EXPERIMENT MANUAL

Ooze Labs CHEMISTRY STATION

THAMES & KOSMOS

Thames and Kosmos UK LP, 20 Stone Street, Cranbrook, Kent UK | 01580 713000 | www.thamesandkosmos.co.uk
Franckh-Kosmos Verlags-GmbH & Co. KG, Pfizerstraße 5 – 7, 70184 Stuttgart | +49 (0) 711 2191-343 | www.kosmos.de

››› SAFETY INFORMATION

WARNING. Not suitable for children under 3 years. Chocking hazard – small parts may be swallowed or inhaled. Strangulation hazard - long flexible tube may become wrapped around the neck.

Read through the instructions on this page and on pages 3 and 4 with the child that is going to be doing the experiments, follow the instructions and keep them for reference. Always carry out the experiments together with your child and supervise them when carrying out the experiments.

Keep packaging and instructions as they contain important information.

Instructions for handling experiment materials:

Glow-in-the-dark slime powder (7g powder, no. 717691), main ingredients:
locust beam gum, guar gum, silica and dye pigments

Hyper Colour slime powder (7g powder, no. 717710), main ingredients:
locust beam gum, guar gum, silica and dye pigments

Sunshine slime powder (7g powder, no. 720324), main ingredients:
locust beam gum, guar gum, silica and dye pigments

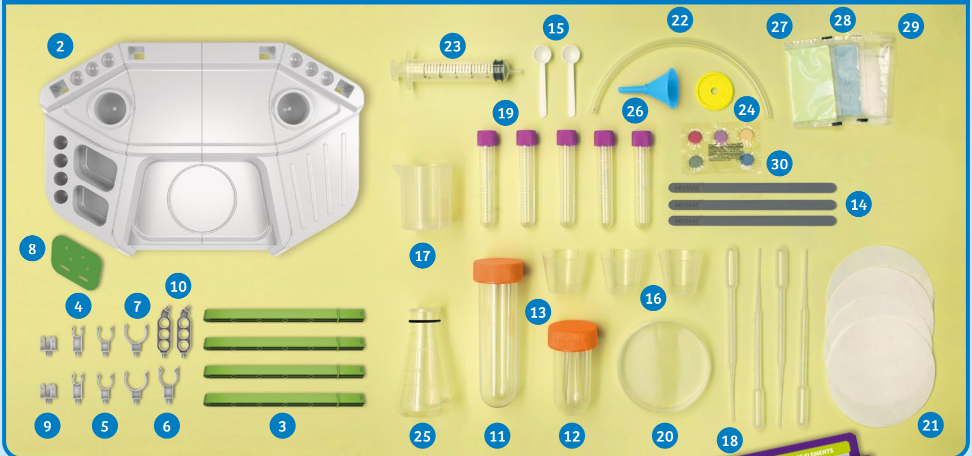
- ››› Do not ingest.
- ››› Only carry out those experiments which are listed in the instructions.
- ››› Do not place any material in the mouth and eyes.
- ››› Wash hands thoroughly after carrying out experiments.
- ››› If any substances get onto your skin by mistake, rinse them off immediately under running water.
- ››› In case of eye contact, wash out eye with plenty of water, holding eye open if necessary.
- ››› If swallowed, wash out mouth with water; drink some fresh water. Do not induce vomiting. In case of doubt, seek immediate medical advice and take the sachet (label) with you.
- ››› Keep experiment material locked away and out of reach of small children and animals.

Use the slime carefully as it sticks to various materials, such as rugs and tables. These can be cleaned using water. Wear old clothes, as the experimentation materials (for example slime powder, the finished slime, the dye tablets, dye solutions or household materials) can stain.
As we have removed any substances from the slime powder that are harmful to health, the slime will unfortunately decompose after a few days and the mixture will become watery. Please then dispose of it in the household rubbish using kitchen roll.
Dispose of empty sachets and other solid waste in the household rubbish. Pour any solutions down the drain after the experiments and rinse thoroughly.

››› CONTENTS

Good to know!
If you are missing any parts, please contact Thames & Kosmos customer service
support@thamesandkosmos.co.uk

What's in your experiment kit:



1

Checklist: Find – Inspect – Check off

✔	No.	Description	Qty	Item No.
❍	1	Set of 10 experiment cards	1	721300
❍	2	Station base	1	720432
❍	3	Vertical rod	4	720433
❍	4	16mm holder clip	2	722958
❍	5	22.5mm holder clip	2	722958
❍	6	28mm holder clip	1	722958
❍	7	38mm holder clip	2	722958
❍	8	Tool holder	1	720981
❍	9	Card holder clip	2	722958
❍	10	Test tube rack	2	722958
❍	11	Tall wide test tube	1	717120
❍	12	Short wide test tube	1	717119
❍	13	Test tube lid	2	720548
❍	14	Plastic spatula	3	722970
❍	15	Measuring spoon	2	720552
❍	16	Small measuring beaker, 30ml	3	714771
❍	17	Large measuring beaker, 80ml	1	715225
❍	18	Pipette	4	714772
❍	19	Small test tube with lid	5	720553
❍	20	Petri dish	1	723751
❍	21	Filter paper, round	4	702842
❍	22	Plastic tubing	1	720554
❍	23	Syringe	1	720555
❍	24	Disc with a 7mm hole	1	720556
❍	25	Erlenmeyer flask with rubber band	1	775462
❍	26	Funnel	1	720558

✔	No.	Description	Qty	Part No.
❍	27	Glow in the dark slime powder (7g)	1	717691
❍	28	Hyper Colour slime powder (7g)	1	717710
❍	29	Sunshine slime powder (7g)	1	720324
❍	30	Dye tablets (5)	1	039051

You will also need: *an effervescent tablet (magnesium or calcium tablet), water, scissors, a saucepan, non-permanent coloured pens, cooking oil, a spoon, plastic cups, paper towels, sugar, salt, a pencil, red cabbage, 2 jam jars, lemon juice, table vinegar, bicarbonate of soda, cornflour, a large bowl, washing up liquid, milk, cotton buds, liquids to be tested (such as cola and juice), icing sugar, tweezers, soil, sand, sugar cubes*

››› IMPORTANT INFORMATION

Dear parents,

Please lend your child a hand and assist and supervise them when experimenting. Read the instructions together before starting the experiment, and follow the safety instructions given and all the experiment steps. Keep all parts of this kit out of reach of small children. Only carry out those experiments which are listed in the instructions.

This kit has been developed for children over 8 and should be used under adult supervision. Keep the kit, the powder sachets, the finished slime or other experiment materials and household substances (such as bicarbonate of soda, table vinegar, lemon juice, effervescent tablets or washing up liquid) out of reach of children under 8 years old and animals.

This experiment kit allows your child to carry out their first simple experiments. Because children's abilities vary so much, even within age groups, supervising adults should exercise discretion as to which experiments are suitable and safe for them. The instructions enable you to assess any experiment to establish its suitability for your child.

The finished slime, the dye tablets and other household materials can stain clothes. You should therefore wear old clothing when experimenting and remove any tablecloths or rugs from the experiment area.

Find a solid, sturdy table with an easy-to-clean surface for the chemistry station. The area surrounding the experiment should be well lit, it should be kept clear of any obstructions and away from the storage of food. Lay kitchen paper out ready in case something falls over or spills. It is best to place a thin layer of kitchen paper in the tool compartment of the chemistry station to soak up any liquids that may still be contained in the pipettes.

The workspace, all the equipment used and the chemistry station should be washed immediately after you have finished experimenting. Wash hands thoroughly after the experiments. Please lay out the household materials ready before experimenting and only ever pour out the amounts required for the next experiments for your child. Otherwise store them away from the experiment area to avoid getting them mixed up. Do not put any leftovers back in the original packaging. Experiment setups that are left for a longer amount of time, for example growing crystals (experiment 18), should be labelled and set up out of reach of small children and animals. Particular attention should be paid to the safe handling of acids (e.g. lemon juice, table vinegar), bases (e.g. bicarbonate of soda solution) and hot water (see experiments 2, 7, 12-14, 16 and 19).

Wash the household items used in the experiments (e.g. the bowl) thoroughly before using them again.

The slime powder sachets should be used up (completely) during the course of one experiment. When experimenting, make sure that you don't get anything in your mouth or eyes and that your child works slowly and quietly. Do not eat or drink in the experimental area.

Have fun experimenting!

The parts that are not included in the kit are written in *italics* under the heading "you will need".

Safety rules

All of the experiments described in this manual can be performed without risk, as long as you conscientiously adhere to the advice and instructions. Read through the following information very carefully:

››› Read these instructions before use, follow them and keep them for reference. Pay particular attention to the amounts stated and the sequence of the individual work steps. Only carry out those experiments which are listed in the instructions.

››› Keep young children and animals away from the experimental area.

››› Store this experimental set and other materials / household substances out of reach of children under 8 years of age.

››› Wear old, durable clothing when experimenting and do not wear wide sleeves, scarves or shawls. Tie long hair back.

››› Clean all equipment after use. Wash your chemistry station and your worktable and dry them with kitchen paper.

››› Wash hands after carrying out experiments.

››› Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.

››› Do not eat or drink in the experimental area.

››› Do not allow slime powder, finished slime, dye tablets or household substances to come into contact with the eyes or mouth.

››› Take care while handling with hot water in the glass jam jars.

››› Always work slowly and carefully. Avoid creating powder dust or splashing or spilling liquids. Wipe splashed or spilt liquids up with kitchen paper immediately.

››› Ask your parents to fetch you the additional materials you will need (written in italics in the experiment) before experimenting and set them out ready before getting started. Let them pour out the required amounts of household substances (e.g. bicarbonate of soda, table vinegar, lemon juice, etc.) needed for the next experiments for you. Do not replace foodstuffs in original container. Dispose of immediately.

››› Disposal: throw solid waste away in the household rubbish. Pour leftover liquid down the sink and rinse thoroughly.

Now let's get started! Have fun with the experiments!

››› INTRODUCTION

Real chemistry – Real Fun

With this experiment kit, you will be able to research simple and fun chemical reactions and analyse chemicals in your chemistry station, just like a real chemist.

To do this you will first need to set up your chemistry station following the instructions on page 7.

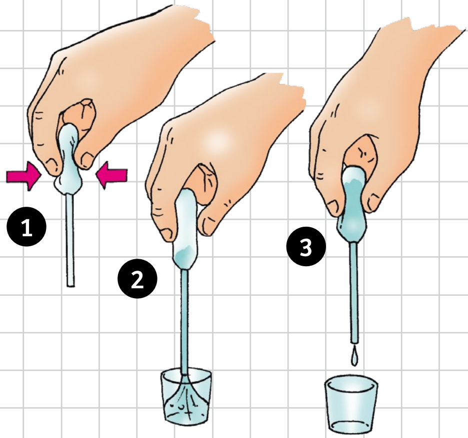
Most of the experiments will be performed in the test tubes. You will learn how to measure liquids precisely with measuring cups and how to add to them drop-by-drop with the pipette. Make your own slime and create fizzing, bubbling, colour-changing and foaming reactions. Learn how to grow crystals, filter mixtures and carry out chemical analyses. You will also be able to make a whole host of interesting observations during these processes.

Some of the materials are not included in the experiment kit, since they can be easily found in your house (see page 2). For those materials, the kit provides plastic containers with a spoon built into the lid. The experiments will tell you what to put into these containers, which should then be labelled in accordance with their contents. In a laboratory it is always important to label everything accurately. Take your samples from the container and never from the original package. After finishing an experiment, do not pour leftovers back into the container.

A chemistry lab has rules that any young researcher should also know about. They are important even though the experiments in this manual are not dangerous.

How to use the pipette

1. Squeeze the upper part of the pipette between your thumb and index finger and dip pipette tip into the liquid.
2. As soon as you release the pressure, the liquid will rise up the pipette.
3. By squeezing carefully, you can make the liquid drip slowly out again.



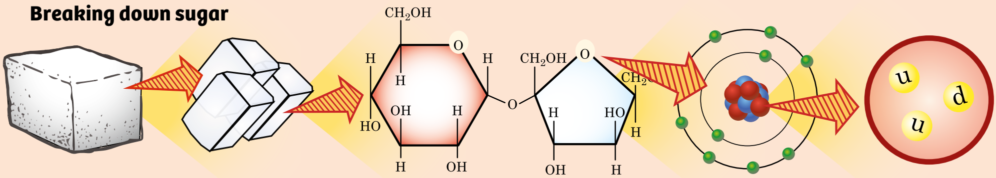
How to use the dye tablets

The dye tablets are used for many experiments. You only need to use small pieces of each tablet rather than the whole tablet. Break the tablets into small pieces. Use this diagram to determine the dye colour of each tablet.

Your Erlenmeyer flask

There is a safety rubber on your piston attached. This ensures that you your piston with the matching retaining clip to your station, even if it is filled with liquid. Do not hang up without the rubber!

Breaking down sugar



Sugar cube Sugar crystal Sucrose molecule Oxygen atom Proton

What is chemistry?

A dictionary would tell you that chemistry is the science of the composition, properties, structure and reactions of matter. But what does that really mean? It means that chemistry is the organised study of all materials – what they are made of, how they are put together, how they come apart, why they behave like they do, and why they are the way they are..

Everything – all the matter in the universe – is a chemical or is made of chemicals that can be studied in chemistry. That sounds like a lot, doesn't it? So how do the scientists who study chemistry, called chemists, keep it all straight? Well, they break things down into smaller and smaller categories and organise them by their properties.

Take sugar for example. Regular table sugar is a material called sucrose. Sucrose is actually made of three other materials that you've probably heard of: hydrogen, carbon and oxygen. They are called elements and are categorised by their properties.

The smallest unit of an element is called an atom. An element consists of one atom or multiple atoms that are all exactly the same. You can't break an atom down any further without changing its properties. But atoms can be broken down into smaller components that do have different properties from each other: protons, neutrons and electrons.

However, all protons in the world are the same as each other, as are neutrons and electrons, no matter what atom they're a part of. It's as if you built houses out of blocks: blue, green and red. Towns with one house or many of the same houses represent elements, individual houses represent atoms. The blue, green and red bricks stand for the protons, neutrons and electrons.

At this time there are only about 118 known elements. So everything you see is made of only these 118 elements. In fact, about 20 of these elements are not found naturally on Earth and have only been made artificially in a lab, so we're talking less than 100 different building blocks for everything on Earth!

How do so few parts come together to make so many different things, that interact in so many different ways? Answering this question is what chemistry is all about.

This kit lets kids experience the fascination of chemistry with 20 fun, hands-on experiments, covering a wide variety of chemistry topics.

Let's get started! You will be amazed at the things to be discovered in the word of chemistry!

And we wish you lots of fun with all your discoveries!

››› INTRODUCTION

Lab Station Assembly

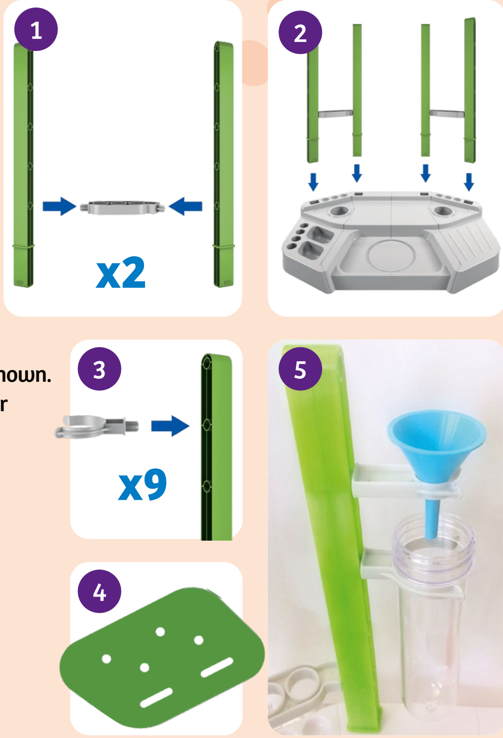
Before starting any experiments, follow these instructions to put your lab station together.

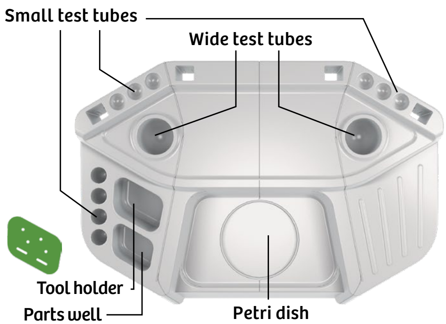
YOU WILL NEED

› **17 pieces of the lab station**

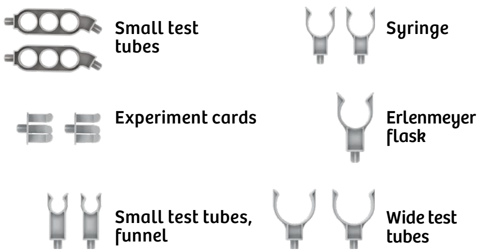
HERE'S HOW

1. Insert a test tube rack into two vertical rods, as shown. Repeat with the other test tube rack and the other two vertical rods..
2. Insert the four vertical rods into the station base as shown.
3. Insert all nine of the clips into the vertical rods. They are all moveable and can be repositioned for experiments as needed.
4. Insert the tool holder onto the tool holder compartment on the left side of the station.
5. Always use the funnel as shown in the picture.





Here's what each part is designed to hold:



START WITH THE CARDS!

Experiments 1 to 9 are on the experiment cards. You should start with experiment 1 and conduct the experiments in numerical order. Experiments 10 to 20 are in this manual.

EXPERIMENT 10

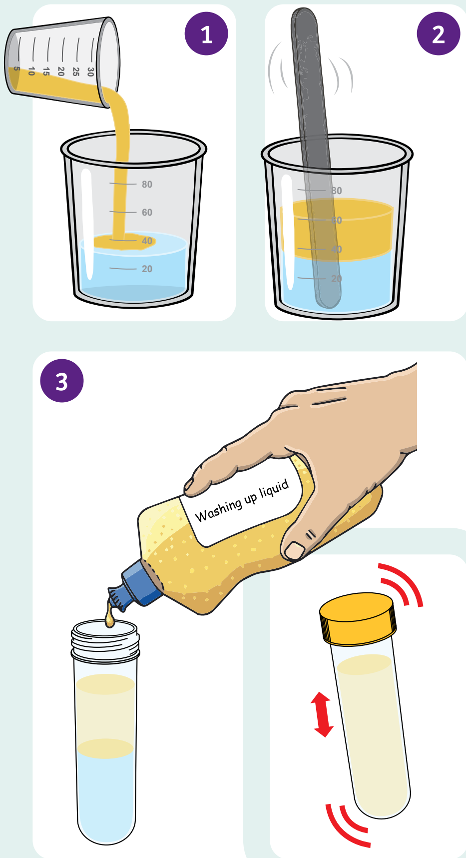
Oil and Water

YOU WILL NEED

› **Small measuring cup, large measuring cup, plastic spatula, tall wide test tube with lid (optional)**
› *Olive oil or vegetable oil, water, washing up liquid*

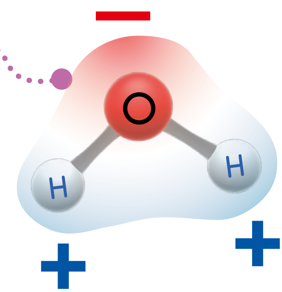
HERE'S HOW

1. Use the small measuring cup to measure out 30 ml of water. Pour it into the large measuring cup. Then measure out 30 ml of oil and pour it into the large measuring cup. What do you notice about how the oil and water interact?
2. Use the plastic spatula to mix the oil and the water together. Pour the mixture into the tall wide test tube, screw the lid on and shake it vigorously. Then let the liquid sit for 30 minutes. Observe what happens to the oil and water.
3. Open the test tube and add a few drops of washing up liquid to the water and oil mixture. Screw the lid onto the test tube again and shake the contents until the water and oil appear to be mixed. What do you observe happening to the oil and water now?



WHAT'S HAPPENING?

Oil and water do not mix because water molecules are **polar** while oil molecules are **nonpolar**. Polar means that one side of the molecule has a slight positive charge, while the other has a slight negative charge. Water is polar because the oxygen atom is much larger than the hydrogen atom, and pulls the negative electrons towards itself. This influences the way water interacts with other molecules.



Unlike water, oils are non-polar. This is because oils have long chains of carbons and hydrogens which don't have differently charged ends like water.

The oil and the water are able to stay mixed when you add the washing up liquid, because the washing up liquid acts as an emulsifier. An emulsifier makes it so that the water and oil are able to mix on a molecular level. This ability of washing up liquid is what allows it to dissolve oily dirt particles, like greasy food residue stuck on a dish, in water so that they can be washed away.

EXPERIMENT 11

Mooooving colours

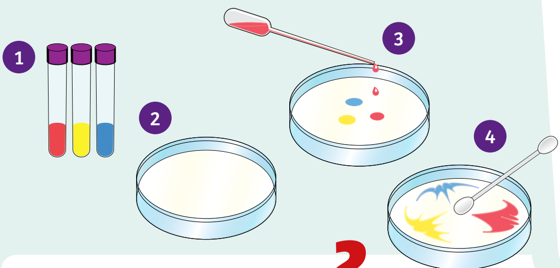
YOU WILL NEED

› Small test tubes with lids, dye tablets broken into eighths, chemistry station, large measuring cup, Petri dish, pipettee

› *Milk, a cotton bud, washing up liquid*

HERE'S HOW

1. Fill the 3 small test tubes with 4 ml of water and add about an eighth of the red dye tablet to the first test tube. Screw the lid on the test tube. Shake it to mix the water and dye tablet. Repeat this step with using the yellow and blue dye tablets in the other two test tubes.
2. Place the bottom of the Petri dish on the base of the chemistry station. Use the large measuring cup to measure out 25 ml of milk. Pour it into the base of the Petri dish.
3. Use the pipette to add a few drops of the red, blue and yellow dye solutions in the centre of the Petri dish.
4. Place the cotton wool bud into the washing up liquid. Then dip it into the middle of the Petri dish. What do you observe happens to the dye solutions when the cotton wool bud touches the milk?



WHAT'S HAPPENING?

Like the washing up liquid mixture in experiment 10, milk is an emulsion containing water, fat molecules and proteins. Different parts of the washing up liquid molecules are attracted to the different molecules that are in the milk so the washing up liquid is able to move quickly through the milk. As they move, the washing up liquid molecules pull the dye coloured solutions through the milk.

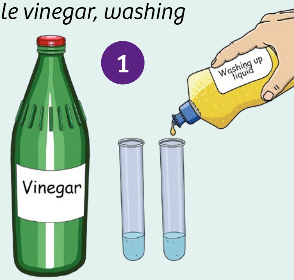
EXPERIMENT 12

Chemical foaming

YOU WILL NEED

› 2 small test tubes, chemistry station, measuring spoon

› *Bicarbonate of soda, table vinegar, washing up liquid, water*



HERE'S HOW

1. Fill both test tubes with water to a height of one centimetre in the tube. Then add half a centimetre of vinegar to each tube. Finally add five drops of washing up liquid to one of the two test tubes.
2. Add one scoop of baking powder to each test tube and watch how the foam behaves.

WHAT'S HAPPENING?

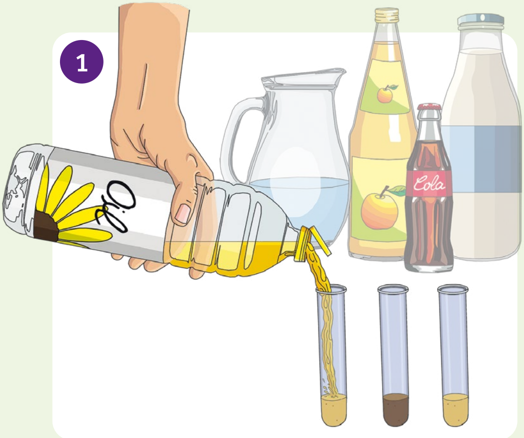
In both test tubes the solution foams up vigorously because the vinegar is an acid and the bicarbonate of soda is a base. The foam quickly falls back down again in the tube without the washing up liquid, but the foam remains stable for a longer period of time in the tube with the washing up liquid. This stability is caused by the washing up liquid which surrounds the bubbles with a protective layer. The bubbles that resulted from the reaction don't contain normal air, but rather carbon dioxide, which is produced during the reaction.

EXPERIMENT 13

Acid detective

When bicarbonate of soda (sodium hydrogen carbonate) reacts with acids, carbon dioxide is produced (the same gas that you know from the previous experiment). You can see this reaction in the bubbles that appear in the liquid.

You can now examine various liquids and test to see if they produce a bubbling acid reaction when bicarbonate of soda is added.



YOU WILL NEED

› **3 small test tubes, chemistry station, measuring spoon**
› *Bicarbonate of soda, test liquids (cola, iced tea, cooking oil, milk, lemonade, apple juice, fizzy drinks or other liquids found in the fridge)*

HERE'S HOW

1. Fill a test tube with one of your test liquids to a height of two centimetres and label it accordingly using a water-soluble pen.
2. With some liquids, you will observe that they are already bubbling or fizzing. To make sure that you do not confuse this bubbling with a reaction to the bicarbonate of soda, stir these fluids with the measuring spoon until no more bubbles can be seen. Then add a small spoonful of bicarbonate of soda to the liquid and observe whether it bubbles or not.

WHAT'S HAPPENING ?

In an acidic liquid, bicarbonate of soda causes bubbles to form. In non-acidic liquids, it does not cause bubbles to form. From this you can identify which liquids are acidic and which are not. The process of using tools and methods to separate, identify and quantify materials is called chemical analysis.

Test liquid	Cola	Iced tea	Lemonade	Fizzy drink	Milk	Cooking oil	
Is it an acid?							

EXPERIMENT 14

Powder detective

In this experiment, you can test for two properties of materials (solubility in water and gas production with an acid) and learn how you can use these properties to distinguish three identical-looking white powders.

YOU WILL NEED

- **3 measuring cups, 3 small test tubes, chemistry station, measuring spoon**
- *Teaspoon, icing sugar, cornflour, bicarbonate of soda, water, table vinegar*

HERE'S HOW

1. Have someone else put a teaspoon of icing sugar in one cup, a teaspoon of cornflour in another cup and a teaspoon of bicarbonate of soda in a third cup so that you don't know which substance is in which cup.

A. Water solubility test

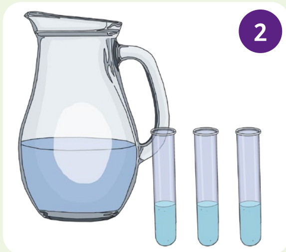
2. Fill the three test tubes with water to height of three centimetres. Place them in the chemistry station rack.

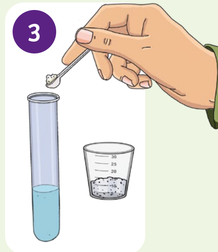
3. To each test tube add one spoonful of one of the three while powders, making sure you put a different powder into each tube. Stir each test tube. Observe how the different white powders behave in the water.

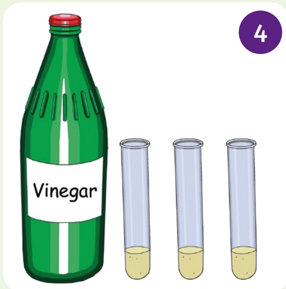
B. Gas production with an acid test

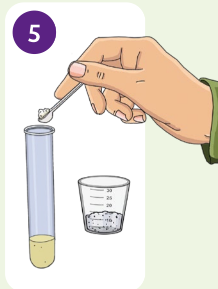
4. Fill the three test tubes with vinegar to a height of one centimetre. Place them in the chemistry station rack.

5. To each test tube, add one spoonful of one of the three white powders, making sure you put a different powder in each tube. Stir. Observe how the different white powders behave in the vinegar.









WHAT'S HAPPENING ?

A. The icing sugar and bicarbonate of soda dissolve in water, and so nothing can be seen. The cornflour forms small lumps in the water and then creates a cloudy mixture as soon as you stir it. Now you can identify the cornflour. The cornflour particles are much larger than the sugar and bicarbonate of soda particles, so they do not dissolve.

B. In the test tubes with the icing sugar and the cornflour, you will not observe a bubbling reaction. However, the bicarbonate of soda reacts with the vinegar to form carbon dioxide bubbles. Now you can identify the bicarbonate of soda. And through the process of elimination, you know the third chemical substance must be the icing sugar.
You have identified all three substances without needing to taste them!

EXPERIMENT 15

Sugar magic

If you add a lump of sugar to a glass of water, it will soon dissolve and "disappear". In this experiment, you are able to see what happens to the sugar.

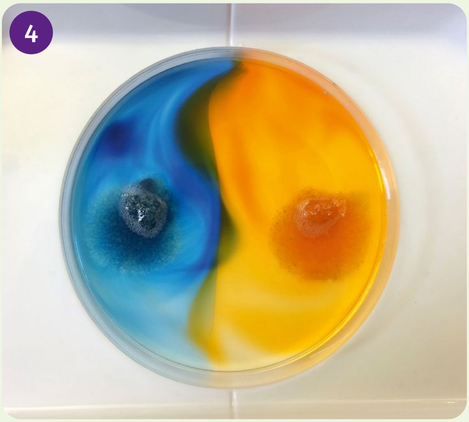
YOU WILL NEED

› **Petri dish, chemistry station, pipettes, 2 small test tubes, dye tablets, plastic spatula**

› *2 sugar cubes, water*

HERE'S HOW

1. Place the two test tubes in the chemistry station and fill them with water to a height of two centimetres. Add a small piece of a dye tablet to one test tube and a piece of a different coloured tablet to the other. Stir using the plastic spatula until it has all dissolved.
2. Place the two sugar cubes in the lid of the Petri dish. Use the pipette to put a few drops of one of the coloured dye solutions on one of the sugar cubes and a few drops of the second colour solution on the other sugar cube. Do not use too much liquid, otherwise the sugar cubes will dissolve.



3. Place the bottom of the Petri dish in the chemistry station and fill it with water until the bottom is covered. Do not pour too much water in!
4. Now carefully place one of the coloured sugar cubes on the left-hand side of the Petri dish in the water and the other cube on the other side.

WHAT'S HAPPENING ?

The sugar cubes dissolve in the water. The dissolved sugar is distributed in the water and absorbs the colour. At the start, the colour can only be seen near the sugar cube, because the sugar concentration is much higher here than at the points further away from the cubes. In the event of such an imbalance, there is always the natural desire to balance it out. The sugar therefore migrates in the water until it is uniformly distributed. You can see this from the colours.

EXPERIMENT 16

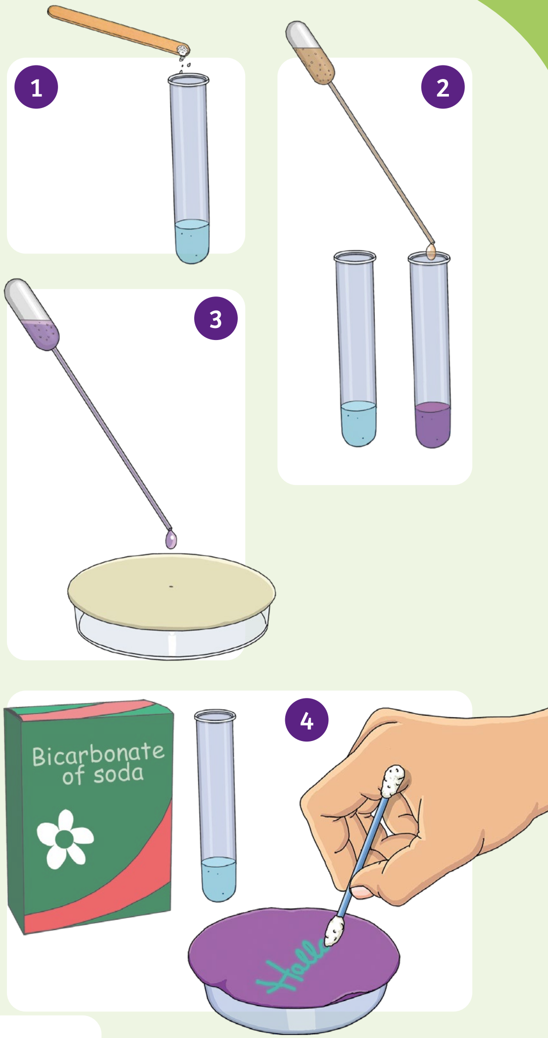
Invisible ink

YOU WILL NEED

› **2 small test tubes, chemistry station, plastic spatula, filter paper, Petri dish, pipette, measuring spoon**
› *Bicarbonate of soda, water, red cabbage juice (from experiment 7), table vinegar, a cotton bud*

HERE'S HOW

1. Fill a small test tube half full with water and add a small spoonful of bicarbonate of soda.
2. Fill a second test tube with cabbage juice to a height of two centimetres. Add a few drops of vinegar.
3. Place the filter paper on the Petri dish. With the pipette drip the red cabbage and vinegar mixture onto the paper until it is completely coloured. Then wait until has dried. This may take a whole day.
4. Dip one end of the cotton bud in the bicarbonate of soda solution. Use the wet end of the cotton bud to write or draw on the dry coloured filter paper. Observe what happens.



WHAT'S HAPPENING ?

When you write with the bicarbonate of soda solution on the cabbage juice-soaked filter paper, the writing will appear greenish even though the solution is actually colourless. As you already know, cabbage juice is an indicator and can indicate whether something is acidic or basic. Because of the bicarbonate of soda, the water applied to the filter paper is basic and so it discolours the indicator.

EXPERIMENT 17

Salty and sweet solutions

YOU WILL NEED

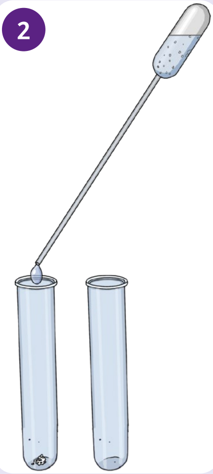
- **2 small test tubes, chemistry station, pipette, measuring spoon**
- *Water, sugar, table salt*

HOW TO

1. At first glance, sugar and salt look pretty similar - take a closer look at them. Can you notice any differences?
2. Set two clean test tubes in the test tube rack on your lab station. Place a measuring spoon of sugar to one of the test tubes. Then use the pipette to add some water. Count the exact number of drops you have added. Observe what happens to the sugar. Swirl the test tube from time to time when you add the water. How many droplets do you have to add before you can no longer see the sugar?
3. Perform the same experiment with the salt. What difference do you notice? When salt and sugar have become invisible, does that mean they have disappeared? Also investigate whether you can dissolve more or less sugar in warm water.

1

2



NOTE:

If you dissolve so much salt (or sugar) in water that some remains undissolved at the bottom of the container, meaning that the solution cannot absorb any more you might say that it is "full". When a solution cannot dissolve any more of a substance, it is called a "saturated solution" by chemists.

WHAT'S HAPPENING ?

The solubility of various substances in water depends on their composition. Salt and sugar, for example, are built out of different building blocks, so they also behave differently when you dissolve them. Neither of them will actually disappear though. As a rule, most substances, such as household sugar, dissolve more quickly and in greater quantities in hot water than in cold water. Table salt, however, is an exception. Its solubility depends hardly at all on temperature.

EXPERIMENT 18

Growing salt crystals

If you study salt and sugar under a microscope, you will see little cube shaped crystals (salt) or crystals with slanted edges (sugar). With a little patience and care, you will be able to make larger salt crystals that are particularly beautiful.

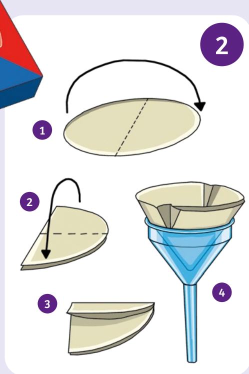
YOU WILL NEED

› **Large measuring cup, filter paper, funnel, wide test tube, chemistry station, Petri dish with lid, measuring spoon**

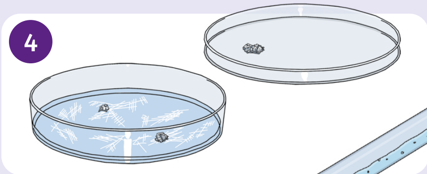
› *Tweezers, water, salt (ideally rock salt, pure sea salt or dishwasher salt)*

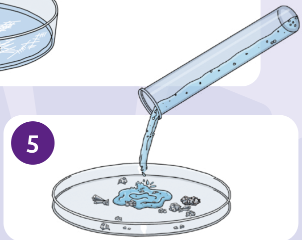
HERE'S HOW

1. Fill the large measuring cup with about 25ml of water. While stirring, dissolve so much salt in it that some remains undissolved, on the bottom of the cup.
2. Assemble a filter out of the filter paper (see experiment 20 for this).
3. Filter the salt solution into the wide test tube, as shown in the picture. Then fill the Petri dish halfway with the filtrate. Set the dish in a quiet place and cover it with a piece of filter paper.
4. After one or two days, crystals will separate out of the solution and accumulate on the bottom of the dish. To make larger crystals, remove the prettiest ones with the tweezers and place them in the lid of the Petri dish. Filter the remaining solution again through a filter into a test tube.
5. Add this solution to the large crystals in the Petri dish lid. Set the lid in a quiet place again. This way, you will eventually get big, beautiful crystals.
6. Dispose of any residues in the household rubbish.



Filtrate is the name for the filtered liquid.





WHAT'S HAPPENING ?

If water evaporates out of a saturated salt solution, the solution will end up with an excess of salt. That gradually results in the formation of little cube-shaped salt crystals. If you regularly remove the smaller crystals and keep using only the bigger ones, you can grow beautiful crystals.

Titration

YOU WILL NEED

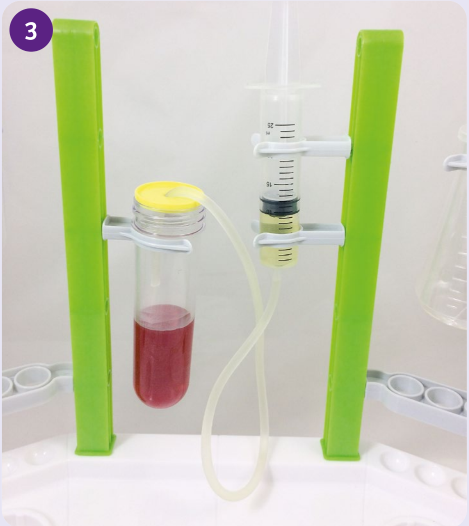
› **Wide test tube, chemistry station, yellow disc with a 7mm hole, plastic tubing, syringe, large measuring cup, small measuring cup**
› *Lemon juice, the red cabbage indicator from experiment 7*

HERE'S HOW

1. Position the wide test tube in the chemistry station with a holder so that you can see it easily. Use the small measuring cup to pour 30 ml of the red cabbage indicator (from experiment 7) into the test tube. Place the yellow disc with the hole on top of the test tube.

2. Pour lemon juice into the large measuring cup and draw up exactly 10 ml using the syringe. Push the tube onto the tip of the syringe and fasten the syringe to the chemistry station using the two suitable holders. Insert the other end of the tube into the hole in the yellow disc on the test tube. Make sure that the tube does not touch the red cabbage indicator.

3. Now push the piston of the syringe downwards really slowly and watch the end of the tube. As soon as the lemon juice starts slowly dripping out, wait a moment. See whether the red cabbage indicator changes. If it doesn't, push a little bit more lemon juice out of the syringe. Repeat this until you notice a change in the red cabbage indicator. As soon as the colour of the indicator changes, do not let any more lemon juice leave the syringe. You can use the scale on the syringe to read off how much lemon juice has been poured into the indicator liquid.


3

WHAT'S HAPPENING?

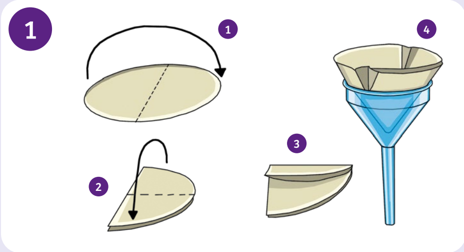
In experiment 7, you have already learnt a little bit about indicators. You know that the red cabbage juice contains pigments that are red in an acidic solution, pink in a neutral solution and blue and green in a basic solution. Since lemon juice is an acid, the red cabbage indicator in the test tube turns red as soon as enough acid has been added. Using the syringe, you can measure out the exact amount of lemon juice you need for the colour to change. Chemists call this method titration. We use titration to be able to find out the exact concentration of a solution.

EXPERIMENT 20

Separating the mixtures

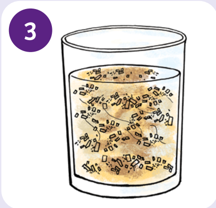
YOU WILL NEED

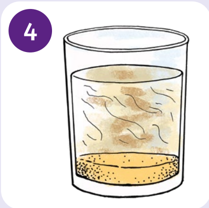
› **Funnel, filter paper, wide test tube, chemistry station, large measuring cup, measuring spoon**
› *Water, soil, sand*



HERE'S HOW

1. Fold the filter paper in the middle and then fold the semicircle you are left with once again. You will be left with a small cone. Place the filter cone in the funnel and wet it with a splash of water so it sticks to the side walls of the funnel better.
2. Place the wide test tube in the chemistry station. Place the funnel above the test tube using a second, smaller holder, as shown in the picture.
3. Pour 50 ml of water into the large measuring beaker and add some soil and sand. Mix the soil and sand with the water using the spoon.
4. Leave the mixture to stand for a few minutes and watch it.
5. Pour the dirty water into the funnel containing the filter paper. What can you see?





6. Leave the test tube to stand until the filter paper has dried. Check the contents of the filter paper. What can you see?

WHAT'S HAPPENING?

This experiment shows how you can physically separate mixtures. The sand is firstly deposited at the bottom of the beaker as it is heavier than water. We call this "sedimentation". You have then separated the soil and sand particles from the water by means of filtration. The filter paper contains small holes that do not allow any large pieces through. However, the much smaller water molecules easily flow through the filter. The filter paper is not perfect, and therefore a few small particles can in fact pass through the filter. Filtration is used in coffee machines. The coffee filter stops coarse coffee powder reaching the coffee cup, but allows the water-coffee solution to pass through.

Kosmos Quality and Safety

More than one hundred years of expertise in publishing science kits stand behind every product that bears the KOSMOS name. KOSMOS experiment kits are designed by an experienced team of specialists and tested with the utmost care during development and production. With regard to product safety, these experiment kits follow European and US safety standards, as well as our own refined proprietary safety guidelines. By working closely with our manufacturing partners and safety testing labs, we are able to control all stages of production. While the majority of our products are made in Germany, all of our products are, regardless of origin, follow the same rigid quality standards.

2nd edition 2020
0721299 AN 29112020-GB

Project management: Bettina Eick
Technical product development: Björn Stolpmann
Text: Ted McGuire; Camille Duhamel
Product design: Manuel Aydt, crosscreative designstudios, Pforzheim
Further editing: Pamela Evans, Emma Hanlon, Amie Prebble

Instructions design concept: Atelier Bea Klenk, Berlin
Packaging design concept: Peter Schmidt Group GmbH, Hamburg
Packaging layout: Matthias Horn, Sloedesign, Stuttgart
Instructions and card layout: Dan Freitas; Michael Schlegel, Würzburg
Renderings chemistry station for material photo and p.7: Liwia Ostrowska
Illustrations: Tanja Donner

Photos: card 1 (glowstick) DuncanL, card 2 (ring) Thames & Kosmos, card 3 (flask) FotografiaBasica, card 3 (ice) edfuentesg, card 3 (steam) eyewave, card 4 (lava lamp) patrickomelette, card 4 (small small bubbles) klerik78, card 5 (pens) Floortje, page 2 (contents). Thames & Kosmos, all the above © iStockphoto.com; card 7 (pH test strips) Sabine, card 7 (test tubes) ottoheuer, card 7 (person) Lucky Dragon, card 9 (hands) Black Beard, page 14 (salt) Unclesam, all the above © Fotolia.com; card 2 (aquarium) Mirko Rosenau, card 4 (bread) knowlesgallery, card 5 (Chromatographie) ggw, card 5 (DNA) science photo, card 6 (rainbow) Tom, (all the above © AdobeStock.com); card 2 (LCD) Chris Rongione, CC-BY-SA 2.0, Flickr.com

Printed in Taiwan / Imprimé en Taiwan

Item No: 721299