what does a scientist do?

A background in science can allow a person to pursue a great variety of careers. The possibilities include academic, governmental and industrial career paths.

Scientists can make a career out of sharing their knowledge as a high school teacher or college professor. Many college professors also focus on uncovering new information and making the knowledge of these discoveries available to the rest of the global scientific community by publishing in scientific journals.

Scientists can also pursue careers with governmental agencies, such as the Food & Drug Administration or the National Institute of Standards and Technology. Scientists in these areas help to develop new products and materials. They also develop guidelines and regulations to ensure that medications and consumer products are safe for people, animals and the environment.

Scientists in industry, like the ones at Merck for example, develop new materials and manufacture chemicals that may be used for research, testing or as starting materials for other products.

At the Life Science business of Merck we develop, manufacture and analyze thousands of chemicals. Our products are used by millions of scientists to better understand our bodies and the world around us. This understanding leads to improved quality of life for us all.

We foster a problem-solving culture that thrives on curiosity, collaboration and innovation, and are excited about what the future holds for the next generation of scientists.

table of contents

Please Note: These experiments can be done with regular household items, but they must be done with adult supervision.

Bobbing Raisins

IN THIS EXPERIMENT YOU WILL LEARN…

- About buoyancy
- What density is
- How the density of an object can be changed by increasing or decreasing its buoyancy

SUPPLIES

- Clear glass jar
- Carbonated drink (clear)
- Handful (4-6) of raisins

INSTRUCTIONS

1. Pour the carbonated drink into the glass jar.
2. Drop the raisins into the glass jar.

WHAT HAPPENED?

The raisins begin to dance and bob up and down. The bobbing up and down happens because the bubbles of the carbon dioxide gas in the drink are much less dense than the drink and the raisins.

Raisins are denser than the carbonated drink, so they will sink when you first drop them in. When the raisins are covered with the bubbles, they become less dense than the drink, so they start to rise. The bubbles act as a flotation device for the raisins. As the bubbles rise, they start to burst and the raisins become denser than the drink again and sink.

FUN FACT

An important part of this experiment is the wrinkles on the raisins. The bubbles can attach to the raisins because of the crevices that the wrinkles create. As the bubbles settle into the crevices, they give the raisins more buoyancy and the raisins begin to rise.

CURIOSITY CHALLENGE

Try adding different objects to your carbonated drink, such as rice or glitter, to create the same reaction.

➜ What do you think will happen?

➜ What were your results?

Bright as a New Penny

IN THIS EXPERIMENT YOU WILL LEARN…

- What acetic acid is
- What sodium chloride is
- What hydrochloric acid is
- What causes copper to look dull or dirty
- What a chemical reaction is

SUPPLIES

- Dull pennies (at least 3)
- White vinegar
- Salt
- 3 clear jars or cups
- Measuring spoons
- Water
- Paper towels

INSTRUCTIONS

1. Add a few scoops of salt to the first jar (enough to cover the bottom of the jar).
2. Add some white vinegar to the second jar (enough to cover the bottom of the jar).
3. Add 3 tbs (45 mL) white vinegar and 1 tbs (15 mL) salt in the third jar. Mix it together to create a solution.
4. Carefully add a dull penny to each jar and stir. Watch what happens next!
5. Carefully remove the pennies from each jar and wipe them off with a paper towel.

WHAT HAPPENED?

The solution of the salt and vinegar cleaned the dull penny to look like new!

Pennies are made of copper. The air all around us has oxygen in it. The oxygen joins with the copper on the penny leaving it with a film, called copper oxide (Cu_2O_2), that looks dull. Your experiment created a chemical reaction that cleaned the dull film of copper oxide off the penny. Underneath the dull copper oxide is the clean, shiny copper.

FUN FACT

Vinegar is acetic acid ($HC_2H_3O_2$) and salt is sodium chloride (NaCl). When these two are mixed together, they form a third substance called hydrochloric acid (HCl). Hydrochloric acid (made from the mixture of salt and vinegar) mixes with the oxygen in copper oxide on the surface of the penny and lifts the dull copper oxide away.

CURIOSITY CHALLENGE

Try adding different types of coins to the salt and vinegar solution.

➜ What do you think will happen?

➜ What were your results?

candy bar flotation

IN THIS EXPERIMENT YOU WILL LEARN…

- What a hypothesis is
- What density is

SUPPLIES

- Several different varieties of fun sized candy bars
- Several clear cups (1 for each candy bar being tested) or one large clear tub
- Water

INSTRUCTIONS

1. Fill the tub or each cup about halfway full of water.
2. Examine the candy bars and make a **hypothesis** about which ones you think will sink and which ones you think will float.
3. Once you have made a prediction for each candy bar, unwrap the candy and carefully drop it into the water.
4. Wait for a few seconds and observe which ones float and which ones sink.

WHAT HAPPENED?

The candy bars that sink are denser than the water, while the candy bars that float are less dense than the water. The density of each candy bar is determined by the contents inside. Candy bars that are filled with more air, such as those containing wafers or marshmallows, are less dense because air weighs less than water.

FUN FACT

A **hypothesis** is an important part of the scientific method. Scientists make a hypothesis statement to predict what they think will happen as a result of the experiment.

CURIOSITY CHALLENGE

Try doing this same experiment with different food groups, such as fruits and vegetables.

➜ What do you think will happen?

➜ What were your results?

chromatography

IN THIS EXPERIMENT YOU WILL LEARN…

- What chromatography is
- What chromatography is used for
- The different pigments used in creating colors

SUPPLIES

- Coffee filter
- Black marker (not permanent)
- Water
- Eye dropper (or straw)

INSTRUCTIONS

1. Take a clean, dry coffee filter.
2. Using a black (non-permanent) marker, draw a black spot in the center.
3. Put the filter on a plate and add a few drops of water on the black spot.

WHAT HAPPENED?

The ink separated and different colors became visible. Most nonpermanent markers use inks that are made of colored pigments and water. When water is dropped on the filter, the colored pigments from the ink dissolve. As the water travels from the center of the filter, it carries the pigments along with it. Different colored pigments are carried along at different rates, with some traveling farther and faster than others.

FUN FACT

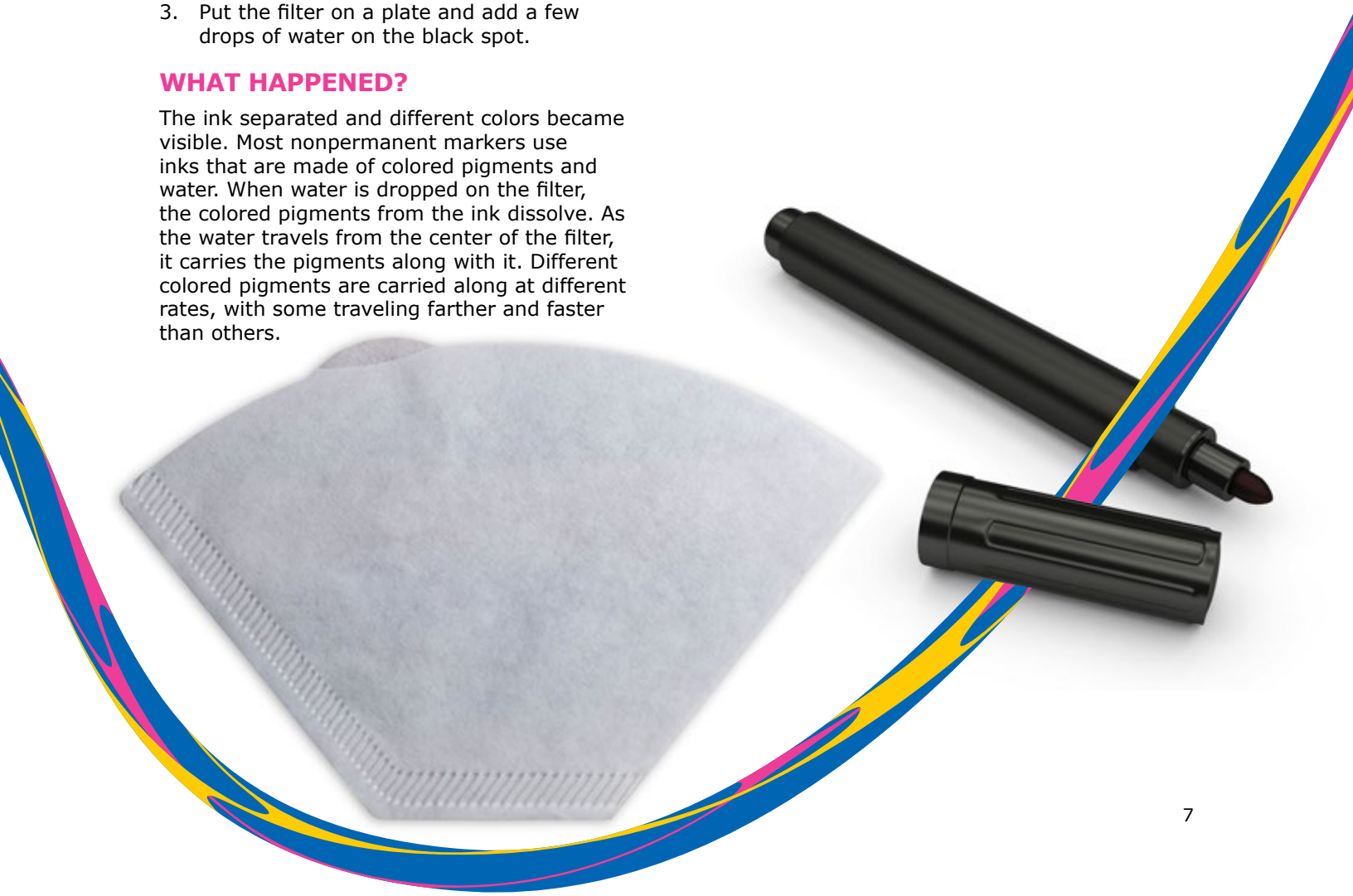
Chromatography is a valuable technique scientists use for separating mixtures. There are many different types of chromatography. In all of them, a gas or liquid (like the water in this experiment) flows through a stationary substance (like the coffee filter in this experiment).

CURIOSITY CHALLENGE

Try using different colors to draw circles around the perimeter of the coffee filter creating a "bullseye". Place several drops of water in the center.

➜ What do you think will happen?

➜ What were your results?



Dancing Critters

IN THIS EXPERIMENT YOU WILL LEARN…

- What static electricity is

SUPPLIES

- Tissue paper
- Markers
- Scissors
- Balloon

INSTRUCTIONS

1. Use the markers to draw a critter of your choice on the tissue paper.
2. Carefully cut out the critter with the scissors.
3. Inflate the balloon and tie it closed.
4. Rub the balloon on your shirt or your hair for a few seconds.
5. Move the balloon close to the critter and see what happens!

WHAT HAPPENED?

Static electricity is a buildup of electricity that stays in one place. In this experiment, the static electricity remains close to the balloon. When the balloon moves towards the tissue paper, the tissue paper also moves since the static electricity around the balloon is a stronger force than the one holding it still (gravity).

FUN FACT

Static electricity can build around many different types of surfaces and causes the quick "shock" feeling you may have felt when touching a doorknob, shopping cart or another person's hand.

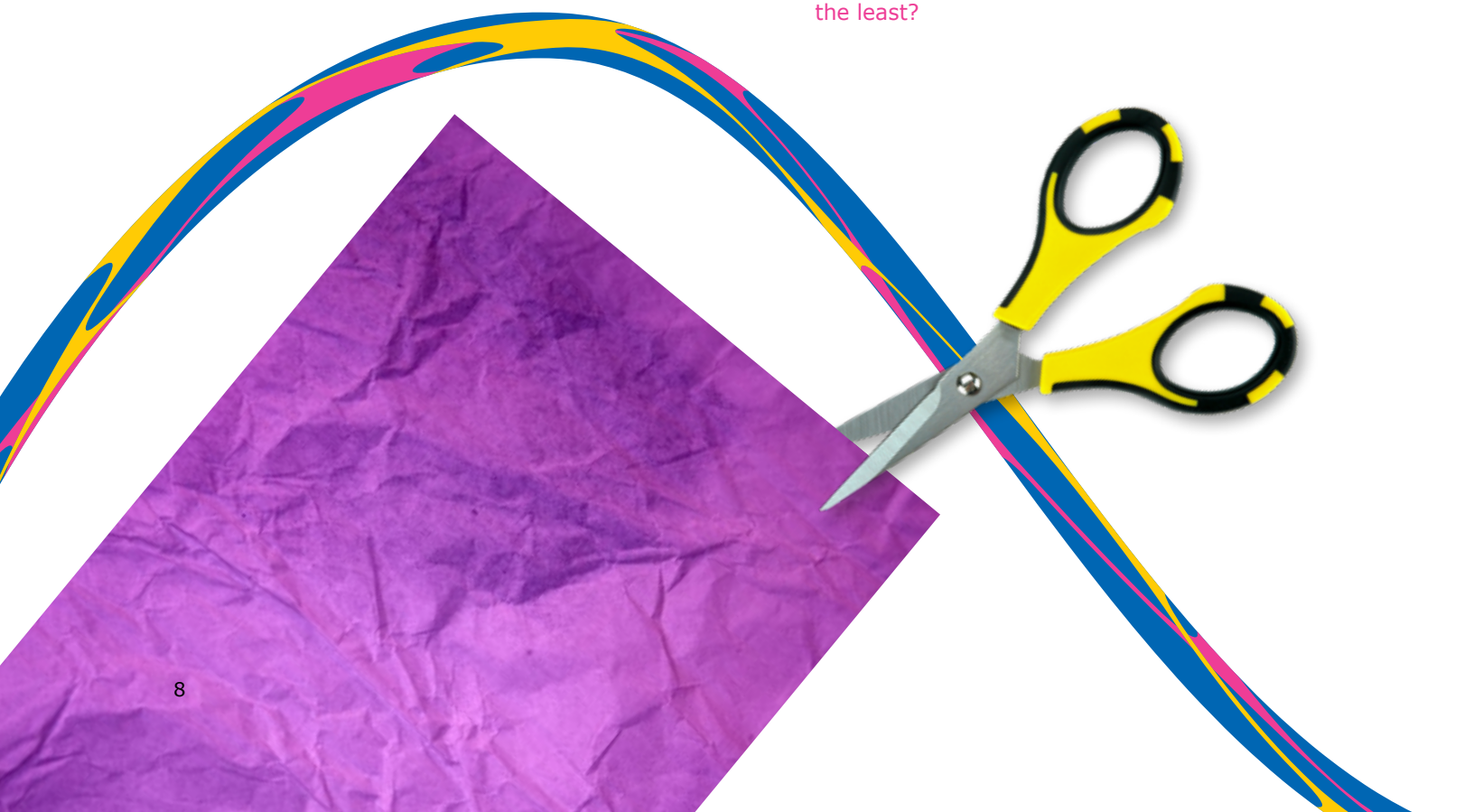
Static electricity is more intense when humidity is low, which is why it is more common to feel these "shocks" in the winter months.

CURIOSITY CHALLENGE

Try rubbing the balloon on different surfaces, such as the tabletop or the carpet.

➜ Which surface made the critter dance the most?

➜ Which surface made the critter dance the least?



elephant toothpaste

IN THIS EXPERIMENT YOU WILL LEARN…

- What a chemical reaction is
- How scientists determine if a chemical reaction occurred

SUPPLIES

- Hydrogen peroxide (3-9%)
- Liquid soap
- Food coloring (optional)
- Yeast
- Hot water
- Graduated cylinder or empty water bottle
- Small cup

INSTRUCTIONS

1. Add 6 tsp (30 mL) hydrogen peroxide into the graduated cylinder or water bottle.
2. Add 2¼ tsp (11 mL) of hot water into the small cup.
3. Add ¾ tsp (10 g) of yeast to the hot water and mix it up.
4. Let the yeast and water set for at least 30 seconds.
5. Add a few drops of liquid soap to the hydrogen peroxide in the cylinder.
6. Add 3-4 drops of food coloring to the hydrogen peroxide in the cylinder. (for a cool effect, have the food coloring run down the side of the cylinder).
7. Add the yeast mixture to the cylinder.

WHAT HAPPENED?

The mixture exploded creating "elephant toothpaste"! This is an example of a chemical reaction. The yeast helped the reaction go much faster. The oxygen that was released as a result of the chemical reaction became trapped in the soap bubbles. So much oxygen was trapped, that it produced foam.

FUN FACT

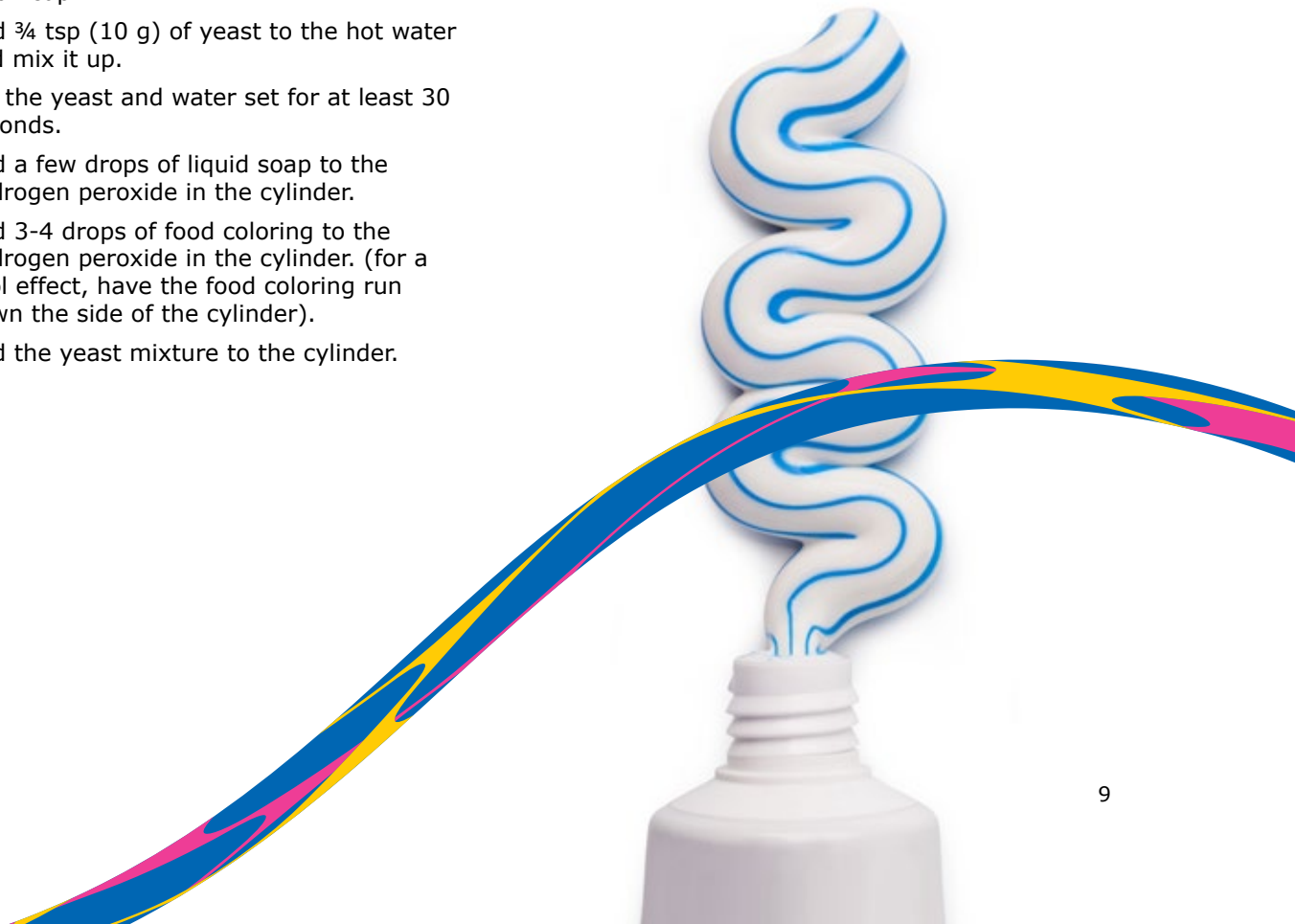
Scientists study physical changes and chemical changes. A physical change is when the shape or form of something changes, such as ice melting. A chemical change is when something new is formed, such as combining flour, eggs and oil to make a cake.

CURIOSITY CHALLENGE

Try using a different shaped bottle or graduated cylinder. How does the size of the bottle affect the experiment?

➜ What do you think will happen?

➜ What were your results?



Fizzy Play Doh

IN THIS EXPERIMENT YOU WILL LEARN…

- What a chemical change is
- How scientists determine if a chemical change occurred

SUPPLIES

- Corn starch
- Baking soda
- Hair conditioner
- Lemon juice
- Eye dropper or straw
- Gloves (optional)
- Wax paper

INSTRUCTIONS

1. Place a large piece of wax paper in front of you.
2. Add ½ cup (65 g) corn starch, ¼ cup (32 g) baking soda and ¼ cup (32 g) hair conditioner on top of your wax paper.
3. Mix all of these ingredients together to create play doh.
4. After mixing to the desired consistency, flatten your play doh and add drops of lemon juice on top to make it fizz. (note: the play doh will only fizz so many times due to the corn starch. There is no need to keep adding lemon juice once the fizzing has stopped.)

WHAT HAPPENED?

A chemical reaction was created! The baking soda is reacting with the lemon juice to release carbon dioxide in the form of bubbles.

FUN FACT

Do you know the difference between a physical change and a chemical change? A few clues that usually signal a chemical change include bubbles, color change, and exchange of energy, such as heat or light.

CURIOSITY CHALLENGE

Try using different citrus fruit juices, such as oranges and limes, to create the same chemical reaction.

➜ What do you think will happen?

➜ What were your results?

Floating Eggs

IN THIS EXPERIMENT YOU WILL LEARN…

- What density is
- How density effects different objects
- How to increase the density of water

SUPPLIES

- 2 clear containers
- Water
- Salt
- 2 hard boiled eggs

INSTRUCTIONS

1. Fill both containers with equal amounts of water.
2. Add approximately 5 large scoops of salt to one container.
3. Stir the container with salt until all the salt has dissolved, creating a saturated solution.
4. Slowly place one egg in each of the containers.

WHAT HAPPENED?

The egg in the salt water floats! The salt in the water makes the liquid dense enough to support the egg (causing the egg to float).

FUN FACT

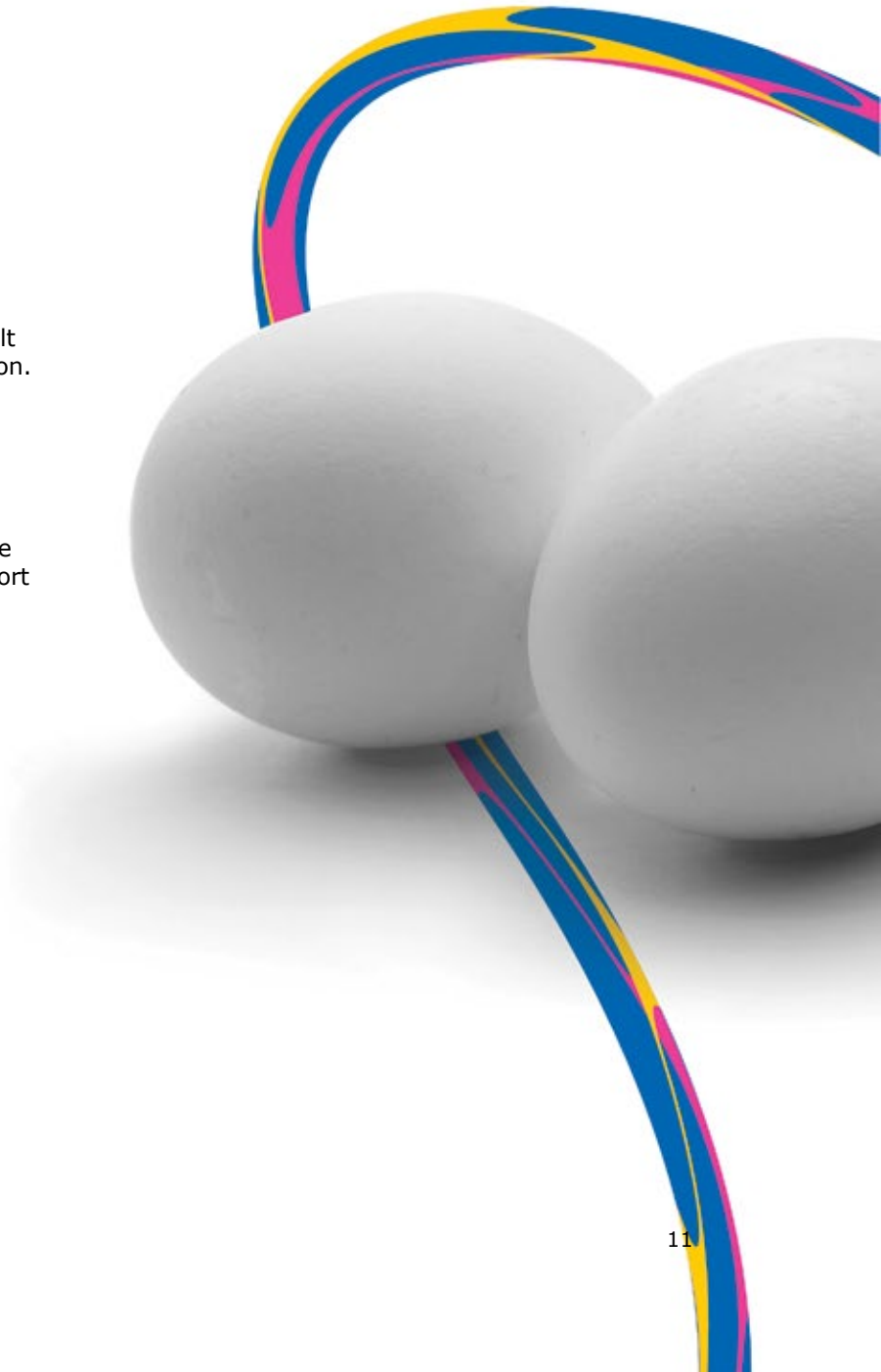
Density is measured by how tightly the molecules in an object are packed together. By adding salt to the water, the number of molecules in the water increased, making it more dense than the egg.

CURIOSITY CHALLENGE

Try testing other mixtures, such as adding sugar or baking soda instead of salt.

➜ What do you think will happen?

➜ What were your results?



Glow in the Dark Slime

IN THIS EXPERIMENT YOU WILL LEARN…

- What coagulate means
- What phosphorescence is

SUPPLIES

- All-purpose glue
- Liquid starch
- Glow in the dark powder
- Mixing bowl
- Sealable plastic bag

INSTRUCTIONS

1. Pour 3 tbs (50 mL) all-purpose glue into the bowl.
2. Add ¼ tsp (1 mL) glow in the dark powder to the glue and mix together until the glue is fully colored.
3. Slowly add ¼ cup (60 mL) of liquid starch and continue to stir.
4. Let everything sit for 1-2 minutes to allow the mixture to **coagulate**.
5. Transfer the slime to a sealable plastic bag and continue to mix inside the bag.
6. Once everything is completely mixed together turn out the lights and check out the glowing slime.

WHAT HAPPENED?

The phosphorus inside the glow in the dark powder captures the light and then releases it in the dark. This process is called phosphorescence. The more light that the slime can capture, the longer it will glow in the dark.

FUN FACT

Coagulate is a verb or an action word. It means to cause a fluid to change to a solid or semisolid state. It was important to allow all the ingredients to coagulate so it would create the correct state of matter for the slime.

CURIOSITY CHALLENGE

Test the effect of different types of light, such as sunlight, indoor/florescent light or blacklight, on the slime.

➜ What do you think will happen?

➜ What were your results?

Homemade Lava Lamp

IN THIS EXPERIMENT YOU WILL LEARN…

- What density is
- How density effects different objects
- What buoyancy is
- How density and buoyancy are connected

SUPPLIES

- Clear jar or container
- Vegetable oil
- Salt
- Water
- Food coloring

INSTRUCTIONS

1. Pour about 1/3 cup (80 mL) of water into the jar.
2. Pour about 1/3 cup (80 mL) of oil into the jar.
3. Add 1-2 drops of food coloring.
4. Shake salt on top of the oil.
5. Add more salt to keep the action going.

WHAT HAPPENED?

The oil floats on top of the water because a drop of oil is lighter than a drop of water. The scientific way of saying this is that water is more dense than oil. In addition to having different densities, oil and water are also known as immiscible liquids, meaning they don't mix. Pouring salt on the oil and water mixture causes lots of movement. Salt is denser than water and oil, so it sinks to the bottom. As the salt passes through the oil layer, a drop of oil sticks to it and travels to the bottom. As the grain of salt dissolves, it releases the oil, which floats back up to the top.

FUN FACT

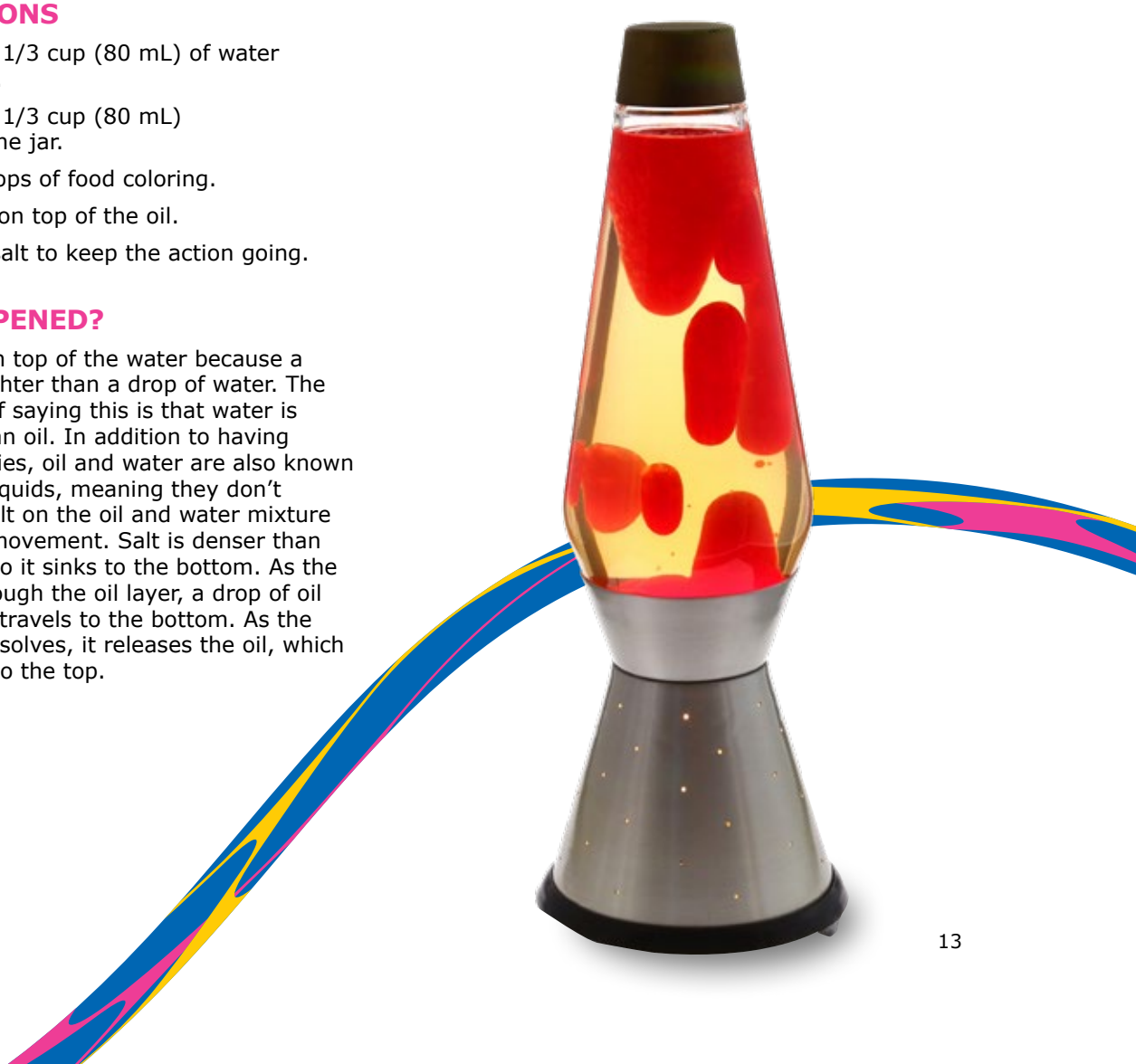
Density is measured by how tightly the molecules in an object are packed together. Density and buoyancy are interconnected. Buoyancy is an object's ability to float. Objects with high density typically have low buoyancy, and objects with low density typically have high buoyancy.

CURIOSITY CHALLENGE

Try adding different materials to the lava lamp, such as glitter or oil-based food coloring.

➜ What do you think will happen?

➜ What were your results?



Homemade silly putty

IN THIS EXPERIMENT YOU WILL LEARN…

- What a polymer is
- What a chemical reaction is

SUPPLIES

- White all-purpose glue
- Food coloring (optional)
- Liquid laundry starch (you can find this near laundry detergents in the grocery store)
- Mixing bowl

INSTRUCTIONS

1. Add 1 cup (250 mL) of glue and a few drops of food coloring (optional) to the mixing bowl.
2. Add 1 cup (250 mL) of liquid starch a little at a time, stirring constantly. Keep stirring until the mixture holds together like putty.
3. Test the mixture with your fingers. If it is too sticky, add more starch until the mass is smooth and rubbery.
4. The final product will bounce and stretch easily, have fun!
5. Store it in a plastic bag or airtight container.

WHAT HAPPENED?

Silly Putty was created! Glue and laundry starch are made of millions of tiny particles called molecules.

Molecules can join together in long chains to form materials called polymers. Silly Putty is a polymer.

FUN FACT

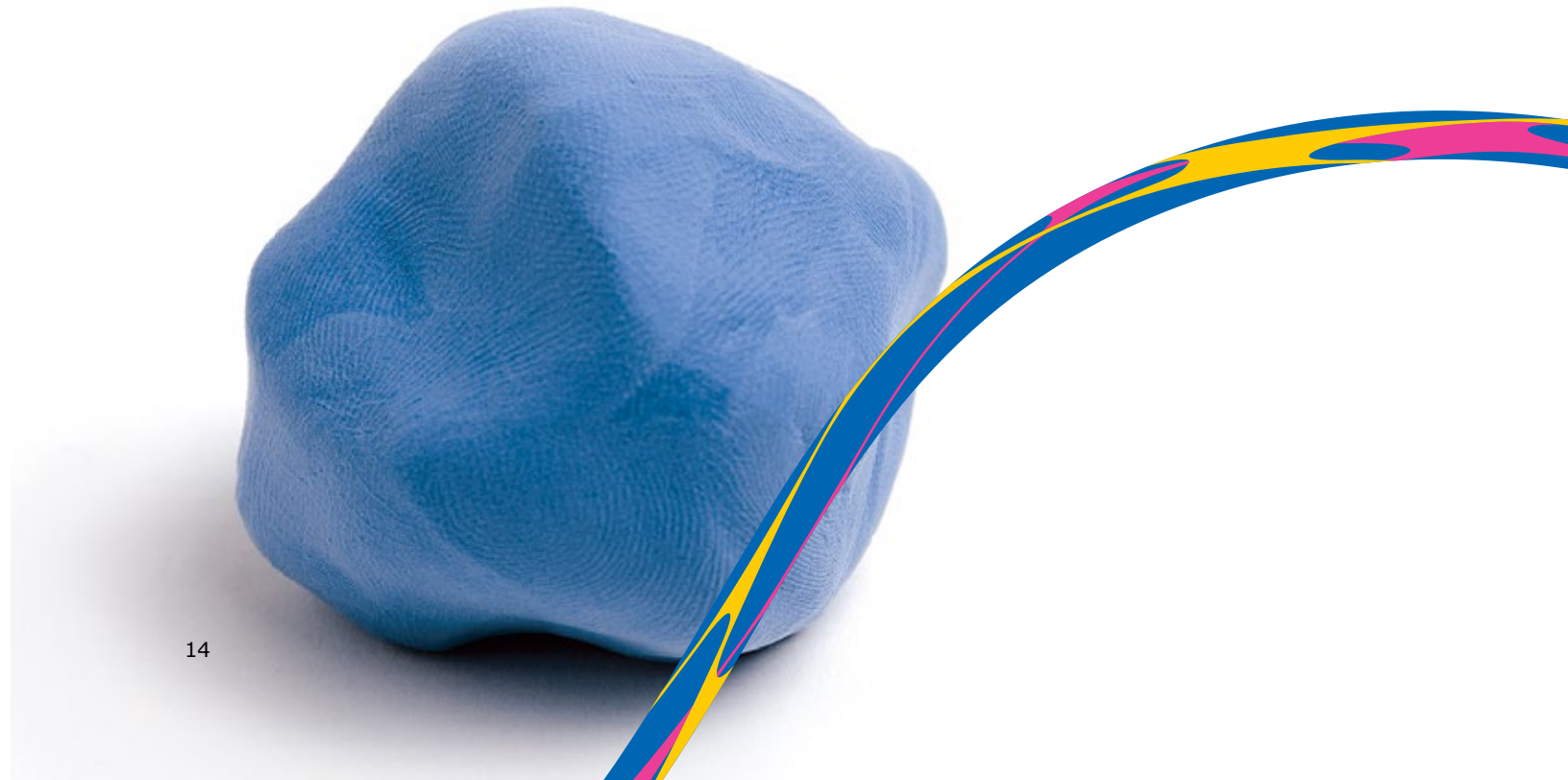
A chemical reaction occurs when you mix the glue and the starch. This reaction causes the polymer chains of glue and starch to join together into even larger chains.

CURIOSITY CHALLENGE

Try making multi-colored Silly Putty. Use the same ingredients with a different color of food coloring to make more Silly Putty. Once the second round of putty is completely mixed together, add it to the first round by smashing it together.

➜ Will it stay two colors or combine into one?

➜ What were your results?



oobleck

IN THIS EXPERIMENT YOU WILL LEARN…

- What viscosity is
- What a non-Newtonian fluid is

SUPPLIES

- Water
- Bowl
- Corn starch
- Marbles
- Food coloring (optional)

INSTRUCTIONS

1. Gradually mix 2 cups (250 g) of corn starch with 1 cup (180 mL) of water. (The measurements can be adjusted to your preference on how much Oobleck you would like to create. Just keep the ratio approximately 2:1)
2. Mix together completely.
3. Add food coloring, if desired, and an additional 1 cup (125 g) of corn starch, if needed.
4. Drop marbles in and see what happens. Make a fist and punch the mixture to see what happens.

WHAT HAPPENED?

This substance is called Oobleck! Oobleck is a non-Newtonian fluid, which means it has properties of both a solid and a liquid, depending on how much force is exerted upon it.

With less push, it oozes and slimes around, but as soon as it is squeezed, molded and shaped, Oobleck solidifies.

FUN FACT

Oobleck allows us to observe and understand viscosity, or resistance to flow. When not put under stress, Oobleck is less viscous and flows easily. When under the stress of your hands however, its viscosity increases, and it starts behaving more like a solid.

CURIOSITY CHALLENGE

Try to find one item that will sink and one item that will float in the Oobleck.

➜ What did you find that sank?

➜ What did you find that floated?

playful pendulum

IN THIS EXPERIMENT YOU WILL LEARN…

- What simple harmonic motion is
- How changing one variable changes the speed of the pendulum

SUPPLIES

- 2 distinctly different lengths of string
- Stack of books or tall surface
- Pencil
- Stopwatch
- Tape
- Small weighted object (such as a washer or marble)

INSTRUCTIONS

1. Stack the books on top of each other to create a tall surface. Tape the pencil to the top of the tall surface so that it is hanging over the edge. Be sure to use enough tape so that the pencil is sturdy.
2. Take one of the two strings and fasten, tie or tape your weighted object to one end of the string. Repeat with the other string and ensure that the amount of the weighted object is equal for both strings.
3. Take one string and tie the other end to the pencil.
4. Using the stopwatch, test the pendulum to determine which one swings the fastest by timing how long it takes the pendulum to swing out from and back to its original starting position. Record your time for string 1.
5. Remove string 1 and tie string 2 to the end of the pencil.
6. Repeat step 4 with string 2. Record your time to see what affect the length of the string has on the speed of the pendulum.

WHAT HAPPENED?

The stopwatch helps to investigate the speed and motion of a simple pendulum. The motion of the pendulum is related to the length of its string. The pendulum with the shorter string swings the fastest.

FUN FACT

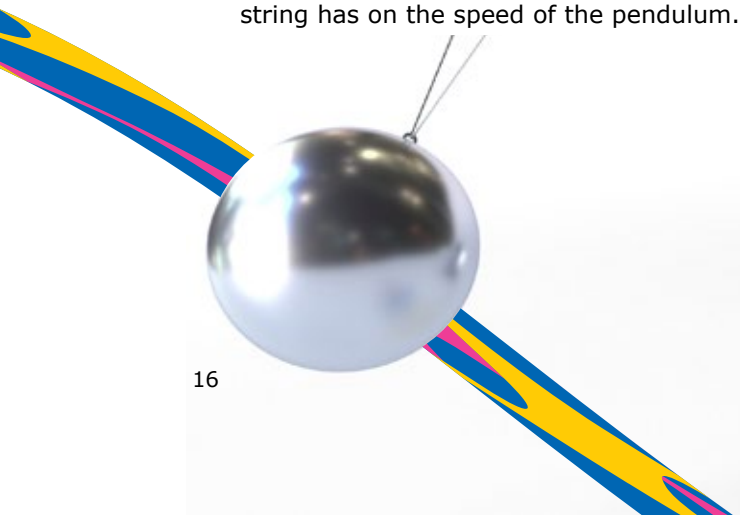
Pendulums allow us to study something called simple harmonic motion. Examples include mechanical clocks, metronomes and a wrecking ball.

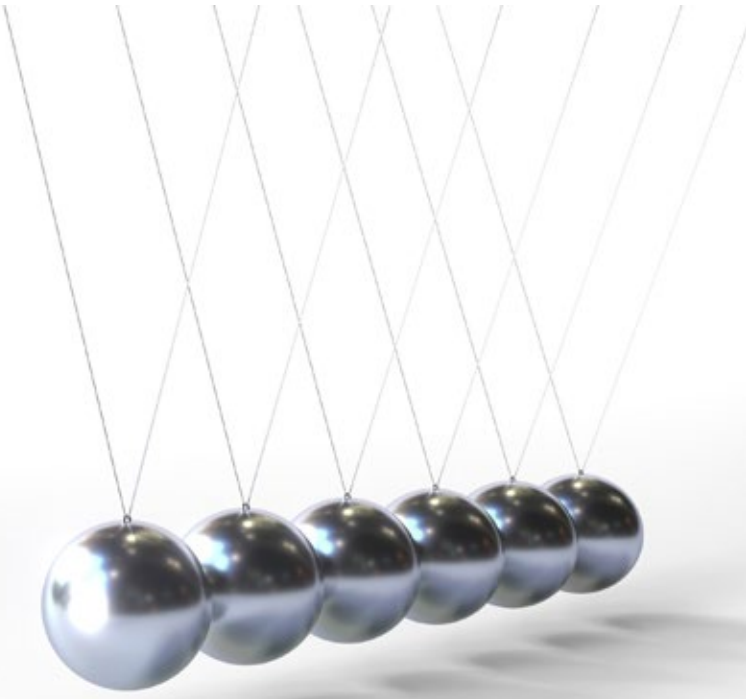
CURIOSITY CHALLENGE

Try to add different weighted objects. How do you think the weight of the object will affect the speed of the pendulum?

➜ What do you think will happen?

➜ What were your results?





Run Away Pepper

IN THIS EXPERIMENT YOU WILL LEARN…

- What surface tension is
- Why it is important to use soap when washing your hands

SUPPLIES

- Plate
- Water
- Pepper
- Liquid soap

INSTRUCTIONS

1. Pour water onto your plate (enough to cover the bottom of the plate).
2. Wait for the water to calm, and then shake some pepper onto the water.
3. Take your finger and stick it in the water and pepper. Notice how the pepper sticks to your finger.
4. Add some soap onto your finger, and then put your finger back in the water.

WHAT HAPPENED?

The pepper runs away to the side of the plate, just like germs run away from soap! Water molecules like to cling to each other and because of that, it creates surface tension. When your finger isn't clean and you stick it in the water, the pepper sticks to your hand. When you use soap, the pepper quickly moves away. This is because soap is meant to break the surface tension so that it can clean an object.

FUN FACT

Using soap when washing your hands is very important. Soap, when used with water, will break the surface tension, creating a slippery environment onto which germs cannot attach.

CURIOSITY CHALLENGE

Try this same experiment with a different surface area by using a smaller or larger plate. Try adding more or less pepper.

➜ What do you think will happen?

➜ What were your results?

self-inflating balloon

IN THIS EXPERIMENT YOU WILL LEARN…

- What acetic acid is
- What sodium bicarbonate is
- What a chemical reaction is

SUPPLIES

- Plastic bottle
- Standard balloon
- White vinegar
- Baking soda
- Small funnel (optional)

INSTRUCTIONS

1. Carefully pour ½ cup (120 mL) white vinegar into the bottle.
2. Loosen the neck of the balloon by stretching it in multiple directions a few times. Insert the funnel into the neck of the balloon and carefully pour approximately 2 tsp (10 g) baking soda in so that it fills one third to one half of the balloon.
3. Without flipping the balloon over, slowly stretch and seal the mouth and neck of the balloon over the entire mouthpiece of the bottle.
4. When ready, lift the top of the balloon so that the baking soda falls into the bottle and mixes with the vinegar.

WHAT HAPPENED?

When vinegar and baking soda mix, they create an Acid-Base reaction, which results in the release of lots of bubbles of carbon dioxide (CO_2) gas. Inside the bottle, liquid that was the vinegar has more mass than CO_2 gas, and so the CO_2 rises and fills the space of the balloon.

FUN FACT

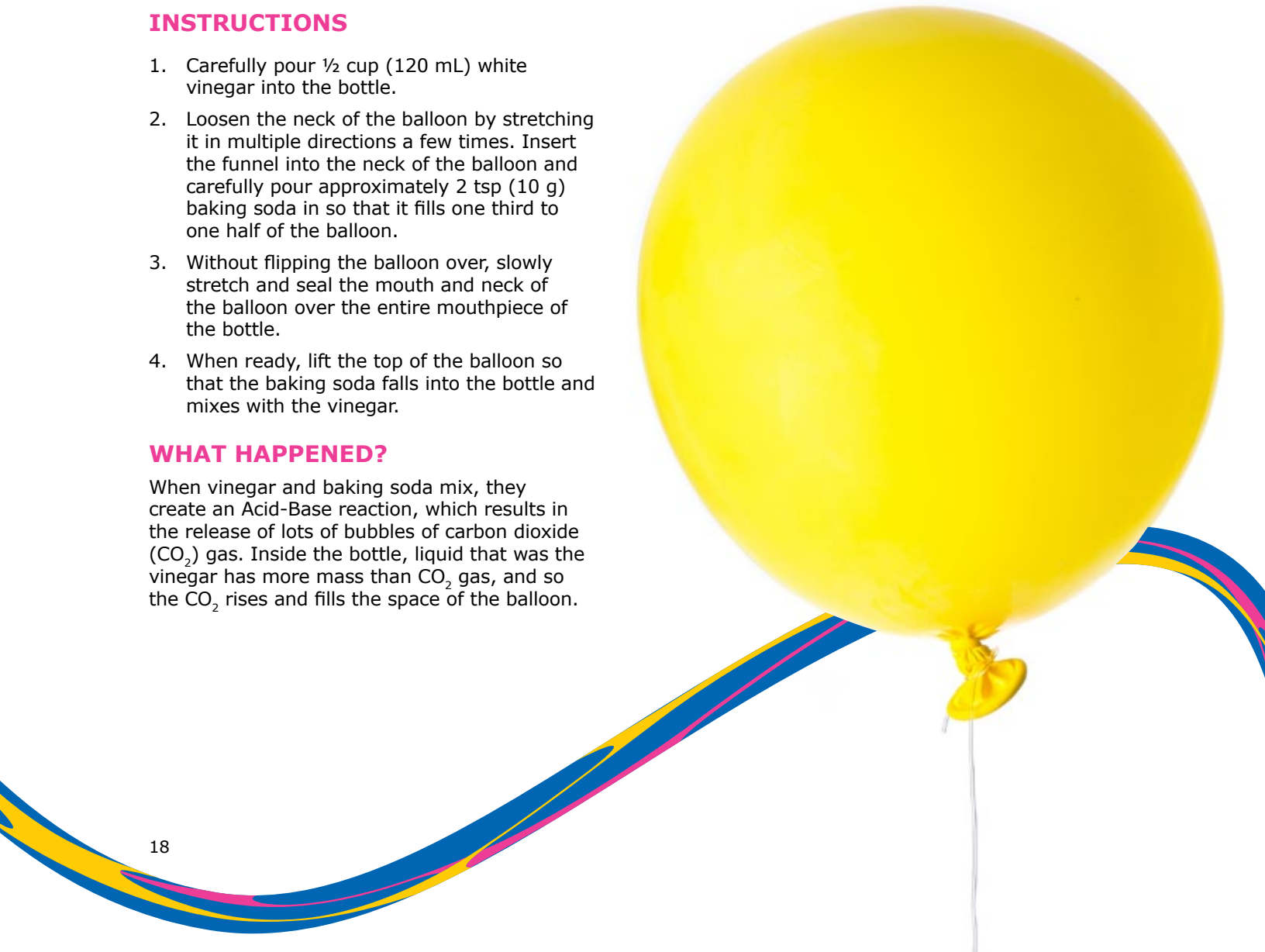
Vinegar is a mixture of water and a weak acid that chemists call acetic acid. Baking soda is what chemists call a base, and it is known as sodium bicarbonate.

CURIOSITY CHALLENGE

Try testing other mixtures, such as lemon juice and baking soda.

➜ What do you think will happen?

➜ What were your results?



The Basics & Acid of pH

IN THIS EXPERIMENT YOU WILL LEARN…

- What pH stands for
- How the pH scale is used
- What the difference is between an acidic and basic solution

SUPPLIES

- Red cabbage
- Blender
- Hot water
- Coffee filter or strainer
- One large clear container
- Small clear containers (one for your neutral pH and one for each substance you choose below)
- At least 3 of the following substances:
  - Baking soda solution: 3 tbs (45 mL) baking soda mixed with 1 cup (250 mL) water until dissolved
  - Lemon juice
  - White vinegar
  - Bleach
  - White soda (such as Sprite)
  - Seltzer water
  - Apple juice

INSTRUCTIONS

1. Chop the cabbage into small pieces until you have about 2 cups (500 mL) of chopped cabbage. Place the cabbage in a blender with 4 cups (950 mL) hot water and blend it until it turns into juice.
2. Use a coffee filter or strainer to filter the juice into the large clear container, removing the plant material. You should have a red/purple/blue colored liquid in your large clear container. The exact color of your juice will depend on the **pH** of the water you used in the blender.
3. Fill each small clear container about ½ full of cabbage juice.
4. Set one container of cabbage juice to the side to represent a neutral pH.
5. Add the various household substances you chose from the list provided to the cabbage juice. Be sure to use separate containers of juice for each added substance. Only adding one substance to each container of juice will help you to determine the cause of the reaction.
6. Compare the color of each mixture to the color of the cabbage juice you set aside.

WHAT HAPPENED?

Very acidic solutions turn the juice a red color. Neutral solutions result in a purple color. Basic solutions turn the juice a green/yellow color. Therefore, it is possible to determine the pH of a household substance based on the color of the cabbage and household substance solution.

FUN FACT

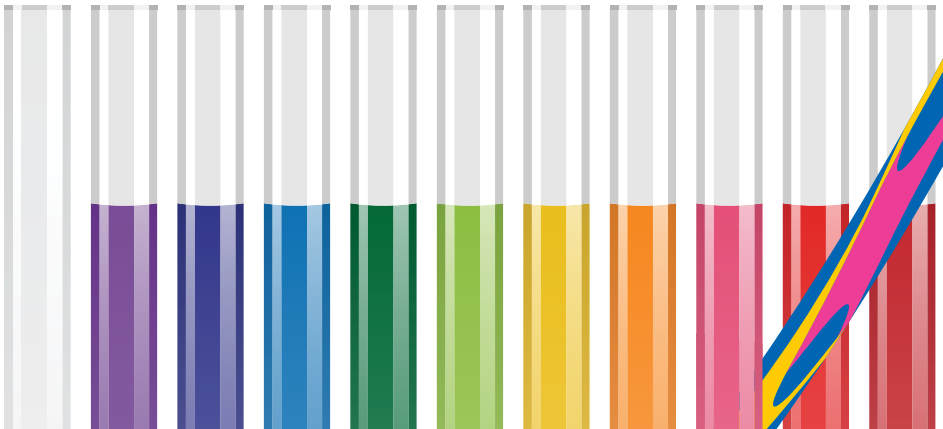
pH stands for potential hydrogens. Sciences use the pH scale to determine how acidic or basic a solution is. The pH scale goes from 0 to 14, with 7 being neutral. Anything below a 7 on the pH scale is considered acidic. Anything above a 7 on the pH scale is considered basic.

CURIOSITY CHALLENGE

Try adding one of your acidic solutions (red) to one of your basic solutions (green/yellow).

➜ Will it become neutral again?

➜ What were your results?



The Making of a Rainbow

IN THIS EXPERIMENT YOU WILL LEARN…

- The color combination of a rainbow
- What happens when light travels through water

SUPPLIES

- Tape
- Water
- Mirror
- Scissors
- White card
- Dark room
- Large clear container
- Flashlight
- Black construction paper

INSTRUCTIONS

1. Using the black paper, cut out the shape of the flashlight face (area where the light comes out).
2. Cut a small slit in the middle of the black paper cover.
3. Place the black paper cover over the flashlight and secure it with tape.
4. Fill the large clear container halfway with water.
5. Stand the mirror in the water so it leans against the end of the container at an angle.
6. Point the flashlight so the light beam shines on the mirror through the water (the flashlight should be on the outside of the container and not submerged in the water).
7. Hold up the white card so the reflected light coming from the mirror can shine on it.
8. Turn out the lights so the room is dark, and turn on the flashlight.

WHAT HAPPENED?

When light travels through water, the light beam slows down and bends, creating a rainbow. The seven different colors that make up the rainbow all travel at different speeds, and therefore, each color bends at a slightly different angle. The mirror reflects the different colors so that you see a rainbow or spectrum of the seven separate colors.

FUN FACT

The colors of the rainbow are always the same combination (red, orange, yellow, green, blue, indigo, violet). Each color is the combination of the two colors that surround it. For example, red and yellow create orange; yellow and blue create green and so on.

CURIOSITY CHALLENGE

Rainbows occur naturally all around us. Try finding rainbows in other areas, such as the base of a waterfall or in the mist of a sprinkler.

➜ How many rainbows did you find?

➜ Where did you find them?

unique as your fingerprint

IN THIS EXPERIMENT YOU WILL LEARN…

- What a fingerprint looks like
- How fingerprints are unique to each individual

SUPPLIES

- Paper
- Lead pencil
- Clear tape

INSTRUCTIONS

1. Draw a 1 in (2.5 cm) square on your paper and color it in with the pencil. Make sure to color the square in very dark using lots of lead.
2. Place 1 finger on the square. Role your finger from side to side and from the tip to your first knuckle to lightly coat your finger with lead.
3. Take a clear piece of tape and carefully place it sticky side down on your finger. Gently press the tape down on your finger as to not smear your fingerprint.
4. Peal the tape off your finger and place it sticky side down on the paper. Observe your unique fingerprint.

WHAT HAPPENED?

Each person has a unique fingerprint. Fingerprints will never change. If you get a cut or a scrape on your finger, your fingerprint will grow back to normal once it heals.

FUN FACT

Fingerprints help to make us unique, but they also help us to grip things. The tiny ridges add extra friction to our hands, so things do not slide out as easily.

CURIOSITY CHALLENGE

Try this same experiment with friends.

➜ What are some similarities in their fingerprint and your fingerprint?

➜ What are some differences in their fingerprint and your fingerprint?

Wind your way around your own DNA

IN THIS EXPERIMENT YOU WILL LEARN…

- What DNA is
- How to extract cells containing DNA
- How to break apart the cell membrane and remove the DNA

SUPPLIES

- Clear sports drink, such as Gatorade. A salt-water solution can also be used by combining 2 cups (500 mL) water and 1 tbs (15 mL) salt.
- 2 small cups
- 30-50 mL conical tube or another small clear container with a cover
- Liquid dish soap (clear dish soap works best)
- Water
- Cold rubbing alcohol (use 91% isopropanol or 95% ethyl alcohol for best results)
- Toothpick

INSTRUCTIONS

1. Measure 2 tsp (10 mL) of the sports drink/saltwater solution into one small cup. Take the small cup and swish the sports drink/saltwater in your mouth vigorously for at least 30 seconds. The goal is to slough off as many cheek cells as possible.
2. Spit the drink with cheek cells back into the small cup.
3. In a second cup, mix 1 tsp (5 mL) of liquid dish soap with 3 tsp (15 mL) water. Mix this solution carefully until the soap is completely dissolved in the water. It is important to stir the solution slowly and not create bubbles.
4. Add 1 tsp (5 mL) of the soap solution to the conical tube or small clear container.
5. Carefully pour the swished sports drink/saltwater solution containing cheek cells into the tube/container with the soap solution.
6. Gently mix this solution for 2-3 minutes with a toothpick or other small object. Try to avoid creating bubbles.
7. Tilt the tube/container of soap solution/cells while adding in 2-3 tsp (10-15 mL) of cold rubbing alcohol. Have the alcohol run down the inside of the tube/container so that it forms a layer on top of your soap solution. **DO NOT MIX THIS!**
8. Put the cap on the tube/container. Hold it still for 1 or 2 minutes. The white clump that you see is YOUR DNA!

WHAT HAPPENED?

First, you extracted cells containing DNA from cheeks by swishing the sports drink/saltwater solution in your mouth. Second, you removed the DNA from cheek cells by using the soap solution to break apart the cell membrane. The soap solution breaks the cell membranes that are made up of fats – just like soap breaks down grease on your dishes.

Finally, by adding the rubbing alcohol, the DNA that was extracted from your cells became visible.

FUN FACT

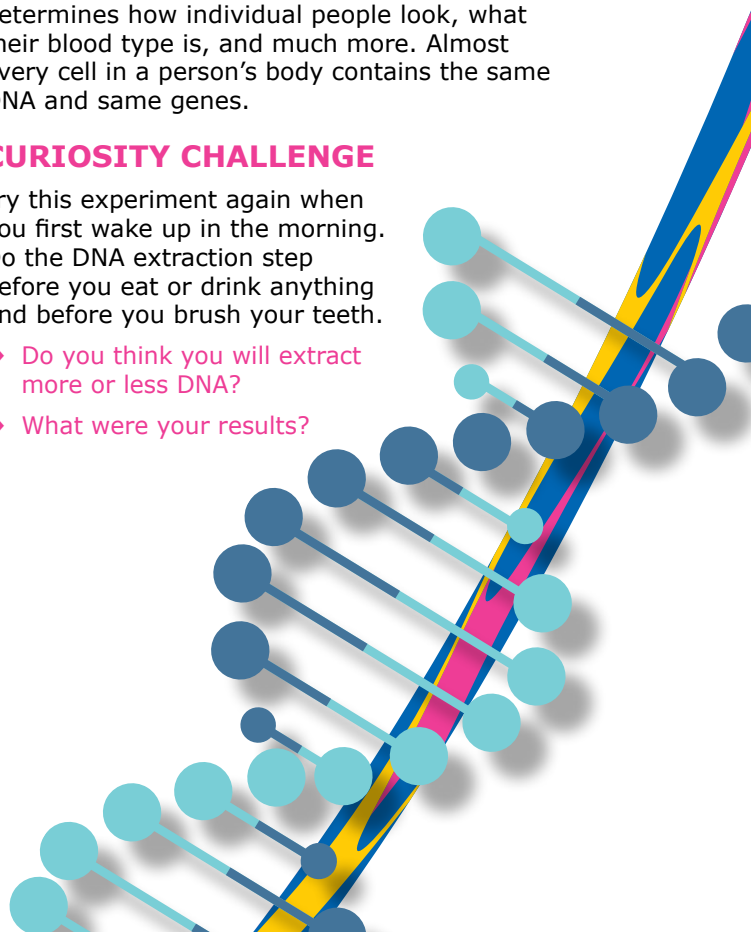
DNA contains the instructions for making an organism, including individual people! DNA determines how individual people look, what their blood type is, and much more. Almost every cell in a person's body contains the same DNA and same genes.

CURIOSITY CHALLENGE

Try this experiment again when you first wake up in the morning. Do the DNA extraction step before you eat or drink anything and before you brush your teeth.

➜ Do you think you will extract more or less DNA?

➜ What were your results?



For more experiment resources,
visit Curiosity Labs™ at Home:
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