Educational Innovations, Inc.®

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Surprising Science for Kids:

KIT-525

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Welcome to Surprising Science for Kids: Just Add Water!

Grades 2-5

Your **Surprising Science for Kids: Just Add Water!** kit includes almost everything you need to perform eight hands-on experiments and dynamic demonstrations related to water and its properties.

We believe the best way to learn about science is to have fun! The activities in this guide will ignite students' curiosity and make them eager to explore on their own.

Included in this kit:

- 2 Large Plastic Cups
- 1 Small Plastic Cup
- 1 Pipet
- 1 Yen Coin
- 1 Paper Clip
- 1 Packet of Pepper
- 1 Toothpick
- 4 Boat Patterns
- 1 Length of Yarn
- Electrical Tape
- 5 Color Splash Tablets
- 4 Colored Markers
- 4 Pieces of Chromatography Paper
- 2 Plastic Bottles
- 1 Tornado Tube

You will also need:

- Scissors
- Water
- Pencil
- Paper Towel
- Liquid Dishwashing Soap
- Plastic Bowl (or Baking Tray with Sides)

About Water

What's so special about water?

Water is the most important liquid on Earth. It actually made life on Earth possible, and when scientists look for life on other planets, one of the first things they look for is evidence of water. Every living thing needs it to survive. Our body is actually made up mostly of water.

Water covers nearly 75% of Earth's surface, and almost all of Earth's water is in the oceans!

Think about all the ways you use water in your life. We use it for drinking, but also for washing, cooking, irrigating crops and lawns, cleaning the streets… and even to produce electricity!

Water is made up of two elements, hydrogen and oxygen. The chemical formula is H_2O because for every oxygen atom there are two hydrogen atoms.

Water has some pretty interesting properties, and we're going to explore some of them with the activities in this kit, so let's get started!

Activity 1:
Sticky Water

Water has a property that makes its molecules stick to one another. This is caused by **cohesion**, the force that holds the water molecules to one another. This is also referred to as **surface tension**. Because of this property, insects like water striders can actually walk or stand on the surface of water.

Materials:

- Large Plastic Cup
- Pipet
- Paper Towel in case you spill water (not provided)
- Yen (This is actual currency in Japan!)
- Water (not provided)

Directions:

1. Put some water into your cup. Place your yen coin on the paper towel. Use the pipet to draw up some water by squeezing the bulb, placing the long tip into the water, and then releasing the bulb. You will see some water move from the cup into the pipet.

2. Over the cup, practice squeezing the pipet gently, so only one drop at a time is released from the pipet.

3. As you squeeze the bulb gently, you will see some water will drip out. Take time to observe the water as it comes from the pipet. The water will form a spherical droplet, but it won't fall from the pipet until the water is so heavy that it can't hold onto the water that still remains in the pipet.

4. You observed the size and shape of one drop of water. Now, take a look at the surface of your yen coin. Can you make a prediction of the number of drops you can put on the head of your coin before it will spill over the edge of the yen?

   Fill in your prediction here. _____

5. Holding your pipet above the center of your coin so the drop doesn't have too far to fall but also isn't touching the coin itself, release your first drop of water. Observe the water on the coin.

   What shape is it? _____

6. Continue squeezing your pipet over the yen so each drop comes out one at a time. Keep count of the number of drops until the water spills over the side of the coin. How did the actual number of water drops compare to your prediction?

Activity 4:
The Soap Boat

Materials:

- Boat Pattern
- Toothpick
- Large Plastic Bowl / Baking Tray (not provided)
- Water (not provided)
- Liquid Dishwashing Soap (not provided)

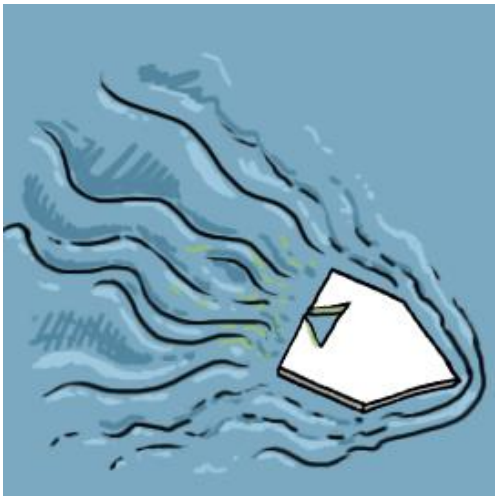
We have learned that water has a property called **surface tension** where the molecules at the surface of the water hold tightly to one another, forming a type of skin. We also know that because of surface tension, many things that are heavier than water will still float. Soap is a surfactant that will break the **cohesiveness** (the attraction between water molecules) of water.

Directions:

1. Fill a bowl or tray with sides about ¾ of the way with water.
2. Cut out one of the soap boat patterns.
3. Carefully place your boat into the bowl of water. Make sure the back of the boat is close to the edge of the bowl.
4. Dip your toothpick into some dishwashing soap. Lower the toothpick into the triangle notch on your boat. What do you observe?

   Why do you think this happened?

Explanation:



Since the soap was in the back of the boat, it reduced the surface tension of the water behind it.

As the molecules released their bond—much like the way the pepper was moved across the surface of the water away from the soap in Activity 3—the boat was propelled through the water because of surface tension.

Use the additional boat patterns to make a boat out of different materials to see which works best.

Activity 5:
Yarn Crawl

continued

7. With all the water in the top cup, place that cup on a few books or a box so it's at least 8 inches above the surface where you are working. Place the lower cup so it's as far away from the top cup as the yarn will allow.

8. Check to make sure the color tablet has completely dissolved in the smaller cup. Using your pipet, place a drop of the colored dye onto the yarn close to the top cup and watch it. What do you observe?

9. Once the first drop of colored dye has made it half-way down the yarn, place another drop on the yarn near the top cup and watch again. What happens to the drop?

10. Once the two drops are close to the bottom cup, carefully place another drop on the yarn above the water but this time, place it on the yarn *inside* the top cup. What do you observe?

11. On the blank sheet at the end of this booklet, draw what your yarn looks like with the color moving down it.

12. Leave your two cups alone for about 30-45 minutes. After the time is up, take a look at both cups. What do you observe?

13. Why do you think that happened?

Explanation:

Because of the water's adhesion to the yarn, the water sticks to it. The water's surface tension pulls the water from the top cup, down the yarn, to the bottom cup. Because of capillary action, the water actually moves from the top cup up and over the lip of the cup and then down to the bottom cup.

Try to envision you and a bunch of your friends holding hands and moving along the yarn. As more and more of you move downward, collectively you are pulling your friends up and over the top cup. Water molecules are like good friends. They hang onto one another. If the yarn was not originally wet, the water wouldn't move down it.

Activity 7:
Tornado in a Bottle

continued

7. Turn your bottles over so the bottle with the water is on the top. Hold the bottle steady without moving it. What do you observe?

8. You should have noticed that the Tornado Tube had a hole in the center of it. Is the water moving down through that hole? ❑ YES ❑ NO

If it is, once all the water gets to the bottom bottle, carefully flip your bottles over again, and stand them up so neither bottle moves.

9. Once you get to a point where the water does not move from the top bottle to the bottom bottle, predict why that happened.

10. Now, with the water in the top bottle, move that top bottle in a wide circular path, so the bottom bottle simply pivots. At this point, you should be able to observe a tornado in the top bottle. What, specifically, can you observe?

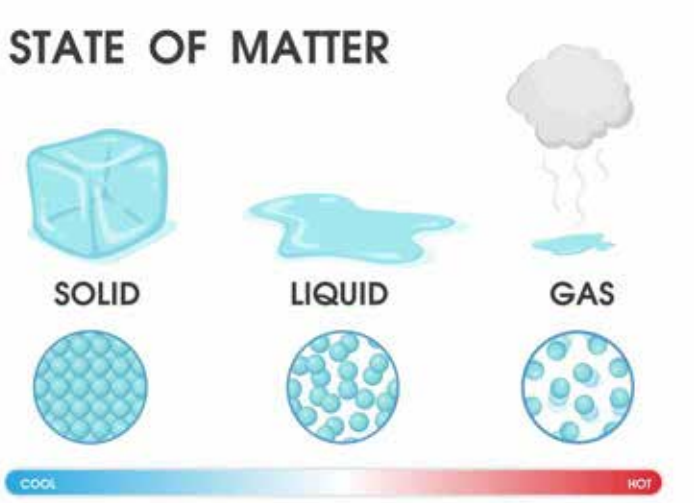
How is the water moving from the top bottle to the bottom?

Explanation:

If, in Step 2, you initially said there was air inside both bottles, you were correct! Air takes up space the same way water does. Before the water can move down into the bottom bottle, the air has to move out of the way. The only way it can do that is to swirl around the outside so the air could escape from the bottle up through the center of the hole into the top bottle.

Place your bottles on the floor and swirl the top bottle again. This time take a look downward from the top bottle, and you will see the swirling water leaving room for the air!

Activity 8:
States of Matter



Matter makes up everything in the universe. Some matter is **solid**, like a table or the floor. Some matter is a **liquid**, like milk or juice. And some matter is a **gas**, like the air you breathe.

In a solid, the molecules are packed very close together so they don't move around. With liquids, the molecules are farther apart and can move freely. If you put a liquid into a container like a cup, the liquid will take the shape of the container—unlike a solid which keeps its original shape. Molecules in a gas are even further apart and can move about very freely.

Water is a very special molecule because it can be found in all three states of matter on Earth. At room temperature, water is a liquid. We use it to wash with and to drink.

Water can also be found on Earth as a gas. Have you ever seen water heated on the stove? Once it boils, you can see the steam rising from the pot. That's actually water in its gaseous state. Water's boiling point is 212 degrees Fahrenheit (100 degrees Celsius). If you look up in the sky, you can see clouds. These fluffy objects are just tiny water droplets.

Water can also be found in its solid state as ice. Water turns from a liquid to a solid at 32 degrees Fahrenheit (0 degrees Celsius).