Ooze Labs CHEMISTRY STATION

Please observe the safety information, first aid information, information about hazardous substances, and poison control information on the inside front cover; the advice for supervising adults on page 3; and the safety rules on page 4.

WARNING. Not suitable for children under 6 years. For use under adult supervision. Read the instructions before use, follow them and keep them for reference.

WARNING — Chemistry Set. This set contains chemicals and/or parts that may be harmful if misused. Read cautions on individual containers and in manual carefully. Not to be used by children except under adult supervision.

THAMES & KOSMOS

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Thames & Kosmos, 89 Ship St., Providence, RI, 02903, USA | 1-800-587-2872 | www.thamesandkosmos.com

Safety Information

- ››› **WARNING.** Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.
- ››› Keep the packaging and instructions as they contain important information.

Poison Control Centers (United States)

In case of emergency, your nearest poison control center can be reached everywhere in the United States by dialing the number:

1-800-222-1222

First Aid Information

- ››› In case of eye contact: Wash out eye with plenty of water, holding eye open. Seek immediate medical advice.
- ››› If swallowed: Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
- ››› In case of inhalation: Remove person to fresh air.
- ››› In case of skin contact and burns: Wash affected area with plenty of water for at least 10 minutes.
- ››› In case of cuts: Do not touch or rinse with water. Do not apply any ointments, powders, or the like. Dress the wound with a clean, dry first-aid bandage. Foreign objects (e.g. glass splinters) should only be removed by a doctor. Seek the medical advice if you feel a sharp or throbbing pain.
- ››› In case of doubt, seek medical advice without delay. Take the chemical and/or product together with the container with you. For household substances, take the retail packaging with you.
- ››› In case of injury always seek medical advice.

Information about Hazardous Substances

None of the substances in this kit are classified as hazardous substances in the quantities included and the applications presented in this kit. However, you must read these safety instructions before use, follow them, and keep them for reference.

WARNING. The following applies to all chemicals:
- Do not ingest.
- Wash hands thoroughly after handling.
- Use only as instructed. Read cautions in this manual carefully.
- Store locked up. Keep out of reach of children. This primarily applies to young children, but also to older children who — unlike the experimenter — have not been appropriately instructed by adults.

The following applies to all powdered chemicals:
- Do not get in eyes, on skin, or on clothing.
- Avoid breathing dust.

Also follow this precautionary statement:
- IF SWALLOWED: Get immediate medical advice/attention and have product container or label of chemical substance at hand.

Here is information specific to each chemical in this kit:

Glow-in-the-dark slime powder
- Ingredients: Locust bean gum, guar gum, silica, sodium phosphate, sodium benzoate, glow-in-the-dark color pigment

Color-changing putty powder
- Ingredients: Locust bean gum, guar gum, silica, sodium phosphate, hypercolor dye, sodium benzoate, color pigment

Acid powder
- Ingredients: Citric acid

Base powder
- Ingredients: Sodium hydrogen carbonate (Sodium bicarbonate)

Fizzing reaction tablets
- Ingredients: Sodium hydrogen carbonate, citric acid, mannitol (E421), mineral oil, polyethylene glycol, sodium benzoate (E211), color dye
- Do not get in eyes.
- The tablets generate carbon dioxide gas upon contact with water. The reacting substances are sodium hydrogen carbonate and citric acid.

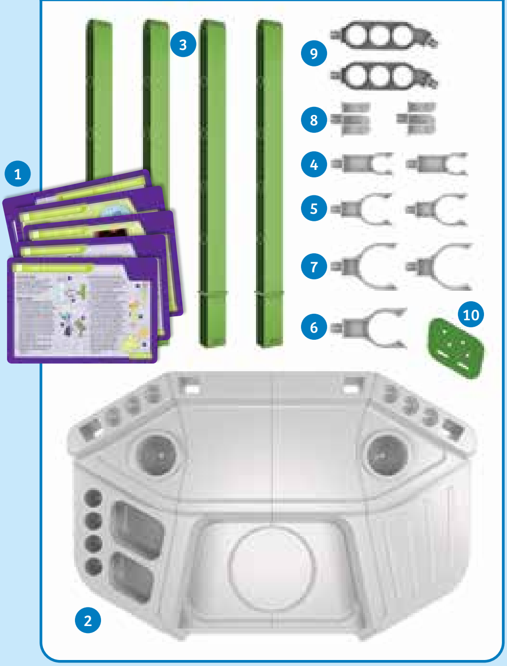
How to dispose of waste
Leftover chemicals can be poured down the drain with plenty of water. Please dispose of leftover solids in the household garbage.

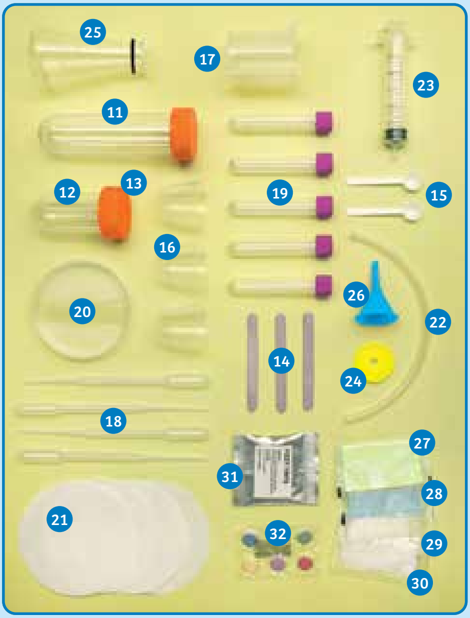
››› TABLE OF CONTENTS

››› KIT CONTENTS

> **Good to know!** If you are missing any parts, please contact Thames & Kosmos customer service.

What's inside your experiment kit:





Checklist: Find – Inspect – Check off

✔	No.	Description	Qty.	Item No.
❍	1	Set of 10 experiment cards	1	720990
❍	2	Station base	1	720432
❍	3	Vertical rod	4	720433
❍	4	16-mm holder clip (720553)	2	
❍	5	22.5-mm holder clip (720555)	2	
❍	6	28-mm holder clip (720557)	1	722958
❍	7	38-mm holder clip (717119)	2	
❍	8	Card holder clip (720989)	2	
❍	9	Test tube rack (720553)	2	
❍	10	Tool holder	1	720981
❍	11	Tall wide test tube	1	717120
❍	12	Short wide test tube	1	717119
❍	13	Lids for wide test tubes	2	720548
❍	14	Spatula	3	722970
❍	15	Measuring spoon	2	720552
❍	16	Small measuring cup, 30 ml	3	714771
❍	17	Large measuring cup, 80 ml	1	715225
❍	18	Pipette	4	714772
❍	19	Small test tube with lid	5	720553
❍	20	Petri dish	1	715232
❍	21	Filter paper, round	4	702842
❍	22	Plastic tubing	1	720554
❍	23	Syringe	1	720555
❍	24	Disk with 7-mm hole	1	720556
❍	25	Erlenmeyer flask w/ rubber ring	1	720557
❍	26	Funnel	1	720558
❍	27	Glow-in-the-dark slime powder (7 g / 0.24 oz)	1	717691
❍	28	Thermocolor slime powder (7 g / 0.24 oz)	1	717710
❍	29	Citric acid powder (5 g / 0.17 oz)	1	719167
❍	30	Sodium hydrogen carbonate powder (5 g / 0.17 oz)	1	719166
❍	31	Fizzing reaction tablets (3)	1	719169
❍	32	Dye tablets (5)	1	039051

You will also need: *Water, scissors, cooking pot, non-permanent colored markers, tape, cooking oil, spoon, plastic cups, paper towels, sugar, salt, pencil, red cabbage, jelly jar, lemon juice, vinegar, baking soda, corn starch, large bowl, liquid dish detergent, milk, cotton swabs, liquids to test (like cola and juice), powdered sugar, balloon, plastic water bottle, magnifying lens, tweezers, tealight candle, saucer, matches, soil, sand*

››› SAFETY INFORMATION

Advice for Supervising Adults

With this experiment kit, you will be accompanying your child on an introductory exploration of the fascinating world of chemistry. Please support your child in his or her first chemical experiments and help him or her with both advice and in physically performing experimental steps when help is needed.

Please read and follow these instructions as well as the safety rules, the first aid information, and the information regarding the handling of plaster and household chemicals and their environmentally sound disposal. Please keep this information for reference.

A. This chemical toy is not suitable for children under 6 years. For use under adult supervision. Keep this chemical toy set out of reach of children under 6 years old.

B. Read and follow these instructions, the safety rules and the first aid information and keep them for reference.

C. Incorrect use of chemicals can cause injury and damage to health. Only carry out those activities which are listed in the instructions.

D. Because children's abilities vary so much, even within age groups, supervising adults should exercise discretion as to which activities are suitable and safe for them. The instructions enable supervisors to assess any activity to establish its suitability for a particular child.

E. The supervising adult should discuss the warnings, safety information and the possible hazards with the child or children before commencing the activities. Particular attention should be paid to the safe handling of alkalies, acids and flammable liquids.

F. The area surrounding the activity should be kept clear of any obstructions and away from the storage of food. It should be well lit and ventilated and close to a water supply. A solid table with a heat resistant top should be provided.

G. The working area should be cleaned immediately after carrying out the activity.

Emphasize to your child the importance of following all instructions and warnings, and the importance of carrying out only those experiments that are described in this manual. Inform your child, but do not frighten him or her — there's no need for that.

››› Devote special care to information about the safe handling of acids (such as lemon juice and household vinegar) and bases (such as solutions of baking soda or detergents) and to experimenting with open flame and hot liquids.

››› A dedicated "laboratory" room will not be necessary for these simple experiments. A sturdy table with a washable, heat-resistant surface is good enough. It should be well lit and ventilated, equipped with a nearby water tap, and not too close to any stored foods. The surroundings should be free of all obstacles. Always get any required equipment and chemicals ready before beginning an experiment. Your child should wear old clothes (or an old smock). After completing the experiments, he or she should pick up and clean the work area and thoroughly wash his or her hands.

››› Be careful not to let the chemicals get into the hands of young children.

››› Always take appropriate precautions when experimenting with open flame! Always place the tealight candle on a fire-resistant surface, such as an old saucer. Make sure that there are no flammable materials near the experiment location, such as curtains, tablecloths, or carpets.

››› Your child should not wear loose sleeves, a shawl, or a scarf while experimenting, and long hair should be tied back. Never let candles burn unsupervised, and don't forget to extinguish them after an experiment. Keep a bucket or box of sand ready in case of emergencies.

We hope you and your child have a lot of fun doing these experiments!

Any materials not included in the kit are marked *in italics* under the "You will need" headings.

Safety Rules

The first thing a lab researcher does is get an overview of what he or she will be doing. 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. Think about everything that you will need. Always pay attention to the safety notes that accompany an experiment.

1. Read these instructions before use, follow them and keep them for reference.

2. Keep younger children under the specified age limit and animals away from the activity area.

3. Store chemical toys out of reach of young children.

4. Wash hands after carrying out activities.

5. Clean all equipment after use.

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

7. Do not eat, drink or smoke in the activity area.

8. Make sure that all containers are fully closed and properly stored after use.

9. Ensure that all empty containers are disposed of properly.

10. Do not allow chemicals to come into contact with the eyes or mouth.

11. Do not replace foodstuffs in original container. Dispose of immediately.

12. Do not apply any substances or solutions to the body.

13. Store this experimental set and the additional materials out of reach of children under 6 years of age, e.g. in a cabinet that can be locked.

14. Carefully prepare your work area for the experiments. Clear off the table and gather everything you will need.

15. Always leave your work area in clean condition. Always pay attention to proper disposal of any residues.

16. Always work slowly and carefully. Do not stir up plaster dust and do not squirt or spill any solutions. If you get something in your eye by mistake, such as a squirt of lemon juice or vinegar, rinse out your eye with plenty of water. Have an adult help you.

17. When experimenting, wear old clothes that can take a little abuse, or wear something over your clothes (such as an apron or old shirt).

18. Take care while handling with hot water or hot solutions. Store solutions out of the reach of small children (under 6 years of age).

19. When experimenting with candles, always take the necessary fire precautions. Always place the candle on a fire-resistant surface, such as a saucer. Never allow candles to burn unattended, and always extinguish them after the experiment.

20. Pay special attention to the quantity specifications and the sequence of the individual steps. Only perform experiments that are described in this instruction manual.

21. Do not use any eating, drinking, or other kitchen utensils for your experiments. Any containers or equipment used in your experiments should not be used in the kitchen afterward.

22. Immediately wipe up any spills with a paper towel to avoid leaving any stains.

23. If chemicals should come in contact with eyes, mouth, or skin, follow the first aid advice (inside front cover of this manual) and contact a doctor if necessary.

24. Handle additionally required items made of glass carefully. Do not use broken test tubes or glassware. Throw away broken test tubes and glassware.

If you have any questions about the experiments, your parents or older siblings will be able to help you.

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

Real Chemistry and Real Fun

With this experiment kit, you will be able to research simple and fun chemical reactions and analyze 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.

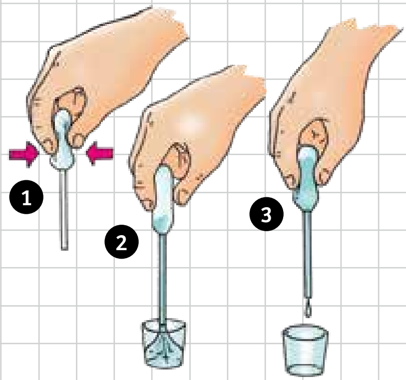
Most of the experiments will be performed in the test tubes. You will learn how to measure liquids precisely with measuring cups and how to add them drop by drop with the pipette. You will make slime and a goopy sludge called oobleck. You will create fizzing, oozing, color-changing, and gas-producing reactions. You will find out how to grow crystals, filter mixtures, and conduct chemical analyses. And you will be making all sorts of interesting observations in the process.

Some of the materials are not contained in the experiment kit box, 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 labeled 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 any 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.

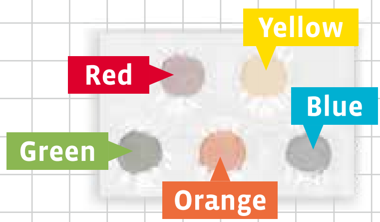
How to use the pipette

1. Squeeze the upper part of the pipette between your thumb and forefinger and dip the 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.



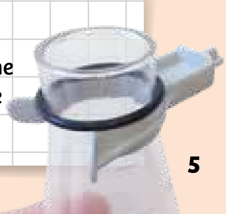
How to use the dye tablets

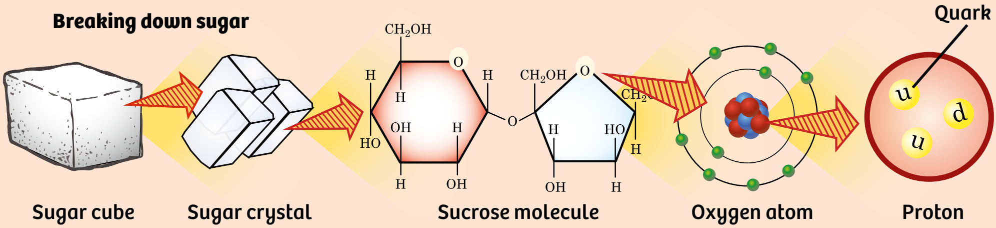
The dye tablets are used for many experiments. You only need to use pieces of each tablet, rather than the whole tablet. Break the tablets into small pieces. This diagram shows the dye color of each tablet.



Using the flask

The black rubber ring on the erlenmeyer flask keeps the flask in place on the clip.





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 organized study of all materials: what they are made of, how they are put together, how they come apart, why they behave the way 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, organizing 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. These are called elements, and are categorized 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, and there were three types of blocks: blue, green, and red. Towns with only one house or many of the same houses represent elements, individual houses represent atoms, and the blue, green, and red blocks represent 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 by all the things to be discovered in the world of chemistry!

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

››› INTRODUCTION

Lab Station Assembly

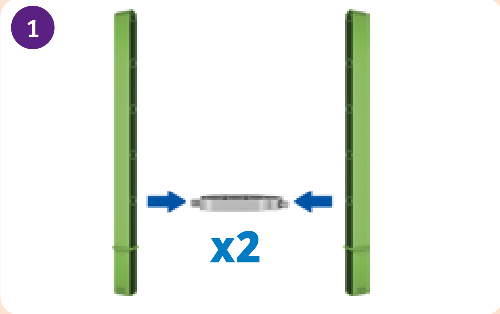
Before starting any experiments, follow these instructions to put your lab station together.

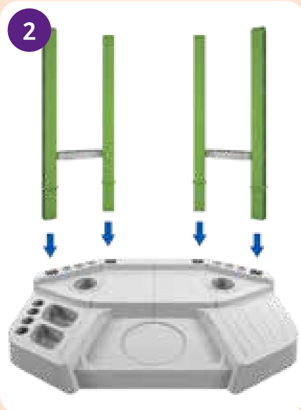
YOU WILL NEED

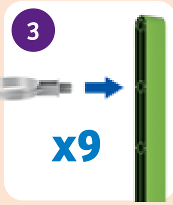
17 pieces of the lab station

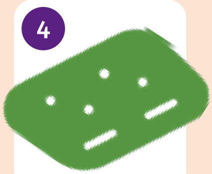
HERE'S HOW

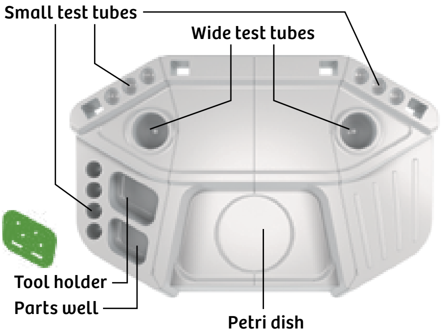
1. Insert a test tube rack into two vertical rods as shown. Repeat with the other test tube rack and the other two vertical rods.
2. Insert the four vertical rods into the station base as shown.
3. Insert all nine of the clips into the vertical rods. They are all moveable and can be repositioned for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



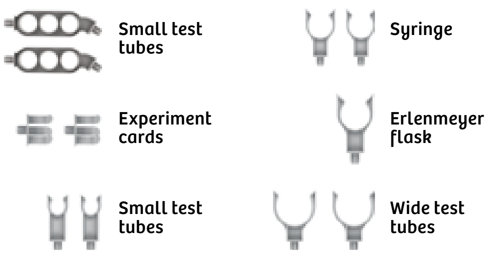








Here's what each part is designed to hold:



START WITH THE CARDS!

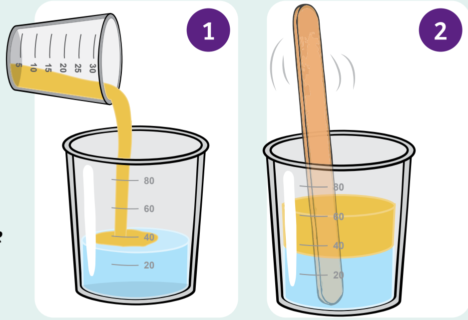
Experiments 1 through 9 are on the experiment cards. You should start with Experiment 1 and conduct the experiments in numerical order. Experiments 10 through 20 are in this manual.

›› › EXPERIMENT 10

Oil and water

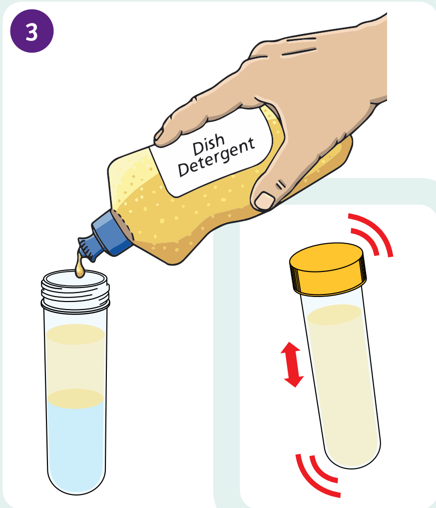
YOU WILL NEED

Small measuring cup, large measuring cup, spatula, tall wide test tube with lid (optional), *olive oil or vegetable oil, water, liquid dish detergent*



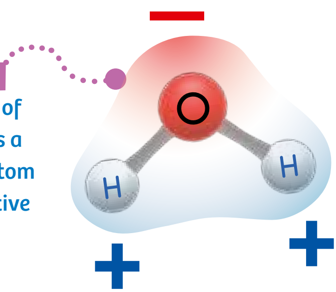
HERE'S HOW

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 spatula to mix the oil and water together. Pour the mixture into the tall wide test tube, screw on the lid, and shake it vigorously to mix it. Then let the liquid sit for 30 minutes. Observe what happens to the oil and water.
3. Open the test tube. Add a few drops of liquid dish detergent to the oil and water mixture. Screw the lid onto the test tube again and shake the contents until the oil and water appear to be mixed. What do you observe happens 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 toward itself. This influences the way that water interacts with other molecules.



Unlike water, oils are nonpolar. This is because oils have long chains of carbons and hydrogens, which don't have different positively and negatively charged ends like water.

The oil and water are able to stay mixed when you add the dish detergent because the detergent 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 detergent is what allows it to dissolve oily dirt particles, like greasy food stuck on a dish, in water so that they can be washed away.

››› EXPERIMENT 11

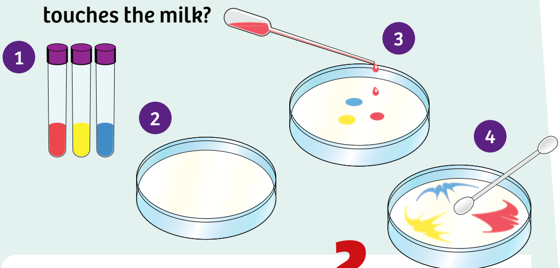
Mooooving colors

YOU WILL NEED

Small test tubes with lids, dye tablets broken into eighths, chemistry station, large measuring cup, petri dish, pipette, *milk, cotton swab, liquid dish detergent*

HERE'S HOW

1. Fill the small test tubes with 4 ml of water and add about an eighth of the red dye tablet. Screw the lid on the test tube. Shake it to mix the water and dye tablet. Repeat this step using the yellow and blue dye tablets in the two other test tubes.
2. Place the bottom of the petri dish in 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 center of petri dish.
4. Place the cotton swab in the liquid dish soap. Then dip the cotton swab into the center of the petri dish. What do you observe happens to the dye solutions when the cotton swab touches the milk?



WHAT'S HAPPENING?

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

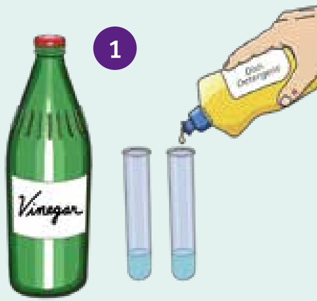
››› EXPERIMENT 12

Chemical foaming

YOU WILL NEED

2 test tubes, chemistry station, *baking soda, household vinegar, dish detergent, water*

HERE'S HOW



1. Fill both test tubes with water to a height of one centimeter in the tube. Then add a half centimeter of vinegar to each tube. Finally drip five drops of dish detergent into one of the two tubes.
2. Add one scoop of baking soda to each test tube and compare how the foam behaves.

WHAT'S HAPPENING?

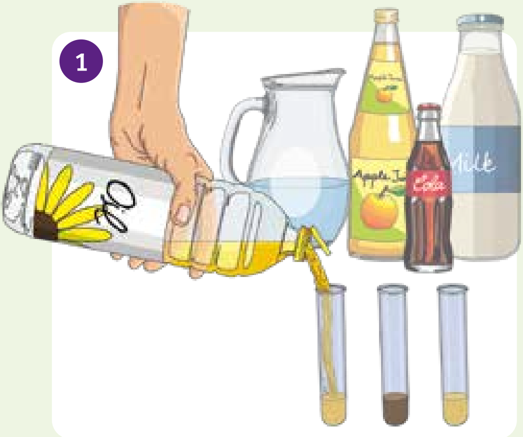
In both test tubes the solution foams up vigorously because the vinegar is an acid and the baking soda is a base. The foam quickly falls back down again in the tube without the detergent, but the foam remains stable for a longer period of time in the tube with the detergent. This stability is caused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

›› EXPERIMENT 13

Acid detective

When baking soda (sodium hydrogen carbonate) reacts with acids, carbon dioxide forms (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 acidic reaction when baking soda is added to them.



YOU WILL NEED

3 test tubes and 2 test tube racks, measuring spoon, *baking soda, test liquids (e.g., cola, iced tea, cooking oil, milk, lemonade, apple juice, fizzy drinks, or other liquids from your refrigerator)*

HERE'S HOW

1. Fill a test tube with one of your test liquids to a height of two centimeters in the tube.
2. With some liquids, you will observe that they are already bubbling or fizzing. To make sure you don't confuse this bubbling with a reaction to the baking soda, stir these fluids with the measuring spoon until no more bubbles can be seen. Then add a small spoonful of baking soda to the liquid and observe whether it bubbles or not.

WHAT'S HAPPENING ?

In acidic liquids, baking 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, powdered sugar, corn starch, baking soda, water*

HERE'S HOW

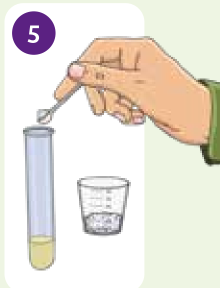
1. Have someone else put a teaspoon of powdered sugar in one cup, a teaspoon of corn starch in another cup, and a teaspoon of baking soda in a third cup, so that you do not know which substance is in which cup.

A. Water solubility test

2. Fill the three test tubes with water to a height of three centimeters in the tube. Place them in the chemistry station rack.
3. To each test tube, add one spoonful of one of the three white powders, making sure you put a different powder into each tube. Stir each 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 household vinegar to a height of one centimeter. 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 into each tube. Stir each tube. Observe how the different white powders behave in the vinegar.



WHAT'S HAPPENING?

A. The powdered sugar and baking soda dissolve in water, so that nothing can be seen. The corn starch initially remains as lumps lying in the water and then creates a cloudy mixture as soon as you stir it. Now you can identify the corn starch. The starch particles are much larger than the sugar and baking soda particles, so they do not dissolve.

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

Self-inflating balloon

A balloon can also be used to capture gasses coming from a chemical reaction.

YOU WILL NEED

Funnel, measuring spoon, small measuring cup, *rubber balloon, baking soda, vinegar, plastic water bottle*

HERE'S HOW

1. Put four spoonfuls of baking soda into an uninflated, pre-stretched balloon. You may need to have a helper hold the balloon.
2. Pour 5 ml of vinegar into the plastic water bottle. Put the mouth of the balloon over the bottle, and lift the balloon so that the baking soda falls down into the vinegar.
3. Observe. A reaction will occur and carbon dioxide gas will form. Hold the mouth of the balloon tightly on the bottle so it does not come off.

1

2

3

WHAT'S HAPPENING ?

The vinegar and the baking soda react together. A gas, namely carbon dioxide, is formed. This gas takes up much more volume than the vinegar and the baking soda did, so it expands and fills up the balloon. This gas is quite harmless. You are already familiar with it from the fizz in a bottle of soda, as well as other experiments in this kit.

››› EXPERIMENT 16

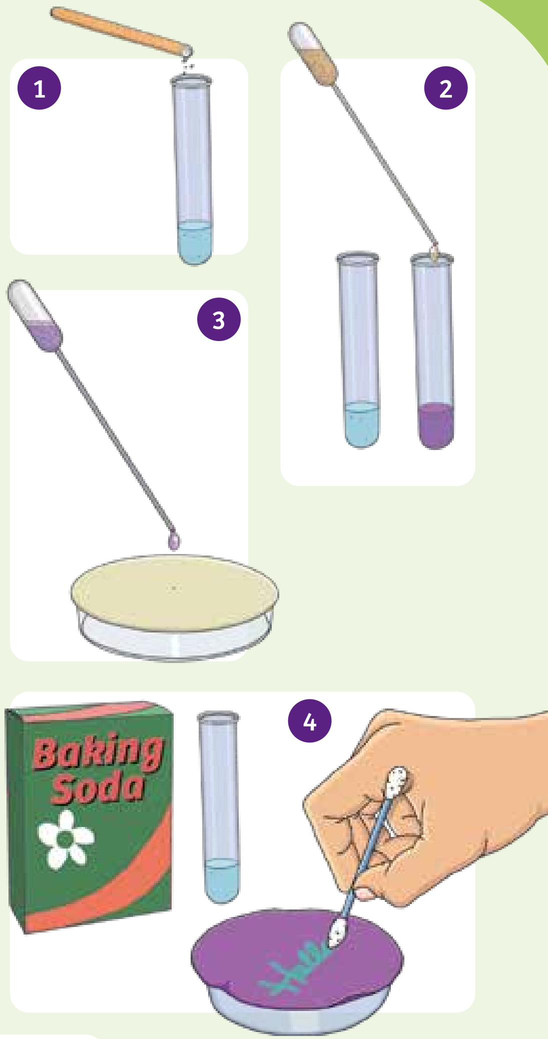
Invisible ink

YOU WILL NEED

2 small test tubes, chemistry station, spatula, filter paper, petri dish, pipette, *baking soda, water, cabbage juice (from Experiment 7), household vinegar, cotton swab*

HERE'S HOW

1. Fill a small test tube half full of water and put a small scoop of baking soda into it.
2. Fill a second test tube with cabbage juice to a height of two centimeters. 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 colored. Then wait until it has dried completely, which may take a whole day.
4. Dip one end of the cotton swab into the baking soda solution. Use the wet end of the swab to write or draw on the dry, colored filter paper. Observe what happens.



WHAT'S HAPPENING ?

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

Salty and sweet solutions

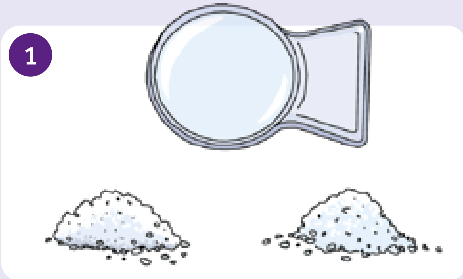
WARNING!
Never leave the magnifying lens in the sun. Fire danger! Never look directly into the sun, either with your naked eye or through the lens. You could blind yourself!

YOU WILL NEED

2 small test tubes, chemistry station, pipette, measuring spoon, *water, magnifying lens, sugar, table salt*

HERE'S HOW

1. At first glance, sugar and salt look pretty similar. Examine them carefully under a magnifying lens and try to detect a difference.
2. Set two clean test tubes in the test tube rack on your lab station. Place a measuring spoon of sugar in one of the test tubes. Then, use the pipette to add some water. Count the exact number of drops added. Observe what happens to the sugar. Swirl the test tube from time to time as you add the water. How many drops 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 that they have disappeared? Also investigate whether you can dissolve more or less sugar in warm water.



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, will dissolve more quickly and in greater quantities in hot water than in cold water. Table salt, however, is an exception. Its solubility hardly depends at all on the temperature.

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 anymore, 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.

››› **EXPERIMENT 18**

Growing salt crystals

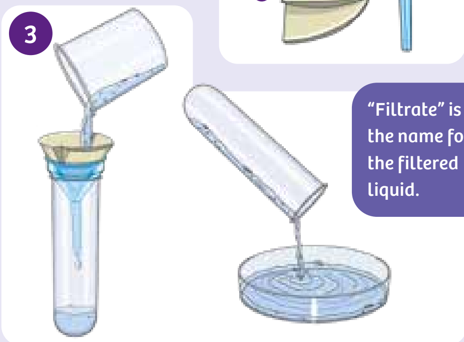
If you study salt and sugar under the magnifying lens, you will see little cube-shaped crystals (salt) or crystals with slanted edges (sugar). With a little patience and care, you will be able to make larger salt crystals that are particularly beautiful.

YOU WILL NEED

Large measuring cup, filter paper, funnel, wide test tube, chemistry station, petri dish with lid, measuring spoon, *tweezers, water, screw-top jar, salt (ideally rock salt, pure sea salt, or dishwasher salt), rock sugar, labels*

HERE'S HOW

1. Fill the large measuring cup with about 25 ml 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 filter paper.
3. Filter the salt solution into the wide test tube and 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 to 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. Compare their shape with that of the rock sugar.
6. Dispose of residues in the household garbage.



"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 smallest secondary crystals and keep using only the bigger ones, you can grow beautiful crystals.

››› EXPERIMENT 19

Carbon dioxide fire extinguisher

The gas in soda and sparkling water has two special characteristics that reveal why it's used in many fire extinguishers. You can investigate this for yourself at a small scale.

YOU WILL NEED

Tall wide test tube, disk with 7-mm hole, plastic tubing, fizzing reaction tablet, *tealight candle, matches, ceramic saucer, water*

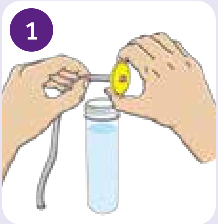
HERE'S HOW

1. Insert one end of the plastic tubing into the hole in the disk, just far enough so that it stays securely in the hole. Fill the test tube most of the way with water. (When you put the disk on the test tube, the tubing should not touch the water.)
2. Set the tealight candle on the saucer. Place it a small distance away from the test tube, but close enough that the tubing will reach from the test tube to the candle. Add a fizzing reaction tablet to the test tube and then light the candle.
3. Press the disk firmly down on the top of the test tube, completely sealing the tube. Point the end of the plastic tubing toward the candle's flame. Observe.

WHAT'S HAPPENING?

The main ingredients in the fizzing reaction tablets react in water. This process creates the gas carbon dioxide. It puts out the candle's flame because it's heavier than air. It displaces the oxygen around the candle's wick, which the flame needs to stay lit.

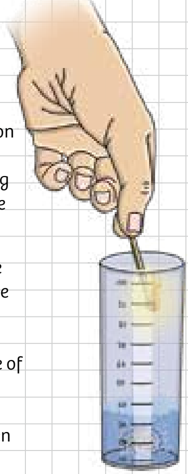
WARNING!
This experiment involves an open flame. Adult supervision is required.



Additional experiment: Match flame

Fill a cup one-third full with water and add a fizzing reaction tablet to it. Light a match and slowly lower it into the opening of the cup. Watch closely to see what the flame does.

The cup fills with CO_2 from the bottom, where the tablet is. The air at the bottom of the cup is displaced because it's lighter than CO_2. As soon as the flame of the match is immersed in the invisible gas layer, it goes out because it no longer has oxygen to burn.



››› EXPERIMENT 20

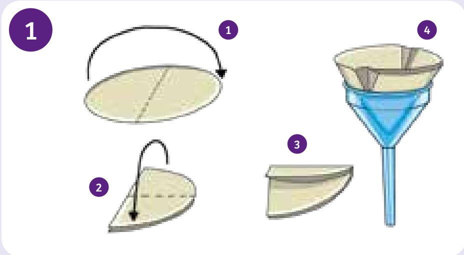
Separating mixtures

YOU WILL NEED

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

HERE'S HOW

1. Fold the filter down the middle. Fold the resulting semicircle again. This will give you a little cone. Set the filter cone in the funnel and moisten it with a little water to help it stick to the sides of the funnel. Place the funnel and filter paper into the tall wide test tube. Attach the test tube to the chemistry station.
2. Fill the large measuring cup with 50 ml of water and then add some soil and sand. Mix the soil and sand into the water using the spoon.
3. Let the mixture sit for a few minutes, and observe.
4. Pour the dirty water mixture into the filter paper in the funnel. What do you observe happens as you do?
5. Let the test tube sit until the filter paper has dried out. Inspect the contents of the filter paper. What do you observe?



WHAT'S HAPPENING?

This experiment shows that you can separate mixtures physically. First, the sand sunk to the bottom of the cup because it's heavier than water. This is called sedimentation. Then, you separated the soil and sand particles from the water through filtration, which is the process of separating solid particles from a liquid. The filter paper contains small holes which prevent large solid particles from passing through. However, the much smaller water molecules are able to easily pass through the filter. The filter paper is not perfect; some small particles were still able to pass through the filter. Filtration is used in the process of making coffee. The coffee filter prevents the large coffee grounds from going into the cup of coffee but lets the water-coffee solution and smaller coffee particles through.

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