IndusTRY AT HOME!

Cleveland Scientific Institution

About this activity

In this activity you will find out how gases can be used to help keep us safe from some types of fire. Just like scientists in industry, you will mix solid bicarbonate of soda and liquid vinegar together to cause an irreversible change and observe what happens.

Kit List

- ☑ 3 teaspoons of bicarbonate of soda or baking powder
- ☑ 50ml of white vinegar
- ☑ Small foil dish (recycled pastry case or deep jar lid)
- ☑ Safety lighter or safety matches
- ☑ Tealight candle
- ☑ Mixing bowl or deep casserole dish

Time: 1 hour

Watch out!

- Do not taste or eat any of the ingredients used.
- Do not try this activity if you have allergies to bicarbonate of soda, vinegar or latex (balloon).
- Place tealights securely in the bottom of the container. You can use a layer of sand for extra security.
- An adult must light tealight safely with a safety lighter.
- Stand up to carry out this activity so you can step away easily if there is a spill.
- Children should be warned about the hazards associated with heating and burning and carry out this activity under **close adult supervision**.

Setting up your equipment:

Important words to understand:

- air
- burn
- carbon dioxide
- change
- engineer
- extinguish
- gas
- irreversible
- liquid
- mixture
- oxygen
- solid

Not sure what they mean? You could use a dictionary to check (paper or online).

The Problem

The 'Safe at Home' company design and make safety equipment to help families protect their homes and keep them safe from fire. They are designing a new range of fire extinguisher and would like your help.

Their scientists have been trying different ways to produce gases, which they hope to use in their latest range of fire extinguishers. They have heard that **carbon dioxide** might be useful. Could you help them by carrying out this investigation?

OUR METHOD

- Place 3 teaspoons of bicarbonate of soda into the foil dish.
- Put the foil dish and the **unlit** tealight candle in the bottom of the clear mixing bowl, as far away from each other as possible.
- Light the tealight candle using the safety lighter (**adult only**).
- Carefully pour 50ml of white vinegar into the foil dish.
- Watch closely to see what happens to the flame – you could even record the reaction so you can watch it again.

What do you think will happen?

Did you know...

There are different types of fire extinguisher because there are different types of fires, like electrical, flammable liquid, oil and gas. They contain different ingredients such as carbon dioxide, water, foam and powder.

Adapted from: Kitchen Concoctions

Recording your Results – Here are some ways you could record your results

Sketch Diary

Draw and label three diagrams to explain/show what happened in your experiment:

1) The equipment is set up and the candle is lit	2) The vinegar is added to the bicarbonate of soda	3) The flame is extinguished

Photo Diary

Video Diary

Once you have completed your observations and recorded your results, it is time to tell the Safe at Home scientists what you found out about mixing bicarbonate of soda and vinegar.

THEY WILL WANT TO KNOW...

- How did you carry out your experiment?
- What happened when you poured the vinegar on to the bicarbonate of soda?
- Did the flame go out?
- What did you see happening?
- Can you explain how and why the flame was extinguished?

Write a short report or make a video to share your results with

Safe at Home

Share it with us @ciecyork

The Fire Triangle

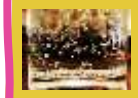
Three things are needed to make fire – oxygen, fuel and heat. If all three of these things are present, a fire will burn. Remove one of these vital elements and the fire will go out.

Covering a fire with water is one way of removing the heat from fires fuelled by solids, like wood and paper, but it can make fires fuelled by liquids or gases worse.

In this activity, you saw heavy carbon dioxide replace lighter oxygen in the bowl which meant the flame could no longer burn.

Removing fuel is tricky because it is very hot, but by removing any potential fuel from the area around a fire, you can cause a fire to burn out, once it runs out of fuel, just like a charcoal BBQ would if you stop adding lumps of charcoal.

Carbon Dioxide in Industry



Fizzy drinks – Ever wondered what the bubbles are in your fizzy drink? Drinks manufacturers add carbon dioxide to drinks which becomes trapped as tiny pockets of gas. These bubbles are much lighter than the drink itself, so they rise to the top and pop, making that familiar fizzing sound.

Dry ice – Some gas manufacturers make solid carbon dioxide, known as dry ice, by compressing (squeezing) and freezing liquid carbon dioxide. It is often used for music concerts, movie special effects and to create spooky bubbling cauldrons and potions in stage shows. It turns in to a foggy looking gas at room temperature and looks really cool. Check out this video to see for yourself.

TAKING IT FURTHER

Follow up activities:

- Experiment with this carbon dioxide capture investigation. Does more vinegar produce more carbon dioxide? Does twice as much bicarbonate of soda fill the balloon twice as fast?
- Research different types of fire extinguisher and where you might find them.
- Watch this video and have a go at making a bath bomb which uses some of the same ingredients and also relies on the release of carbon dioxide.
- Design a fire safety poster or have a go at making a fire safety video if you have access to a camera.

Things to think or talk about:

- How do you know that a gas is being produced when you mix bicarbonate of soda and vinegar together? Watch this video for an explanation (**remember not to put any of the ingredients in your mouth!**).
- Why do you think the candle flame is extinguished from the bottom upwards?
- Where have you seen fire extinguishers? What colour were they? Who is allowed to use them?
- Do you have a fire extinguisher at home? If so, do you know where it is kept and why?
- What rules and equipment do you have at school to help with fire safety?

Adapted from: Kitchen Concoctions