

# Questacon at HOME

## Activity Sheet

# Carbon Dioxide Balloon

### Background

A chemical reaction occurs when two or more substances are mixed together, and during that process their chemical bonds are broken then reformed, creating a brand new substance. In this experiment, we are going to combine bicarbonate soda and vinegar to create a chemical reaction. This reaction makes carbon dioxide gas, which we can use to blow up a balloon!

### Materials

- Bicarbonate soda
- White vinegar
- A bowl
- An empty bottle
- A funnel
- A balloon
- A teaspoon



### Procedure

**Experiment with bicarbonate soda and vinegar:** Put a small amount of bicarbonate soda in the bowl. Carefully pour in a small amount of vinegar. Watch how they react!

**Experiment with a balloon:** Carefully pour a small amount of vinegar into the bottle. Using the funnel, carefully put two teaspoons of bicarbonate soda inside the balloon. Stretch the opening of the balloon over the top of the bottle. Once the balloon is securely attached to the bottle, tip the balloon up so the bicarbonate soda falls out into the bottle and mixes with the vinegar. Watch what happens to the balloon!

### Safety

Never combine bicarbonate soda and vinegar in a screw-top container, as this will result in dangerous pressure build-up. Adult supervision is recommended for young experimenters.



## Tips & tricks

- Try using different amounts of bicarbonate soda and vinegar to create a bigger or smaller reaction.
- Do this experiment in an area where you can make a mess, like a backyard or laundry.
- Vinegar can be tipped down the sink, but any bicarbonate soda that has not reacted with vinegar should go into the bin.

## What's the Science?

Vinegar and bicarbonate soda react chemically because vinegar is an acid and the bicarbonate soda is a base. Acids found around the house tend to be sour (e.g. lemon juice) while bases are often bitter or slippery (e.g. soap). An acid is a substance that has lots of free Hydrogen ions ( $H^+$ ) in it, and a base is a substance that has very few free  $H^+$  ions in it. When an acid and a base are mixed, the  $H^+$  ions from the acid react with the base, and in a chemical reaction, creates water, a salt, and carbon dioxide gas ( $CO_2$ ).

Gas molecules move around a lot, liquid molecules move around less, and solid molecules only move around a little bit. As a result, gases take up more space than liquids, and liquids take up more space than solids. In this experiment, we mix a solid (bicarbonate soda) with a liquid (vinegar).

The chemical bonds of the two ingredients are broken, and then reformed, creating a salt (sodium acetate), a liquid (water), and a gas (carbon dioxide). This gas can be seen in the form of bubbles and if you observe closely, those bubbles will move quickly to fill the empty space in the bottle. The purpose of the balloon is to capture some of this carbon dioxide gas that is created.

## What questions could I ask?

- What do you think will happen when we mix the bicarbonate soda and vinegar?
- What is inside the bubbles?
- What do you think will happen to the balloon?

## What's next?

- **Comparison challenge:** Try comparing the results of the experiment when you make small changes to the procedure. For example, you could compare the results of room temperature vinegar and warm vinegar, or a small amount of bicarbonate soda and a large amount of vinegar. Film each experiment so you can watch and compare
- **Balloon challenge:** Fill one balloon up with carbon dioxide from a reaction between bicarbonate soda and vinegar.
- Fill another balloon up with air. Mix them up and see if you can tell which one has carbon dioxide and which one has air.
- **Different household acids:** Lemon juice, soft drink and milk are all common household acids, of varying strengths. What happens if you replace the vinegar with any of the above acids?

