evaporated first?

Was it close or far away from the pot?

What happened when the pot became cold?

Were there any fingerprints on the window after the steamed picture evaporated away?

What was the temperature difference between the hot water and the cold water?

5) Pocket Garden - Grades 2-3

OBJECTIVE: The students will learn that water is needed to grow the foods that we eat

GRADE LEVEL: Second and third

CURRICULUM AREA: Social studies, Health

TIME NEEDED: 20 minutes of activity. One to two days for seeds to germinate.

TEACHERS' NOTES: Since many students have never been to a farm or a ranch, they sometimes have difficulty realizing that plants need water in order to grow. This activity allows students to grow their own food and see how seeds germinate, or sprout, due to the presence of water.

MATERIALS NEEDED:

- Two sandwich-sized self-locking plastic bags for each student
- Two paper towels for each student
- Approximately 5 to 10 alfalfa or bean seeds per student
- Two pockets per student (use painting smocks, if possible)
- Warm place for the gardens to germinate

ACTIVITY DIRECTIONS: Have the students moisten (not drown) a paper towel and put the paper towel into the sandwich-sized self-locking plastic bag. Then sprinkle the towel with some seeds. Seal the bag and place into a pocket.

Next have the students create a "control" garden by placing some seeds into a plastic bag, putting in a dry paper towel, and sealing it. Place this bag in the other pocket. Then open the bags after one or two days to see what has happened. Let the children enjoy the sprouts that have grown in the moist towel.

QUESTIONS TO ASK: Which bag did the seeds sprout in?

What did the seeds need in order to sprout?

What would happen if you left the bags sealed for a few more days?

Why didn't the moisture leave the bag?

6) Rain, Rain - Grades K-2

Materials:

- Quart- (liter-) sized glass jar
- Metal pie tin
- Hot water
- Ice cubes

Objective: Learn how a solid turns into a gas. Learn the concept of condensation in relation to the water cycle.

Vocabulary word:

Condensation : the process of changing gas (such as steam) to a liquid (such as water).

Instructions:

1. Pour a cup of hot water into a quart- (liter-) sized glass jar.

2. Pour some ice cubes in a pie tin and place the tin on top of the jar.

3. Observe for several minutes. What happened?

How does it work?

The hot water heats the air in the jar and adds moisture to it. The moisture-laden hot air rises. As it nears the cold pie tin, the air cools and condenses. In time, it may actually "rain" outside the jar, as water drops form on and fall from the area of the tin overhanging the jar.

This illustrates what happens in the water cycle. The sun makes water on the earth so warm that it adds moisture to the air. Air contains tiny droplets of water. When the air moves high above the ground, it becomes very cold. When the air becomes very cold, the water vapor in the air collects onto pieces of dust. They become droplets. These droplets become bigger and form clouds. The drops in the clouds get so heavy that they fall to the earth as raindrops. When the drops reach the earth, they may soak into the ground. They may run into a river, lake, or the ocean. The sun then makes these bodies of water warm and the water will evaporate into the air again. Droplets form clouds again. Once again, it rains or snows. This happens over and over again.

Questions to ask:

1. Where do you think the "rain" came from?

2. Do you think the same thing would happen if you put the ice in the jar and hot water in the pie tin?

7) Hotter & Hotter Grades K-3

Materials:

- Two white 8-ounce (1/4-liter) paper cups
- Two cups of water
- Weather or cooking thermometer
- Reading lamp
- Clean dark sock
- Clean white sock

Objective: Learn about the way different colors make us warmer or cooler.

Vocabulary words:

Reflective : sending back waves of light and/or heat.

Absorb : gather or become a part of.

Instructions:

1. Fill each cup with water.
2. Place a dark sock over one cup and a white sock over the other cup.
3. Put the cups under the reading lamp. Turn on the lamp and leave the cups under the lamp for 1 hour.
4. Determine the temperature of the water in both cups.
5. How does it work?

The lamp, acting like the sun, sends light to the two cups. The dark sock absorbs light and changes it to heat. Light colors act like reflectors and bounce the light off. That's why many people wear dark heat-absorbing colors in the winter and light heat-reflecting colors in the summer.

Questions to ask:

1. Which cup was warmer: the one with the dark sock or the white sock?

2. What do you think would happen if you put a medium-colored sock over a cup? Try it!

8) Soap Slick - Grades K-3

Materials:

- ξ Saucer
- ξ Pepper
- ξ Liquid detergent
- ξ Water
- ξ Two toothpicks

Objective: Learn about the effect of adhesion on particles in water.

Vocabulary words:

Adhesion : attraction of water drops to each other.

Surface tension : attraction of water drops to the surface.

Instructions:

1. Cover the bottom of the saucer with water.
2. Cover the surface of the water lightly with 1/2 teaspoon of pepper.
3. Dip one end of a toothpick into the center of the water. (Watch what happens to the pepper.)
4. Take the other toothpick and dip one end into liquid detergent.
5. Dip the end of the toothpick with detergent on it into the center of the water. (Watch what happens to the pepper.)

How does it work?

Pepper will float on the surface of water due to adhesion. Water drops are attracted to the surface. The water drops then push the pepper all the way around the water surface. Adding detergent breaks the surface tension of the water and the pepper is pulled to the edge of the saucer by the tugging of water molecules on one side of the pepper particle. Because of adhesion, water drops cling to the side of each pepper particle.

Questions to ask:

1. What happened when you dipped the toothpick without detergent into the water?

2. What happened when you dipped the toothpick with detergent into the water?

9) Polka Dotted Celery - Grades K-3

NOTE: ADULT SUPERVISION NEEDED FOR THIS EXPERIMENT

Materials:

- Two cups, 1/2 filled with water
- Green or orange food coloring
- 1 teaspoon
- Stalk of celery with some leaves on it
- Stalk of celery without leaves on it
- Knife

Objective: Learn about "capillary action," or how water moves through celery, trees, and other plants.

Vocabulary word:

Capillary action : the upward movement of liquids due to the molecular attraction to the surface.

Instructions:

1. Mix 1 teaspoon of food coloring into each cup of water.
2. Cut both celery stalks at a diagonal about 1 inch (2 - 1/2 centimeters) from the bottom.
3. Put each stalk in one of the cups of colored water.
4. Leave the celery in the water for 4 to 5 hours, until you see the color gradually going up the stalks.
5. Take the celery stalks out of the water and cut diagonally across the stalk. Do you see any color in the stalks? Which one has the most color? You should see a row of circles colored with the dyed water. These are the cut ends of the fine long tubes that travel the length of the stalk. The colored water traveled up the tubes. Trees have similar tubes running up their trunks.

How does it work?

Heat from the sun evaporates the water molecules that are in the top of the leaves. Because water will climb a short way up the wall of certain substances (for example, drinking glasses), the next molecules in line move up to replace the molecules that evaporated. Water molecules always hold (or bond) tightly together, and when they are squashed into very narrow tubes like those in celery, they grip with enough strength to pull up the molecules behind them. The water molecules at the top evaporate, the other molecules move up to take their place, and the water moves up the celery stalk into the leaves. This is called capillary action. This only works if the tubes are full of liquid to begin with. Since the other celery stalk does not have leaves or a surface for the water to evaporate from, the water cannot move up the stalk. Capillary action is how trees and other plants get water to their leaves.

Questions to ask:

1. Which plants use capillary action?

2. Would the roots of vegetables and trees use capillary action?

10) Siphon Magic - Grades K-3

Materials:

- ξ Two plastic glasses
- ξ Ladder
- ξ Plastic tubing, 2 feet (0.6 meters)
- ξ Two paper clamps
- ξ Table
- ξ Book
- ξ Water

Objective: Learn how gravity affects the force of water.

Vocabulary word:

Gravity : the force that pulls things to the center of the earth.

Instructions:

1. Place the ladder next to the table and put the book on the table.
2. Fill one of the glasses almost to the top with water and stand it on the top rung of the ladder.
3. Put the empty glass on the table on top of the book.
4. Fill the tubing with water and pinch the ends tightly so the water doesn't run out. Put a paper clamp on each end.
5. Put one end of the tube under water in the full glass and unclamp that end. Make sure that the end doesn't flop out of the water.
6. Put the other end of the tubing in the empty glass.
7. Release the paper clamp on the end of the tubing and watch the water flow.
8. Try raising the low glass without letting the tube come out of the water at either end.
9. Try lowering the glass on the ladder without letting the tube come out of the water at either end.

How does it work?

Gravity pulls the water down on the lower side of the tube, while air is pushing the water into the tube on the high side. Together, they create the flow of water through the tube. When the water is at the same level in both glasses, gravity is pushing on both sides of the tube and the flow stops.

Questions to ask:

1. What happened when you began to raise the low glass?
2. What happened when you began to lower the high glass?
3. Would it work if you had water in the low glass?
4. What would happen if the tube wasn't filled with water? What is blocking the water from coming to the other end?
5. Water engineers consider gravity when they choose sites for water treatment plants and wastewater treatment plants. Which one of these plants should be placed at the highest point of the city? Which one of these plants should be at the lowest point of the city?

11) Making an Egg Float - Grades K-3

Materials:

- Raw egg
- Hard-boiled egg
- Glass of water
- Salt
- Tablespoon

Objective: Learn how salt affects the buoyancy of water.

Vocabulary word:

Buoyancy--the ability of things to float.

Instructions:

1. Put the raw egg in the glass of water. Watch what happens. Take the raw egg out of the glass.
2. Put the hard-boiled egg in the glass of water.
3. Add salt, a tablespoon at a time, until something happens to the egg.
4. Once you have finished with step 3, take out the hard-boiled egg and put the raw egg into the glass. What happens?

How does it work?

Salt makes the water heavier. As the salt water becomes heavier, the egg is able to float. The key to floating is that the object (the egg) has to weigh less than the water it displaces (takes the place of). Adding salt makes the water heavier, so eventually the egg weighs less than the salt water it displaces. The raw egg weighs less than the hard-boiled egg, so it can float in both the tap water and the salt water.

Questions to ask:

1. What happened to the hard-boiled egg after you kept adding salt into the glass?

2. Why was the raw egg able to float in the water without salt?

3. Do you think that it would be easier for you to float in a lake or the ocean?

12) Ice Treats - Grades 3-5

Materials:

- Two measuring cups
- Distilled water
- Six paper cups
- Six cardboard disks to cover the cups
- Six wooden sticks
- Grease pen
- Canned cherry fruit juice, 1 cup

Objective: Learn how "pure" water freezes differently than a mixture freezes.

Instructions:

1. Put the six paper cups on a counter.
2. With the grease pen, number each of the cups from 1 to 6.
3. Fill the first cup with fruit juice.
4. Fill the second cup 1/2 full of juice and 1/2 full of water.
5. Fill the third cup 1/4 full of juice and the rest with water.
6. Fill the fourth cup 1/8 full of juice and the rest with water.
7. Fill the fifth cup 1/16 full of juice and the rest with water.
8. Fill the sixth cup with pure water.
9. Put the cardboard disks over the cups. Punch a hole in each disk with the wooden stick and keep the stick in the cup.
10. Place all of the cups in a freezer. Be sure that they are all on the same shelf in order to keep them at the same temperature.
11. After 1 hour check to see which ones are freezing by jiggling each stick.
12. Keep checking every 1/2 hour until frozen.

How does it work?

The temperature at which the juice freezes is lower than the temperature at which water freezes (32 degrees Fahrenheit, 100 degrees Celsius). The cups with the most juice should freeze last, while the cups with the most water should freeze first.

Questions to ask:

1. Which ice pop took the longest to freeze?

2. Which ice pop froze first?

3. Do you think the results would have been different if you had used another type of juice?

13) Shifting Sands of Time - Grades 4-6

Materials:

- Three large paper cups
- Sand, topsoil, and gravel
- Three plastic coffee can lids
- Three nylon stockings
- Three rubber bands
- Marker and pencil
- Water
- Four beakers, 250-milliliter
- Pin
- Scissors
- Watch

Objective: Learn how water moves in an aquifer.

Vocabulary words:

Aquifer :a layer of rock, sand, or gravel beneath the earth's surface that contains water.

Percolation : the movement of water downward.

Instructions:

Using a pin, punch several holes in the bottom and around the lower part of each cup. Make sure that you punch the same number of holes in each cup.
Put a nylon stocking over the bottom of each cup, so it covers all the holes. Secure the stocking with a rubber band.
Using scissors, cut a hole in the plastic coffee lid so that the cup just fits inside. Place each cup in a lid and place each lid over a beaker. Label the cups A, B, and C with a marker.
Fill cup A 1/2 full of dry sand, cup B 1/2 full of topsoil, and cup C 1/2 full of a mixture of sand, gravel, and topsoil.
Predict the soil type that will allow the water to soak through (percolate) the fastest and predict the time it will take.
Pour 2 ounces (0.06 liters) of water into each cup. Record the time when the water was first poured into each cup.
Record the time when the water first drips from each cup. Notice the appearance of the water.
Allow the water to drip for 25 minutes. At the end of this time, remove the cups from the beakers.
Measure and record the amount of water in each beaker.
How does it work?

Different soil types have different particle sizes. Gravel particles are the largest, then sand particles, and clay soil has the smallest particle size. The bigger the particle size, the faster the water can seep around the particles and go to the bottom of the cup or into the ground. A garden or lawn planted in sandy soil needs more water than a garden or lawn planted in clay soil.

Questions to ask:

1. Which soil sample had the most water at the bottom of the beaker at the end of the experiment or had the fastest rate of percolation?

2. Which soil sample had the least water at the bottom of the beaker at the end of the experiment or had the slowest rate of percolation?

14) Alarming Aquifer Grades 4-6

Materials:

- ξ Clear plastic soft-drink container with the spout and first 1/2 inch (1 - 1/3 centimeters) of the container cut off, 32-ounce (1-liter)
- ξ Two transparent straws
- ξ Washed pea gravel
- ξ Sand
- ξ Topsoil
- ξ Water

Objective: Learn the parts (components) of an aquifer.

Vocabulary word:

Aquifer : a layer of rock, sand, or gravel beneath the earth's surface that contains water.

Instructions:

Put the gravel on the bottom of the soft-drink container to a depth of 2 inches (5 centimeters). Position two straws upright in the gravel layer. While holding the straws, pour 3 inches (8 centimeters) of sand on top of the gravel.

Add 1 to 2 inches (2 1/2 to 5 centimeters) of topsoil on top of the sand. Slowly add water to saturate the sand and gravel. This water becomes the groundwater. Note the water's movement through the sand and gravel.

Suck the top end of one of the straws. Pinch the opening of the straw closed. Observe the effect of the pumping action on the aquifer. (The effect is similar to the effect of the pumping action of a well.)

Suck on the second straw and repeat the process. Note the effect on the level of the groundwater.

Suck on the straws several times, and observe any changes in the groundwater model.

How does it work?

The pressure of the water and pumping creates a vacuum in the aquifer. This can create changes within the aquifer itself. If an aquifer is overpumped, the land over the aquifer may begin to shift and crack. This is called subsistence. Homes have been known to fall into these holes and cracks.

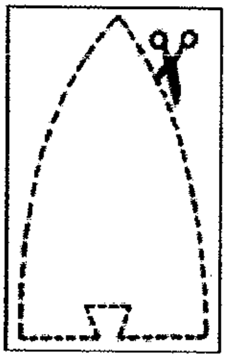
Questions to ask:

1. What would be the impact on the groundwater if even more "wells" or straws were added? What would happen if they were all pumped at the same time?

2. What do you think would happen if there were houses on the area that had shifted?

3. What do you think would happen if there wasn't any sand but only topsoil in the aquifer?

15) Water Experiment



You use soap to take a bath, to wash your hands, and to blow bubbles. But did you know that soap can also produce a power boat? Give it a try!

You'll need:

- one index card
- scissors
- a baking dish or a sink full of water
- liquid dish detergent

What to do:
Using your index card, cut out a boat shaped like the drawing here. Make it about 2-1/2 inches long and 1-1/2 inches wide. Place the boat gently on the water. Pour a little detergent into the notch in the end of the boat. Your boat should move across the water!

Here's why:
Water molecules are strongly attracted to each other. They stick close together, especially on the surface. This creates a strong but flexible "skin" on the water that we call surface tension, which keeps the boat in place. Adding the soap disrupts the arrangement of the water molecules, breaking the skin and making the boat go forward.

Here's a hint:
If you try this experiment more than once, be sure to wash out the dish or sink carefully to remove all traces of the detergent. Otherwise, your boat won't go.

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16) Watching The Water Cycle

Build Your Own Water Cycle

The water cycle is how moisture evaporates into the atmosphere, reenters the atmosphere as rain or snow, and then evaporates again.

You will need:

- A large jar with lid
- Plants
- A bottle cap or shell filled with water
- Soil
- Sand
- Small rocks

Instructions:
Fill the bottom of the jar with the rocks, followed by sand. Put soil on top of the sand -- enough in which to nestle the plants. Place the cap or shell filled with water in the jar and put on the lid. The water in the lid will travel into the atmosphere, and will take the form of water spots on the inside of the jar. What happens when you take the cap or shell of water out?

17) The Slime Filter

Stink Busters!
Or How to Filter Water to Remove Impurities

Water in lakes, rivers and swamps often contains impurities that give it an unpleasant look and odor. This water must be "cleaned" before it comes through the faucet in your house.

Water treatment plants usually clean water by taking it through (1) aeration, (2) coagulation, (3) sedimentation, (4) filtration, and (5) disinfection. The following experiment demonstrates the first four processes.

You will need:

- 5 liters of "swamp water"; this can be water you get outdoors from a lake, river or swamp, or you can make your own by adding two cups of dirt to 5 liters of water
  1 two-liter plastic soft drink bottle with its cap (or a cork that fits tightly)
- 2 two-liter plastic soft drink bottles – one with the top removed and one with the bottom removed
- 1 one-and-a-half liter (or larger) beaker (this can be the bottom of another two-liter soft drink bottle)
- 20 grams (about 2 tablespoons) of alum (potassium aluminum sulfate, available at a pharmacy or in the spice section of the grocery)
- Fine sand (about 800 ml, or eight-tenths of a quart)
- Coarse sand (about 800 ml, or eight-tenths of a quart)
- Small pebbles (about 400 ml, or four-tenths of a quart)
- 1 large (500 ml or larger) beaker or jar
- 1 coffee filter
- 1 rubber band
- 1 tablespoon
- A clock with a second hand or stopwatch

Instructions:
Pour about 1.5 liters of "swamp water" into a 2 liter bottle. To aerate the water, put on the lid and shake vigorously for 30 seconds. This adds oxygen to the water and lets gases trapped in the water escape. Continue the aeration process by pouring the water back and forth between the cut-off bottles 10 times. Then pour the aerated water into the bottle with its top cut off.

To start the process of coagulation; add the alum crystals to the water and stir the mixture slowly for 5 minutes. The alum helps the dirt and other solid particles "stick together" into floc so that they can be removed easily.

To start the process of sedimentation, allow the water to stand for 20 minutes.

To start the process of filtration, you first must build a filter. Take the bottle with its bottom cut off and turn it upside down. Attach the coffee filter to the neck of the bottle with a rubber band. Pour a layer of pebbles into the bottle. Then pour the coarse sand in, followed by the fine sand. Then clean the filter by slowly pouring through about 5 liters of clean tap water. Try not to disturb the top layer of sand as you pour the water.

After the sediment has settled to the bottom of the "swamp water," carefully pour the top two-thirds of it through the filter into the beaker. You now have filtered water!

Important Note:THIS WATER IS NOT SAFE TO DRINK! *At the water-treatment plant, special chemicals are added to disinfect the water that we have not included here.*

18) The Incredible Rising Spaghetti

Voyage to the Bottom of the Glass, or What's the Deal with the Soggy Spaghetti?

This is an experiment that teaches you about a bunch of stuff: displacement, molecular action, chemical reaction, and how to make wet pasta!

You will need:

- Small lengths of uncooked spaghetti
- A tall glass filled with two cups of water
- 3 tablespoons vinegar
- 1 tablespoon baking soda

Instructions:
Stir the baking soda into the glass of water until it dissolves.

Put spaghetti pieces into the glass. They sink because their volume weighs more than the water volume they take the place of, or "displace."

Now stir in the vinegar. What happens?

The mixture of baking soda and vinegar produces a chemical reaction that releases carbon dioxide gas. The gas forms bubbles on the spaghetti pieces, and the bubbles, which are lighter than the water, float the pieces to the top. At the surface of the water they break, and the poor heavy spaghetti sinks to the bottom again.

19) Needle In a Beaker

Breaking the Surface: How Much Tension Does It Take?
The surface tension of water – that is, the "elastic skin" on the surface – is surprisingly strong. Here's how to see it in action!

You will need:

- One large glass filled with water
- Sewing needle
- Fork
- Several coins

Instructions:
Make sure the needle is dry. Rub it between your fingers. Place it on the fork. Gently lower the fork into the glass. Then carefully remove the fork. What happens?

The needle should float, even though it is heavier than the water. That's because the needle is on top of the elastic surface tension of the water. The tension occurs when water molecules come in contact with air and band together to form the thin film on the surface.

Now remove the needle. Make sure the water in the glass is filled to the rim, until it seems to be rounded higher than the glass surface.

With a steady hand, gently drop one coin into the water. Notice that, the more coins you add, the more convex the surface of the water becomes. This is caused by the combination of gravity and surface tension.