

Make Some Gas!

What You'll Need

- Empty soda bottle (either 12 or 20 oz size)
- Vinegar
- Balloon
- Baking soda
- Measuring cup
- Measuring spoon
- Funnel (optional)

What You'll Do

1. Place 2 tablespoons of baking soda into the balloon. (If you have a funnel, it could help!)
2. Pour 1/2 cup of vinegar into the soda bottle. (You can use the funnel for this step, too.)
3. Without spilling the baking soda into the bottle, carefully place the balloon on the lip of the bottle.
4. Make a prediction: what do you think will happen when the baking soda and vinegar mix?
5. Let the reaction begin! Lift the balloon up so that the baking soda falls into the bottle and mixes with the vinegar.
6. Observe what happens! How did your observations compare to your predictions?





Make Some Gas!

What's Happening?

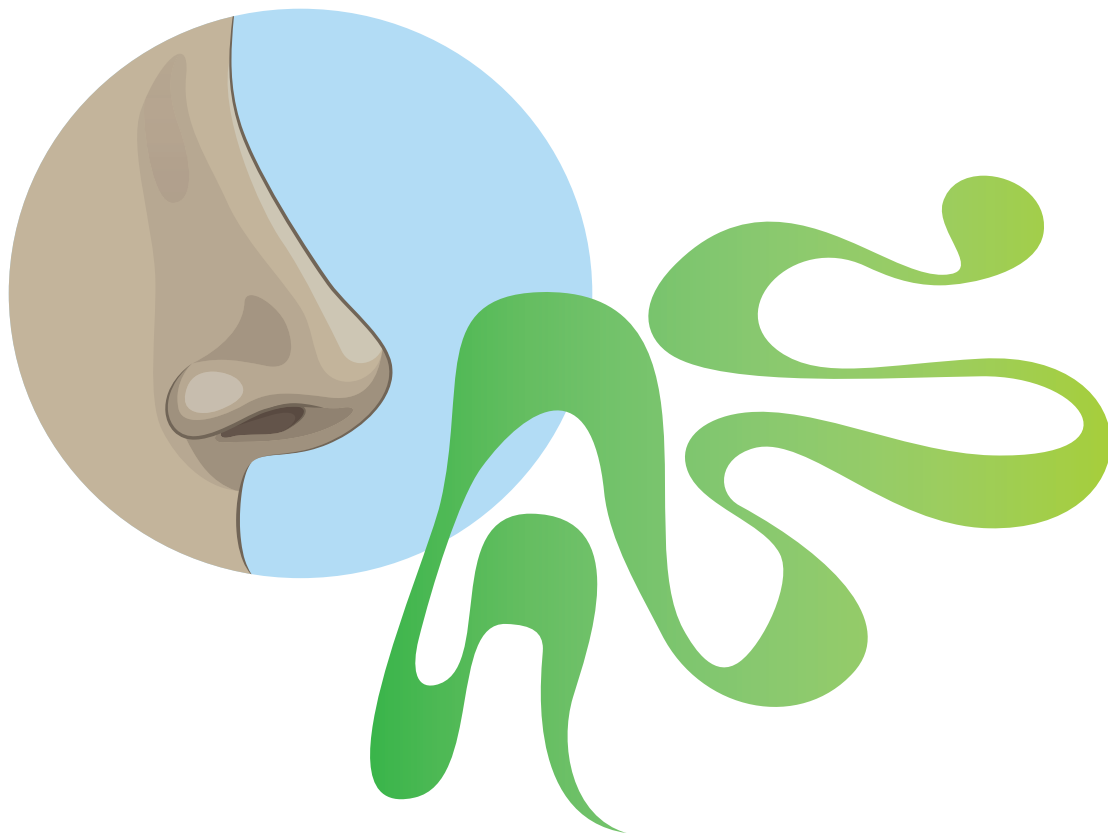
You created a chemical reaction! The reactants – the baking soda (sodium bicarbonate or NaHCO_3) and vinegar (acetic acid or CH_3COOH) – mixed together to create, or yield, the products water (H_2O), carbon dioxide (CO_2) and sodium acetate (CH_3COONa).



What observations did you make? Did you see any bubbles? That is a sign gas was being created, in this case the carbon dioxide. The gas expanded to fill up the balloon! Did the temperature of the bottle change? Did it get cold? This is an endothermic reaction: it absorbs heat from the surroundings so it will feel cold to the touch.

If you let the bottle sit undisturbed for a few moments, you can see the other products of this reaction. There should be a white solid substance on the bottom of the bottle with a clear layer of liquid on top. The solid is the sodium acetate and the clear layer is the water!

The smell of this reaction should also have changed. To notice, remove the balloon. While holding the bottle several inches in front of your face, slowly wave your hand over the top of the bottle to bring air from the bottle toward your nose. This is a technique chemists call the “waft and sniff.” (Why do they do this? For safety! Never stick your nose over something if you don't know what it is.) What do you smell? You should no longer smell the distinct scent of vinegar. Why? The vinegar combined with the baking soda to create new substances.





Make Some Gas!

Fun with Carbon Dioxide!

Don't stop there! Explore some of the properties of the carbon dioxide you generated in the experiment you just finished.

What You'll Need

- Candle
- Lighter
- Adult helper
- The finished reaction from your "Make Some Gas" experiment

What You'll Do

1. Have your adult helper light the candle.
2. After you remove the balloon, tilt the bottle horizontally about a foot above the candle. Pretend like you are "pouring" a drink onto the candle, but don't let any of the water and sodium acetate escape the bottle!
3. Observe what happens to the candle.

What's Happening

Carbon dioxide is more dense than air, so it sinks!

The air around us is composed of 78% nitrogen gas (N_2), 21% oxygen gas (O_2) and 1% everything else, such as helium (He), argon (Ar) and carbon dioxide (CO_2). In the reaction, some carbon dioxide escaped into the balloon, but some still remained in the bottle. Even though you can't see it, because CO_2 is denser, or heavier, than air, it pours out and down from the bottle just as if you were pouring out water.

Why did the candle go out? Oxygen gas is a key component of the combustion reaction (the science of burning). Combustion requires fuel, a heat source and oxygen. The sinking carbon dioxide pushed aside, or displaced, the oxygen gas away from the candle. Without oxygen, the fire goes out. Fire extinguishers filled with carbon dioxide are used to put out fires from flammable liquids, such as gasoline and alcohol, and electrical fires.

Safety first! Remember to protect yourself. Around a flame, you should not be wearing loose clothing and long hair should be pulled back. It's also good to wear safety goggles if you have them.

