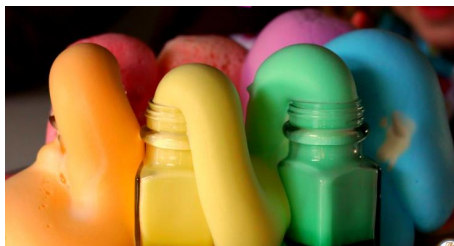
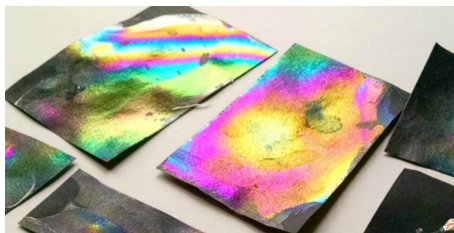


Rainbow Science Experiment





How do we get rainbows?

Rainbows are spectacular rays of color. Sunlight looks white, but it's really made up of different colors...red, orange, yellow, green, blue, indigo, and violet. The sun makes rainbows when white sunlight passes through rain drops. The raindrops act like tiny prisms. They bend the different colors in white light, so the light spreads out into a band of colors that can be reflected back to you as a rainbow.

Why can't you ever find the end of a rainbow?

A rainbow is an optical illusion, so you just can't catch up to it. When you move, so does it!



What is an upside-down rainbow?

An upside-down rainbow is an unusual phenomenon caused by sunlight shining through a thin, visible screen of tiny ice crystals high in the sky. Interestingly enough, it has nothing to do with rain. Some people refer to this as a 'smile rainbow'.

Can a rainbow appear during the night?

Yes, they're called moonbows! The nighttime rainbow is very rare and occurs only when the moon is bright enough and positioned properly with respect to falling rain to produce the beautiful effect.



How to form fun rainbows at home...

1. Rainbow Prism

Materials

- strong sunlight

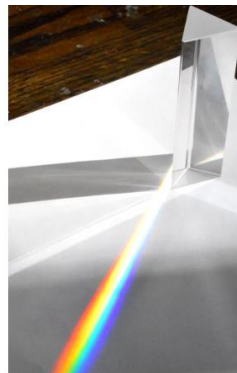
Tools

- glass prism
- white cardboard / paper (optional)
- adult supervision



Instructions

1. Place a piece of white paper on the ground under the sunlight.
2. Put the prism on or above the paper.
3. Rotate and move the prism around until you see rainbow colors on the paper.



Look around your house and see if you can find objects that act as prisms...



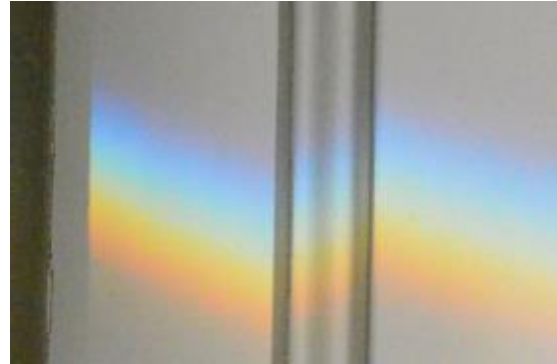
2. Rainbow on the Wall

Materials

- Water
- sunlight

Tools

- a clear glass
- small mirror
- adult supervision



Instructions

1. Fill the glass with water.
2. Put the mirror into the water inside the glass at an angle.



3. Position the glass so that sunlight shines directly at the mirror. You may have to shift the mirror to find the right angle.
4. Look for a reflection on the wall. It would be easier to see if the room is dark.
5. Adjust the angle of the mirror until you see a rainbow on the wall.

3. Make a Rainbow Using a Flashlight

Materials

- water

Tools

- clear glass
- flashlight that emits strong focused white light.

Flashlights that emit only yellowish light won't work.

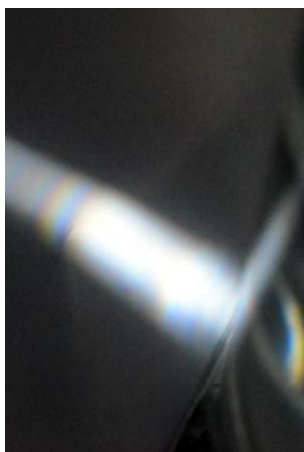
Flashlights that don't emit focused light also won't work.

Look for one with parabolic reflecting mirrors inside to focus the light, or one with a strong LED light.

- 2 pieces of white cardboard
- adult supervision

Instructions

1. Fill the glass with water.
2. Cut a narrow rectangle in the middle of one piece of paper.
3. Stick that paper to the outside of the glass so that the slit is at the center.
4. Place the other piece of paper on the floor on the other side of the glass to catch the rainbow.
5. In a pitch dark room, point the flashlight at the slit.



6. Start from the glass and slowly move the flashlight farther and farther from the glass.
7. Adjust the distance and angle of the flashlight until you see a rainbow on the paper on the other side.

Fun Experiments with Rainbow Colors...

4. Sugar Water Density Experiment



What happens when you combine blue, green, yellow and red water in a single glass? Brown, right? Not necessarily! By dissolving different amounts of sugar in each glass of water, you change the densities, allowing the colors to stack like a rainbow! For this sugar water density experiment, you'll need a few common household items, listed below.

Supplies

- 5 glasses
- warm water
- sugar
- spoon
- food coloring
- turkey baster

Instructions

1. Fill four glasses with $\frac{1}{4}$ cup of warm water each.
2. Add 1 tbsp. of sugar and 2 drops of red food color to the first glass, and stir vigorously to completely dissolve the sugar. Add 2 tbsps. of sugar and 2 drops of yellow food color to the second glass, and stir completely again to dissolve. Add 3 tbsps. of sugar and 2 drops of green food color to the third glass (and stir). Add 4 tbsps. of sugar and 2 drops of blue food color to the fourth glass.

Note: Stirring to completely dissolve the sugar is very important; without the sugar fully incorporated into the water, you'll have trouble getting the colors to separate.



Don't be afraid to heat up your water a little more, too, if it's not working – 5 to 10 seconds in the microwave and an extra stirring session should help.

3. Use the baster to transfer about half of the blue water into the empty glass. This is where you'll make your rainbow.

4. Still using the baster, transfer half the green water into the rainbow glass. Add it slowly on top of the blue water. It will sit on top. Add the yellow next.

5. Finally, add the red on top of the yellow. You'll see a beautiful rainbow!

NOTE: Make sure the sugar is completely dissolved before attempting to layer the colors – it's what creates the difference in density of each color.

❖ Activity from <https://www.littlepassports.com/>

5. Erupting Rainbow Experiment

Kids love to make explosions and watch things form bubbles. While this rainbow doesn't explode *all* over (that just doesn't seem necessary, right?), it will definitely erupt and bubble over.



Supplies:

- Small plastic containers
- Rainbow food coloring (I use the gel kind found at a craft store)
- White vinegar
- Baking soda
- An easy-to-clean hard surface (a little soap and water will do the trick)

Directions:

1. Place a drop of food coloring at the bottom of each plastic container.
2. Fill up each container 1/2 way with vinegar.
3. When the kids are ready, drop 1 to 2 teaspoons of baking soda into each plastic cup.
4. The mixture will start to fizz, then it will bubble, then it will rise, and before you know it, the colors will explode over the containers and melt into each other on the hard surface.

The reaction happens quickly, so be ready. If there is leftover liquid in the containers, add a little more baking soda or vinegar, and watch it happen again.

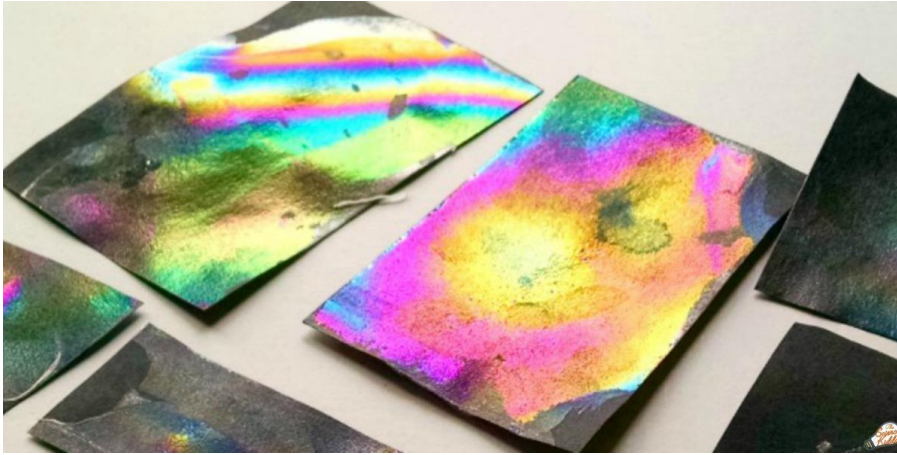
And don't forget to explain to kids how it works: Carbon dioxide is a gas that's created when vinegar (an acid) is mixed with baking soda (a base).

If that's too complicated for younger kids, you can simply discuss the mixing of the colors. Ask questions about what happens when certain colors mix. You can even have them make predictions about what they think will happen before the experiment starts. At the end, have them observe the mixed colors and tell you about what they find.

For older kids, have them write down their predictions first; they're likely used to doing this in school science class. They can even draw a picture of their prediction. Next, explain the buzzwords: *acid*, *base* and *gas*. Once the rainbow is done exploding, have them write down what happened. Then have them discuss, draw or write out their conclusions.

You've played, you've learned, you've stimulated minds, and best of all, you've had *fun*.

6. Rainbow Paper



Supplies:

- A bowl filled with water
- Clear nail polish
- Rectangles of black construction paper or black card stock (about 3-5 inches long on the sides)
- Paper towels

Note: Since using nail polish, make sure you do this experiment outside or in a well-ventilated area.

How to Make Rainbow Paper

1. Fill a large bowl (or tray) with water. Then, drip one little drop of clear nail polish into the bowl of water.
2. Then dip a piece of black paper into the water and pulled it out again. That's it!

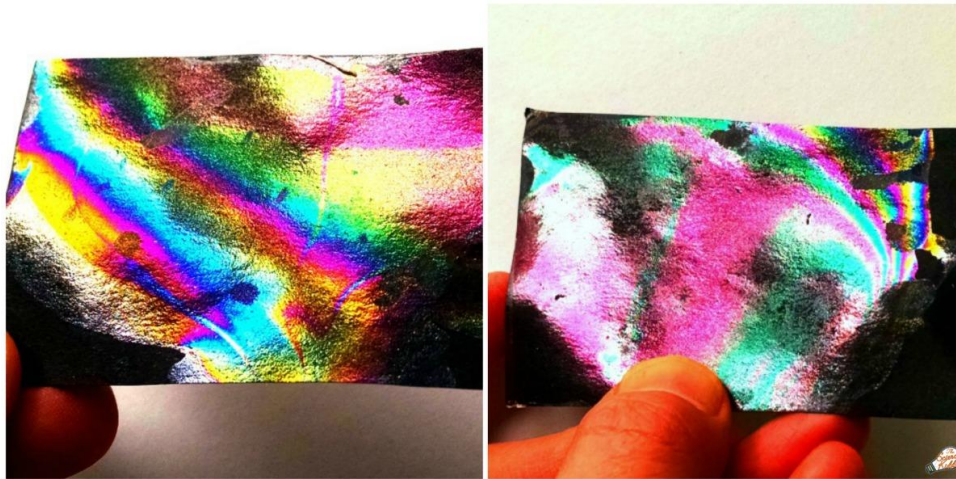


The nail polish dries quickly on the surface of the water, which creates a film that won't stick to the paper. To do this activity successfully it needs to be done quickly. Be sure to dip the paper into the water within 10-15 seconds after the drop of nail polish goes in.

If the nail polish does create a dry film on top, simply scoop it off and try again more quickly!

We did this experiment several times with several pieces of paper. It was fascinating to see how each piece came out so differently!

Once the paper is dry (this only takes a few minutes) tilt the paper in different directions to see the rainbow patterns appear. Hold it next to a sunny window for best results!



❖ Activity from <https://www.sciencekiddo.com/>

7. Walking Rainbow Experiment



The rainbow paper towel experiment teaches a few basic scientific concepts.

When the paper towels are rolled up and placed between two jars, they exemplify capillary action, which is how liquid can move up something, rather than follow the usual pull of gravity and pull down.

To get a bit technical, intermolecular forces between the liquid and the paper towel creates surface tension that reacts with the adhesive force between the liquid and paper towel.

This causes the water to move up the paper towel and into the next jar.

Capillary action is how plants pull water from the soil and up into their leaves to keep watered.

Then, once the paper towels pull color from the base red, blue, and yellow primary color jars, the resulting mixture creates the secondary colors of green, purple, and orange, completing the rainbow.

Supplies:

- 6 mason jars
- Food coloring (in red, yellow, and blue)
- Paper towels
- Timer

How to make walking water...

1. Fill three jars full of water. Add red Food coloring to one, blue to another, and yellow to another.

Go over the color wheel before starting. Show the kids how mixing colors will create different colors. However, don't tell them how to make the rainbow!

Let the kids discuss how they will make a rainbow from just three colors. It will take them a little bit to determine the right combination.



2. Put an empty jar between red and yellow, yellow and blue, and blue and red.
3. Roll the paper towels into tube-like pieces and put one end in a full jar and the other end in an empty jar.



4. The paper towels will start soaking up the water right away, but it will take about 48 hours before the process is finished. Set a timer or mark down the time to find out exactly how long it takes to start mixing colors



8. Rainbow Toothpaste Experiment



Supplies:

- Empty small spice jars or cups
- Baking dish
- 6% Hydrogen peroxide
- Food coloring
- Liquid dish soap
- Condiment squeeze bottles
- Dry active yeast
- Lukewarm water
- Measuring spoons and cups
- Funnel
- Wooden skewers

A Note About Safety

Outlined below are a few safety precautions. Just be careful and tell your children about the real hazards of using hydrogen peroxide.

However, don't let the safety warnings keep you from sharing this awesome rainbow science experiment with the kids! You can do this experiment, even with young children, as long as you take safety precautions. If you are really worried you could always have the kids wear eye protection and gloves to keep them extra safe!

An adult should definitely handle the hydrogen peroxide since it can cause skin irritation and bleach hair and clothes. Use your own best judgement with the kids you are working with.

If hydrogen peroxide does come in contact with skin or eyes, flush the area with water immediately. Always keep hydrogen peroxide stored out of children's reach.

1. Arranged the empty jars in a circle on a large serving plate or baking pan/dish, so it can contain the mess this experiment makes.
2. Add to each jar 2 tablespoons hydrogen peroxide, a few drops of food coloring, and a small squeeze of liquid dish soap. Since we wanted to make a rainbow we made the jars red, orange, yellow, green, blue, violet, and pink!
3. They used a funnel to add yeast and water to a couple of condiment squeeze bottles. You want to use a 1:6 ratio of yeast to water. We added 2 tablespoons of yeast and 3/4 cup lukewarm water to each bottle.



4. Use a wooden skewer to mix up the yeast mixture. Wait a few minutes to let the yeast dissolve a little bit.



5. Have kids take turns squeezing the yeast mixture into each of the colorful jars. One by one they erupted in a brilliant, foamy mess!

Playing in the Foam

This rainbow foam is too fun not to touch. And it's totally safe as long as a little bit of caution is used.

As explained below, the actual foam is just soap and water and food coloring. Everything that bubbles out of the spice jars is safe to touch.

HOWEVER. There may be hydrogen peroxide left in the jars. If the kids want to play in the foam just watch carefully and make sure they don't tip over leftover peroxide from the jars onto their hands.



Rainbow Science Experiment

So, what's actually going on with this fascinating rainbow science experiment?

This is a wonderful way to get kids interested in chemistry and science in general!

Hydrogen peroxide is somewhat unstable and easily decomposes into oxygen gas and water all by itself. It usually comes in brown bottles to protect it from being exposed to light, which makes the peroxide decompose even faster.

When yeast is added to the peroxide mixture, it acts as a catalyst. A catalyst makes a chemical reaction happen more quickly.

So, when yeast comes into contact with hydrogen peroxide it produces oxygen gas and water very quickly. This happens so quickly that the oxygen bubbles out of the solution vigorously, creating foam and making the mixture overflow!

The foam that is produced looks just like bright rainbow toothpaste that a magical unicorn might use each morning!

Note: This experiment might be a good one to try after quarantine, due to the limited supply of yeast.