BAYER

Making Science Make Sense®

EXPERIMENT GUIDE, VOL. 1

Making Science Make Sense®

It's easy to be a scientist. Simply look around and ask, "why?" As a science-based company, Bayer is committed to creating awareness of the importance of science literacy among parents and fostering curiosity, creativity and critical thinking skills in children. So as you and your child use this booklet together, exploring even the simplest wonders around your home, we hope not just to create a new scientist, but to reawaken the one that's inside of every one of us.

STICKY ICKY

MATERIALS:

- White **school glue**
- Food coloring
- **Borax** (found in the laundry aisle at store)
- Two **pitchers** (one labeled **Borax Solution;** one labeled **Water Only**)
- Two pints of **warm tap water**
- Three **tablespoons** (one to measure **plain water,** one to measure **glue,** one to measure **Borax**)
- One **teaspoon** (to measure Borax solution)
- Two six-ounce **plastic cups** (one for plain water and glue mixture and one for Borax solution)
- One **popsicle stick** (to stir Borax solution into plain water and glue mixture)
- **Safety glasses**

PROCEDURE:

1. Put on the safety glasses.
2. Take the pitcher of warm water labeled "Borax Solution." Add one pint of warm tap water and two tablespoons of Borax and stir well.
3. In one plastic cup, mix one tablespoon of plain warm tap water with one tablespoon of white glue. Stir well with popsicle stick.
4. Add a few drops of food coloring to the glue and water mix. Stir well with popsicle stick.
5. In another plastic cup, measure out two teaspoons of Borax solution.
6. While stirring vigorously with popsicle stick, slowly pour the Borax solution into the glue and water mixture. Keep stirring until there is no water/liquid left.

WHAT THIS MEANS:

THE GLUE AND WATER MIXTURE CONTAINS MOLECULAR CHAINS CALLED "POLYMERS" WHICH MOVE RELATIVELY FREELY AS A LIQUID. WHEN THE BORAX SOLUTION IS ADDED, IT ACTS AS A "CROSS-LINKER," BINDING THE POLYMER CHAINS TOGETHER AND RESTRICTING THEIR MOVEMENT. IT IS THIS MOLECULE IN THE BORAX SOLUTION THAT CAUSES THE LIQUID TO TURN INTO STICKY ICKY.

MARTIAN JELLY

MATERIALS:

- 1 tablespoon **Grape Jelly**
- 1/8 teaspoon **Baking Soda** (not baking powder)
- 1 tablespoon **vinegar**
- 1/2 plastic cup of **Warm Water**
- **Popsicle stick** to stir solution

PROCEDURE :

1. Dissolve grape jelly in the glass of warm water and note the color.
2. Add baking soda and stir. (NOTE: You should do this over a sink. A fizzing reaction will occur, possibly causing it to overflow.) Notice the change in color.
3. Next, add vinegar and stir until the color of the grape jelly solution changes.

WHAT THIS MEANS:

CHEMICAL REACTIONS OCCUR WHEN ONE CHEMICAL COMES INTO CONTACT WITH ANOTHER. FOR EXAMPLE, WHEN YOU ADD BAKING SODA (A BASE) , IT TURNS THE SOLUTION BASIC AND TURNS THE PURPLE COLOR OF THE GRAPE JELLY SOLUTION TO A GREENISH-BLACK COLOR. THEN, WHEN YOU ADD VINEGAR (WHICH CONTAINS ACETIC ACID) , THE GRAPE JELLY SOLUTION REACIDIFIES AND THE COLOR CHANGES BACK TO PURPLE. ALSO, MIXING BAKING SODA AND VINEGAR TOGETHER CAUSES A REACTION THAT RELEASES A GAS CALLED *CARBON DIOXIDE*.

CAUTION: THIS EXPERIMENT REQUIRES PARENTAL SUPERVISION. TAKE CARE NOT TO LET ANY VINEGAR SPLASH INTO YOUR CHILD'S EYES — IT CAN STING.

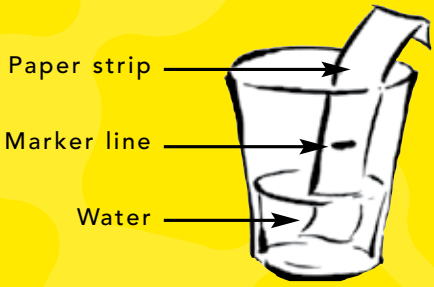
COOL COLORS

MATERIALS:

- Black, green, orange and/or brown **markers** (non-permanent, washable ink only)
- **Coffee filter**
- **Plastic cup** containing 1/2-inch warm water

TRY THIS :

1. Cut your coffee filter into a strip approximately 4 inches long and 1 inch wide (one for each marker).
2. Draw a line 1 inch from the bottom of your filter strip with a green marker, then drape the strip over the edge of the water glass. (Make sure the bottom of the strip is touching the water, and the marker line is above the water level.) As the water soaks up along the filter, what happens? Look at the color. Is green ink really green? Repeat the experiment with the orange and brown markers. What colors actually make up orange and brown?
3. Do the same with the black pen. If you have several different black pens, try each one. Is the black ink from one pen exactly like the black ink from another? (Remember: permanent ink does not dissolve in water. Only washable markers will work.)



WHAT THIS MEANS:

THE WATER DISSOLVES THE INK AND CARRIES IT ALONG THE PAPER, CAUSING THE DIFFERENT CHEMICALS (COLORED INKS) THAT MAKE UP THE INK TO BE LEFT AT DIFFERENT PLACES ON THE PAPER. SO YOU SEE, BLACK ISN'T REALLY BLACK, BUT RATHER A COMBINATION OF COLORS. THIS IS ALSO TRUE OF GREEN, ORANGE, BROWN, AND MANY OTHER COLORS. THIS "COLOR WRITING" IS CALLED CHROMATOGRAPHY AND IS A WAY OF SEPARATING THE COLORED CHEMICALS THAT MAKE UP EACH INK.

MOLD MADNESS

MATERIALS:

- Three cups containing a little **COFFEE** or leftover food
- A **MAGNIFYING GLASS**

PROCEDURE :

1. Put one cup with coffee or leftover food on a sunny windowsill, one in the refrigerator and one in a dark cupboard.
2. Look inside the cups every day for several days and write down what you see. Your magnifying glass will help. (It may take a few days for the mold to start growing.)
3. Does *temperature* affect the mold's growth? See if the cup on the windowsill grows mold more slowly, more quickly or at the same rate as the one in the refrigerator.
4. Does *light* affect the growth of the mold? Does the cup on the windowsill grow mold at the same rate as the one in the dark cupboard?
5. Look around your home for other molds. Inspect: pickles in a jar, cottage cheese, bread, paint on the walls, oranges, house plants, tiles around a bathtub or shower.
5. Are the molds all of the same color, or are they different?

WHAT THIS MEANS:

WE CAN FIND MOLDS IN ALL SORTS OF UNEXPECTED PLACES. UNLIKE GREEN PLANTS, THEY CAN'T MAKE THEIR OWN FOOD FROM SUNLIGHT. INSTEAD, THEY LIVE DIRECTLY OFF OF WHAT THEY ARE GROWING ON. MOLDS CAN BE A NUISANCE WHEN THEY SETTLE ON OUR FOOD OR POSSESSIONS. BUT MOLDS ARE ALSO USEFUL. THE GREEN SPOTS ON OLD ORANGES ARE PENICILLIN MOLD. THIS IS WHAT THE MEDICINE IS MADE FROM.

HANDS-ON SCIENCE TIPS

Children are born with natural curiosity about the world. They love to explore, ask questions and learn. And that's what science is all about.

Today, our children need to be creative problem solvers and critical thinkers in order to be productive members of society and the workforce. As parents and teachers, you can help by encouraging children's natural curiosity and taking time to explore and enjoy the science that's all around you.

Here are some suggestions to help you get started:

- Watch how molecules change from liquid to gas by boiling water.
- Demonstrate the power of infrared technology by channel surfing with a remote control device.
- Fill a sink or bucket with water and compare the difference in buoyancy of a sponge and a rubber toy.
- Go to a neighborhood park and try to identify all the different types of trees. See how the pigment and texture of the leaves change with the seasons.
- Visit the local recycling plant and learn how a soda bottle can be transformed into a spaghetti jar.
- And, of course, visit your local museum, library, zoo, planetarium and science center as often as you can.

Most importantly, realize that it's okay to tell a child, "I don't know." Science is about looking for the answers.

COOL SCIENCE WEB SITES

- **Bayer's *Making Science Make Sense* —** MakingScienceMakeSense.com
- **Bill Nye the Science Guy —** nyelabs.com
- **NPR Science Friday —** sciencefriday.com
- **Earth & Sky —** earthsky.com
- **NASA —** www.nasa.gov
- **PBS Kids —** pbskids.org
- **National Science Teachers Association —** www.nsta.org

Why do socks stick together?

Although they are much too small to see, atoms make up everything around us. And atoms are made of protons (positive charge) and electrons (negative charge). In the dryer, as your socks rub together, electrons move from atoms of one sock onto atoms of the other. As one sock becomes more loaded with electrons than the other, an attraction is created causing one sock to stick to the other. As they say, opposites attract!

What is a shooting star?

A shooting star is really a meteoroid—a fragment of an asteroid or a comet, made up of iron, silicates or a mixture of both. When the asteroid or comet is shattered by an explosion in space, meteoroids are propelled through the earth's atmosphere, creating friction, which heats up the "shooting star" and gives it the glow we see.

Why do Birds Sing?

Birds sing for many reasons: to greet each other, to define their territories, to let their parents know they're hungry, to attract a mate, to warn each other of approaching danger and to tell each other about good feeding spots. Go outside and listen for yourself!

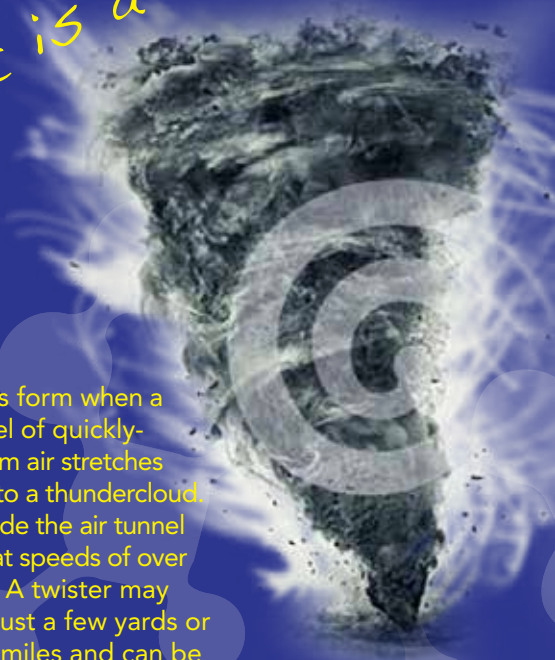
Why does popcorn pop?

Popcorn is a kind of corn. A kernel pops when it is heated to 400 degrees Fahrenheit, causing water inside each kernel to change to steam. Popcorn's hard cover keeps the steam from escaping,causing pressure to build up, and finally, pop goes the kernel!

Where do bugs go in the winter?

To avoid the cold, many insects dig deep into the Earth – sometimes as deep as six feet. Others hide in logs or under rocks, travel south, or simply die off as temperatures drop. Just like people, some bugs like the cold and some just plain don't!

What is a tornado?



Tornadoes form when a long funnel of quickly-rising warm air stretches up, often to a thundercloud. Winds inside the air tunnel can twist at speeds of over 300 mph. A twister may measure just a few yards or up to 2.6 miles and can be clearly seen on the horizon because of the dust it sucks up as it moves, as well as the condensation of water droplets in the center of the funnel.

What is a flame?

As a candle burns, it gives off molecules in the form of gases. Those molecules are in a very excited state, causing a breakdown of the chemical bonds that bind them together. This releases energy which you see as both light and heat from the flame. In other words, the flame is simply a column of very excited gases.

Why are bubbles round?

Water molecules are polarized, meaning one end is negatively charged and the other is positively charged. Like a magnet, their opposites attract. When soap is added, the water molecules lose their attraction and, rather than pulling together into a droplet, the molecules create a thin film. Inside, the air pressure is equally distributed along each wall. It's that pressure that keeps the bubbles round.

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Making Science Make Sense® is Bayer's award-winning, company-wide initiative that advances science literacy through hands-on, inquiry-based science learning, employee volunteerism and public education.

For more information,
please visit MakingScienceMakeSense.com

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