MICHIGAN Science CENTER

MetroParent

LESSON #2

WEATHER WONDERS

VIRTUAL CAMP:
SUMMER OF SCIENCE 2017

DIY CLOUD IN A BOTTLE

STUFF YOU'LL NEED

- Empty plastic water bottle (the thinner, the better) with cap
- Isopropyl rubbing alcohol G
- Safety glasses

G = Grown-up step. Safety first!

THE CHALLENGE

How are clouds created?

There's definitely some high-pressure science at play here. Let's find out!

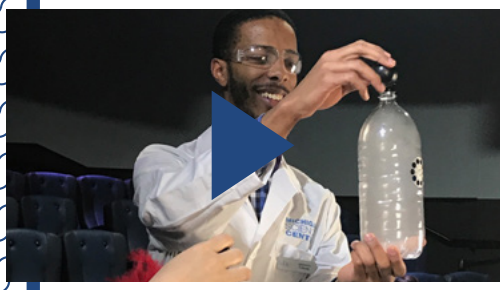
WEATHER CONCEPTS!

Molecules. These microscopic components make up nearly everything on Earth, including air, liquids and dust. Each molecule is a group of two or more atoms.

Water vapor. This refers to active water molecules bouncing around in the air. It's happening around you right now. You just can't see it.

Condensation. When water vapor is put under pressure – for example, when it gets warmer outside (or, say, when you squeeze on a empty plastic bottle that has its lid on) – the molecules rise and squeeze together, or condense, forming little droplets. When things cool down, as they do higher up in the sky, the vapor expands and clings to tiny dust or pollution particles. When billions of those come together, they form a cloud.

Why rubbing alcohol? In our experiment, it's a substitute "water vapor." It evaporates more quickly than water and condenses at lower pressure – so you can see the "cloud" better!



SEE IT IN ACTION

Watch Izzy, our STEM-loving puppet, and her Michigan Science Center friends Taylor and Quentin make their own cloud in a bottle!

SCIENTIFIC PROCEDURE

1. **Pour a bit of isopropyl rubbing alcohol** into the bottom of the empty plastic water bottle. It should be enough so there's a little "pool" at the bottom. G
2. **Secure the cap tightly** back onto the bottle.
3. **Slosh the rubbing alcohol around** the bottle so that it coats the walls – especially along the lower half of the bottle.
4. **Using both hands, give the bottle several good twists.** Basically, you're squeezing or crunching-up the bottom portion of the bottle. It might feel like it's going to break or pop (remember, you're putting pressure on this mini "atmospheric system"), but don't worry. It won't.
5. **Making sure your safety goggles are on** – and making extra sure to point the bottle away from people and towards an empty "target" space without any breakable items in the way – quickly unscrew the cap. You'll just have to get it started; then pressure will finish the job and send that cap flying!
6. **Watch in wonder** as, sure enough, a white little "cloud" forms in the bottle. Give it a few little squeezes to make it "puff" out of the bottle.

G = Grown-up step. Safety first!

BONUS!

DIY BAROMETER

THE CHALLENGE: Pressure in the atmosphere creates clouds – and changes in the weather!

Here's an easy way to track it!

STUFF YOU'LL NEED

- Wide-mouth glass jar
- Latex balloon
- Scissors
- 1-2 rubber bands
- Plastic drinking straw
- Clear tape
- A long rectangle of sturdy cardboard
- Marker

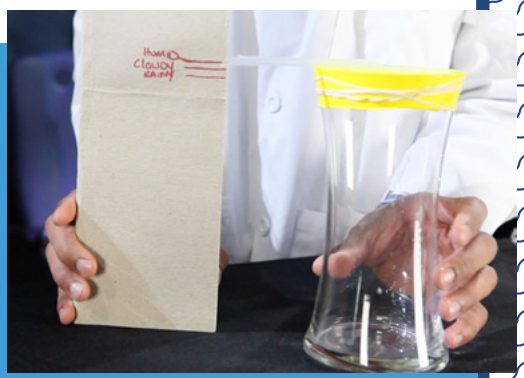
SCIENTIFIC PROCEDURE

1. **Cut the latex balloon** roughly in half (you'll discard the bottom "opening" portion). Take the top portion and stretch it very tightly over the opening of the jar.
2. **Secure the balloon** with the rubber bands. Make it as airtight as possible.
3. **Cut the straw** to about 6 inches long. Next, on either side of it, make a diagonal cut, so that each end is angled and a bit pointy.
4. **Rip off a small square of tape.** Use it to attach one side of the straw to the very center of stretched balloon circle – with the "flat" side touching the balloon. The opposite side is going to be your "pointer."
5. **Now, fold the cardboard rectangle** into a triangle. To figure out the right size, place it next to your jar. The two "wall" sides should be a little taller than where the straw is sticking out. The third side should be long enough to be a sturdy base (several or so inches – so it doesn't tip easily). Secure the triangle with more tape.
6. **Place your barometer outside** in a spot that's not too drafty or in direct sunlight. Let it settle or acclimate for an hour or two.
7. **Set the cardboard triangle next to the jar.** Make a marker mark where the straw pointer touches the cardboard and note the weather. Is it humid? Cloudy? Rainy?
8. **Keep checking in** with the barometer. See where the pointer goes and record what the weather is doing. What changes do you see over time?

WHAT'S THE WEATHER?

Sunny. The barometer straw points up. That's because the hotter air pressure outside of the jar is heavier. It presses the balloon down, which pushes the straw up.

Stormy. The barometer straw points down. In these cases, the cooler air pressure outside the jar is lighter. That pushes the balloon up, so the straw goes down.



SKIES OF BLUE AND CLOUDS OF WHITE

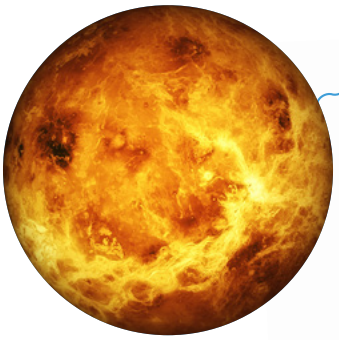
Ever wonder why gray clouds are called storm clouds? Well, in nice weather, clouds are white because they're reflecting sunlight. When clouds get saturated with water, though, they're no longer as reflective and appear gray. Another reason? Bunches of gathering clouds create shadows, also resulting in a gray hue.

WHAT'S IN A NAME?

Robert Boyle coined the term "barometer" back in 1665 by blending two Greek words. The name translates to "measuring weight" – suitable, since a barometer measures air's pressure, or weight. Boyle didn't invent it, though: That honor goes to Galileo student Evangelista Torricelli.

TRIVIA TIME
DID YOU KNOW?

This forecast calls for some fascinating weather factoids!



OUTTA THIS WORLD

Earth isn't the only place with clouds. Other planets with atmospheres have them too – they just don't always include water. Venus, the hottest planet in our solar system, has thick sulfur dioxide clouds. And you'll find ammonia ice clouds on Jupiter and Saturn.

NEED FOR SPEED

Clouds often appear to be floating gracefully through the sky, but they are actually capable of moving pretty fast. Wispy cirrus clouds, which soar high up at least 20,000 feet, can hustle at speeds broaching 100 mph (that's faster than a cheetah!).

HEAVYWEIGHT CHAMPS

Just because they're floating, it doesn't mean they're lighter than air. A standard-issue fair-weather cumulus cloud is in the neighborhood of 1 million pounds, while thunderstorms heft billions – if not trillions – of pounds of H20.

LEARN MORE
GREAT RESOURCES

Play, read, browse and watch to learn more about the weather.

Wacky Weird Weather Kit

Bring the "mysteries of meteorology" to light with this set by Scientific Explorer. Kids can create blizzards, tornadoes, tidal waves, thunder and other wild weather forces of nature through a variety of experiments. Features 28 pieces. Parent supervision is a must. For ages 12-plus.

The Everything KIDS Weather Book

By Joseph Snedeker • Ages: 7-12
This engaging read is packed with tons of tidbits and 30 cool puzzles about all types of weather – all compiled by a real-life meteorologist from Pennsylvania. There's a good chance you'll learn about types of clouds, how to predict weather, global warming effects and more.

Weather Wiz Kids

A great resource for kids, parents and teachers alike, this site is filled with tools for understanding the weather and even natural disasters. Geared at ages 7-12, it features a dedicated "Kid's Zone," experiments section and a breakdown for every kind of weather imaginable.

Toyota Engineering 4D Theater

Michigan Science Center just opened this new theater, and National Geographic's *Extreme Weather* movie is showing here this summer! In this film, you do more than just see footage of extreme weather – you get to feel it, from tornadoes to forest fires.

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SHARE THE FUN ON INSTA

Post a pic of your kiddo enjoying Virtual Camp on Instagram using the hashtag **#MPCamp**. Six lucky kids will score a **$25 Amazon gift card** – and get featured in our Friday emails!

TEST YOUR SMARTS
WEATHER QUIZ TIME

Don't chew that No. 2! This quick quiz is just **five questions** about what kids learned after trying the experiment and using this guide to learn more – done in a few clicks.

Just for completing it, each kid gets **one free general admission to the Michigan Science Center AND a pass to its all-new Toyota Engineering 4D Theater**, good Sept. 15-Dec. 31, 2017. Plus, one lucky kid wins $1,000 for college!

So put on that thinking cap.

READY TO TAKE THE QUIZ? **Click here!**