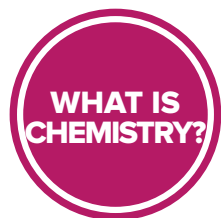


6 week STEM clubs

CHEMISTRY



Chemistry is the branch of science concerned with the substances of which matter is composed, the investigation of their properties and reactions, and the use of such reactions to form new substances



BUT WHAT DOES THAT MEAN?

Everything around us is made up of matter. This matter consists of particles (which may be molecules, atoms, or subatomic bits) that make up our own bodies and all the other things we can hold, see, smell and taste. Chemistry investigates how these individual elements of matter react and combine, or separate, to make new substances.

For example, we know there is oxygen and hydrogen in the air as diatomic, gaseous molecules. However, when they bond together, they form water which is a liquid and a very different substance to the two original separate gases. Chemistry is concerned with how, and why, reactions like this one happen.

BECOME A CHEMIST

ACTIVITY 1



Chemistry is concerned with looking at how elements react together to create new substances. We are going to do a simple experiment to explore this.

EQUIPMENT:

- Empty soda bottle (500ml)
- 2 teaspoons baking soda
- 100ml white vinegar
- Balloon
- Funnel

INSTRUCTIONS

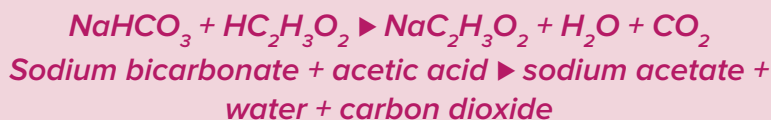
- 1** Pour the white vinegar into the empty soda bottle and put to one side
- 2** Take the balloon and stretch the opening over the narrow end of the funnel. Put 2 teaspoons of baking soda into the balloon via the funnel
- 3** Once filled, remove the balloon from the funnel and put a small twist in the balloon to retain the baking soda (in the large end of the balloon)
- 4** Carefully stretch the open end of the balloon over the open mouth of the empty soda bottle, trying to ensure that none of the baking powder escapes into the bottle
- 5** Once the balloon is securely stretched over the open bottle, lift the balloon so that all the baking soda is emptied into the bottle and then let go
- 6** The baking soda and white vinegar should now react, releasing some gas which will inflate the attached balloon. By mixing a solid and a liquid we have created a gas which has filled the balloon
- 7** You will need the gas-filled balloon for the next activity so leave it in place

ACTIVITY 2

In Activity 1, we created a gas, which filled the balloon. However, to truly understand what happened, we need to look at the substances we mixed to understand what we have created.

We started with sodium bicarbonate (baking soda) and dilute acetic acid (vinegar). Looking at their names can you guess what gas was released?

Perhaps a chemical equation for the reaction would help:



So, the balloon is filled with carbon dioxide. We can use this carbon dioxide to extinguish a flame.

EQUIPMENT:

- Tealight candle
- Plastic beaker
- Matches
- CO₂ filled balloon from activity one

INSTRUCTIONS

- 1** Place the plastic beaker on a table in a draft free area
- 2** Take the CO₂ filled balloon off the bottle top by first pinching the balloon above the bottle top to trap the gas inside
- 3** Now slowly hold the balloon end downward into the beaker and very slowly release the gas into the beaker
- 4** Light the tealight candle using the matches and then, from a distance above the flame (about 5cm), slowly pour the invisible gas out onto the candle. The candle should be extinguished

SO WHAT?

These two experiments showed how various substances can react together to create new compounds. The second experiment showed that one of the new compounds could be used for a purpose - putting out a fire.

We see CO₂ fire extinguishers everywhere. Essentially, they are cylinders full of pressurised CO₂ gas. This can be used to smother a flame by introducing a lot of CO₂ and therefore reducing the available oxygen needed by the flames to burn. Not too different from our CO₂ balloon really.

FIND OUT MORE

There are lots of options for studying Chemistry in Higher Education, you can read more about these options here: www.ucas.com/explore/subjects/chemistry. Each Chemistry course at university will have a set of entry requirements students need to meet to be accepted onto the course. To better understand what is on offer why not look at these courses, offered by the University of Liverpool, and find out the entry requirements for an A Level student, including

grades and specific subjects required.

Chemistry BSc: www.liverpool.ac.uk/study/undergraduate/courses/chemistry-bsc-hons/overview/

Medicinal Chemistry BSc: www.liverpool.ac.uk/study/undergraduate/courses/medicinal-chemistry-bsc-hons/entry-requirements/

Chemical Sciences BSc with a Foundation Year: www.liverpool.ac.uk/study/undergraduate/courses/chemical-sciences-bsc-hons-4-year-route-including-a-foundation-year-at-carmel-college/overview/

These are only a small selection of the chemistry-related courses at the University of Liverpool so why not find out more from the Department of Chemistry. www.liverpool.ac.uk/chemistry/undergraduate/our-degree-programmes/

NEED HELP?

Why not chat live to the team at Shaping Futures to find out more about what is on offer, or to get further advice and guidance www.shaping-futures.org.uk/activities