EXPERIMENT MANUAL

STEPPING INTO SCIENCE

SCIENCE KIT

THAMES & KOSMOS

Franckh-Kosmos Verlags-GmbH & Co. KG, Pfizerstr. 5-7, 70184 Stuttgart, Germany | +49 (0) 711 2191-0 | www.kosmos.de
Thames & Kosmos, 301 Friendship St., Providence, RI, 02903, USA | 1-800-587-2872 | www.thamesandkosmos.com
Thames & Kosmos UK Ltd, Goudhurst, Kent, TN17 2QZ, United Kingdom | 01580 212000 | www.thamesandkosmos.co.uk

››› IMPORTANT INFORMATION

WARNINGS. Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled. Strangulation hazard — long cords may become wrapped around the neck.

Store the experiment kit out of reach of young children.

Keep the packaging and instructions as they contain important information.

Rules for Safe Experimentation

››› Supervising adults should exercise discretion as to which experiments are suitable and safe for the child or children.

››› Supervising adults should discuss the warnings and safety information with the child or children before commencing the experiments.

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

››› Do not throw the airplanes toward anyway. Do not aim at eyes or face.

››› Never inadvertently leave the magnifying glass in the sun — it could start a fire!

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

››› After the experiments, the used pieces of equipment should be rinsed, dried with paper towel, and put back in their spots in the experiment kit. The worktable should be wiped off and hands should be washed.

› › › IMPORTANT INFORMATION

Dear Parents,

Children are curious and hungry for knowledge. They want to discover the world and understand their environment. With this kit, children five years and older can conduct their first exciting experiments. The experiments are playful and full of surprises to make learning fun.

Children will develop an understanding of simple scientific principles and discover the fun of experimental research. In addition, some of the experiments can be staged as small presentations. It is great fun for children to show off an achievement and receive applause. Such experiences of success will reinforce their self-confidence.

The experiments are simple, but cannot be done totally without adult assistance. Therefore, support the little explorers, because their thirst for and ability to absorb knowledge are often better developed than their manual skills. If something does not immediately succeed, encourage your child to repeat the experiment one more time.

When experiments are marked with this  symbol, it is to indicate that your help is required for a successful outcome.

Together with your child find a well-illuminated and clean place where you can experiment without being disturbed, and that can stand getting a little messy and wet. Just like real experimenters do, it is recommended to wear old and easy-to-clean clothes. We also recommend having all items laid out and ready to use, so that it won't become necessary to go and look for something in the middle of an experiment. Because this kit was designed for young researchers, the descriptions and explanations have been kept as short and simple as possible.

Before starting an experiment, look at each step together with your child so that he or she will understand what is going to be done during the experiment. According to their interest in science and curiosity level, children may continue to experiment according to the suggestions for additional experiments given, and also try out their own ideas. Encourage them to explore their innate sense of curiosity.

We wish you lots of fun and successful experiments!

››› KIT CONTENTS

Checklist: Find – Inspect – Check off

✔	No.	Description	Quantity	Item No.
❍	1	Paper sheets (1 sheet for cutting and 2 sheets for airplanes)	1	703 545 705 710 705 711
❍	2	Die-cut cardboard	1	715 738
❍	3	Garden cress seeds	1	705 133
❍	4	Plastic dish (2 halves)	1	702 184
❍	5	Magnifying glass	1	311 137
❍	6	Flexible straw	2	705 249
❍	7	Straw	6	707 779
❍	8	Clay pot	1	121 816
❍	9	Plastic bag	1	703 547
❍	10	Disk/Spinning top	1	703 548
❍	11	Sundial	1	259 181
❍	12	Plastic stick	1	700 401
❍	13	Rubber band	5	161 412
❍	14	Polystyrene ball	1	700 080

✔	No.	Description	Quantity	Item No.
❍	15	Paper bag	3	700 083
❍	16	Paper clip	2	020 040
❍	17	Suction cup	1	700 181
❍	18	Blotting paper	1	000 569
❍	19	Soap bubble ring	1	000 583
❍	20	Modeling clay	1	000 588
❍	21	Wool thread	1	702 751
❍	22	Small polystyrene soap boat	1	700 633
❍	23	Pipette	2	232 134
❍	24	Measuring cup	2	061 150
❍	25	Measuring cup lid	2	061 160
❍	26	Round filter paper	12	702 842
❍	27	Polystyrene air-cushion boat and polystyrene disk	1	700 088
❍	28	Funnel	1	700 364

Any materials not included in the kit are marked with this symbol ✚ under the "You will need" heading.

››› Please do a preliminary review of the parts list and check to make sure that all of the correct materials are included in the kit.

››› If you are missing any parts, please contact Thames & Kosmos customer service.

You will also need: Paper towels, water, toy block, plant parts, trowel, scissors, potted plant, string, confetti or tiny paper pieces, wool cloth, glue, glass bowl, sugar, soap flakes or bar of soap, drinking glass, soup bowl, saucer, ballpoint pens, markers, crayons, vegetable oil, ink, white paper, desk pad or blotter, small pieces of paper, teaspoon, tablespoon, pepper, salt, dish detergent

››› TABLE OF CONTENTS

Dear Kids!

Do you want to explore the wonders of the natural world, learn about plants, experiment with air and water, watch clouds form, and make colorful concoctions? Then let's get going and start in on the awesome experiments in this kit!

Your parents will be happy to help you gather the extra things you might need for each experiment, perform each step of the experiment, and read the explanations afterward. Make sure you follow the instructions closely. Don't be frustrated if something doesn't work as expected: That is an important part of science!

Let's start our experiments by sprouting some cress seeds! Have fun!

Experiments in Nature

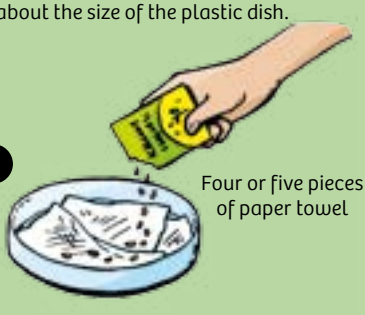
EXPERIMENT 1

The cress garden

YOU WILL NEED

+ Paper towel
+ Water

1 Tear off a few pieces of paper towel that are about the size of the plastic dish.



2 Four or five pieces of paper towel

3

4

5 Keep the paper moist at all times!

WHAT'S HAPPENING ?

As long as the garden cress seeds are dry, they do not germinate, or start to grow. Only when they come in contact with water will the seeds swell and begin to grow. After about three days, you will see tiny sprouts.

Continue to experiment! At a greenhouse or garden store, get some more seeds, such as radish or bean seeds. Sprout these as you did the garden cress. Observe with the magnifying glass whether they germinate and whether they grow faster or slower.

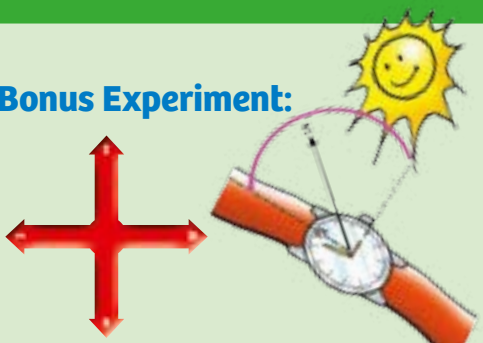
EXPERIMENT 2

Weather station

YOU WILL NEED

- Hand mirror
- Sheet of white paper
- Crayon or colored pencil
- Desk pad or blotter

Bonus Experiment:

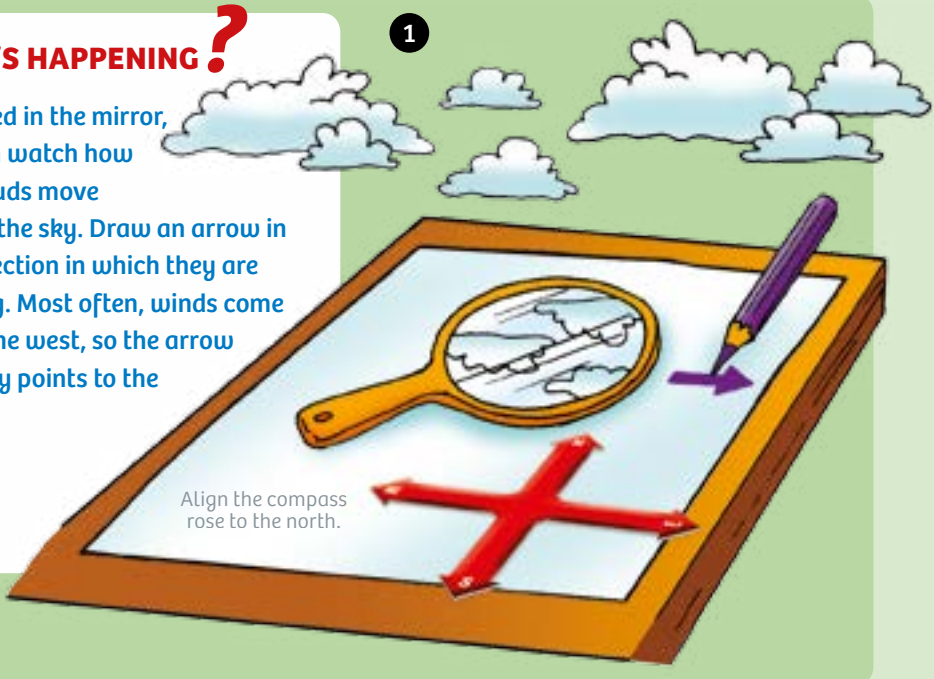


Point the hour hand of a watch toward the sun. Hold it in place and imagine a line that is exactly between the 12 o'clock mark and the hour hand. This line points out of the watch center, toward the south.

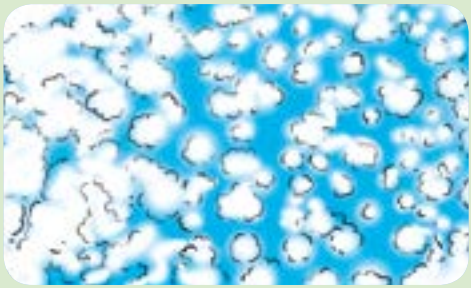
Tip! Ask your parents to point out the directions or ask them for a compass.

WHAT'S HAPPENING?

Reflected in the mirror, you can watch how the clouds move across the sky. Draw an arrow in the direction in which they are moving. Most often, winds come from the west, so the arrow usually points to the east.



What are the different types of clouds?



Small, high, fleecy clouds called **cirrocumulus clouds** often announce a change in the weather.

Rain clouds are dark and usually cover the entire sky. They usually mean that a long-lasting rain is ahead.

In big, fluffy **cumulus clouds** you can see the most beautiful shapes!

The larger the towering anvil-shaped **storm cloud,** the more violent the storm.

Contrails are formed when the water vapor from aircraft emissions freezes into ice crystals.

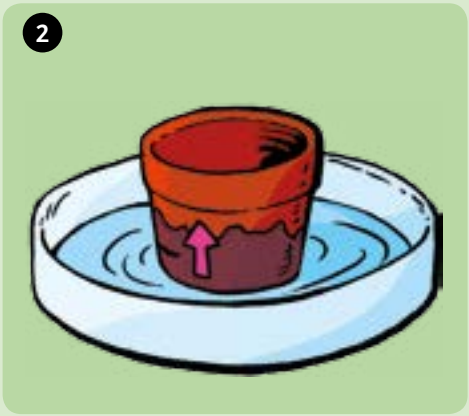
What is it like to be inside a cloud? See for yourself! Next time there is **fog** or **mist** outside, stand in it. Fog and mist are just clouds that are at ground level.

EXPERIMENT 3

The water absorbing clay pot

YOU WILL NEED

+ Water



WHAT'S HAPPENING?

Fired clay is not a totally solid material. It has numerous small holes, almost like a sponge only the holes are much smaller. In these tiny holes, the water can slowly creep upwards because it will fill small openings even when they are above the water surface. The water adheres to the holes like glue and does not flow down again. This characteristic makes clay ideal for flowerpots.

Continue to experiment! Repeat the experiment with a large flowerpot that you put in a bowl. Observe how long the water takes to reach the upper edge.

EXPERIMENT 4

Plants also sweat

YOU WILL NEED

- Houseplant
- String

Be sure not to break any parts of the plant.

Continue to experiment! Repeat the experiment in the garden, for example with a leaf or branch from a hedge or bush. The leaf of a sunflower also works well for this experiment.

WHAT'S HAPPENING?

After some time the bag will fog up. Small water droplets will form. Depending on the time of year and the plant, this can take up to a couple of hours.

People and animals aren't the only living things that sweat: plants sweat too! With their roots, they absorb water from the soil. They expel the excess water into the air. This happens through tiny openings on the underside of the leaves. The plant needs the water to transport and distribute nourishment to the entire plant.

EXPERIMENT 5

Plants from cuttings

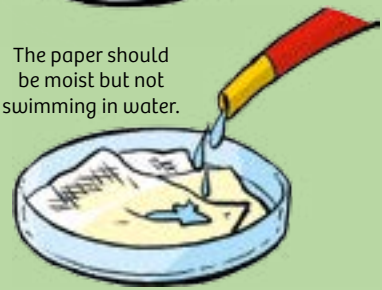
YOU WILL NEED

- Plant parts (e.g. dandelion stems)
- Paper towel
- Trowel
- Scissors
- Water

1

2

The paper should be moist but not swimming in water.



3

4

5

6

Keep the paper moist at all times!

Continue to experiment! Repeat the experiment with other plants, for example, the cut-off top from a carrot. Ask your parents which plants you can use for this.

WHAT'S HAPPENING?

After about one week small shots will begin to grow from the root cuttings, which you can see with the magnifying glass.

CHECK IT OUT

Seeds ...

... contain all the important nourishment that young plants need in order to start growing. They get everything else they need from the water and the air. And later, once the roots have grown, the plant gets more nutrients from the soil.

Shoots and Flowers

Plants do not reproduce only through seeds, but also through other parts of plants and cuttings. Plants can develop from damaged shoots or flowers eaten by animals. This characteristic is very important for plants because they serve as food for many animals. Obviously they need fresh air, light, and fresh water to grow.

GARDEN CRESS ...

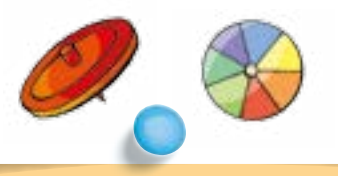
... is very healthy and contains many vitamins that we need daily. In addition, the young sprouts taste very good. Therefore, many people grow cress regularly to eat it in their salads.

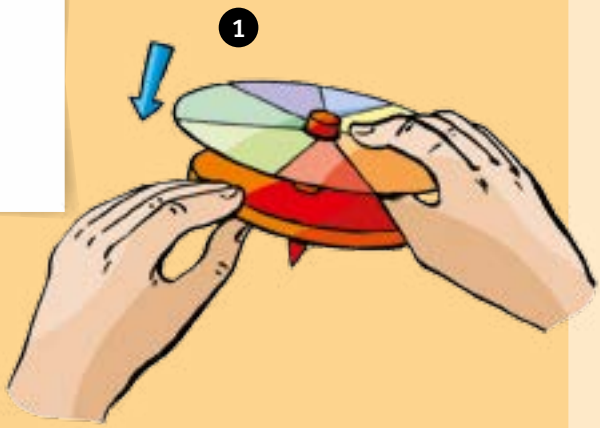
Experiments in Physics

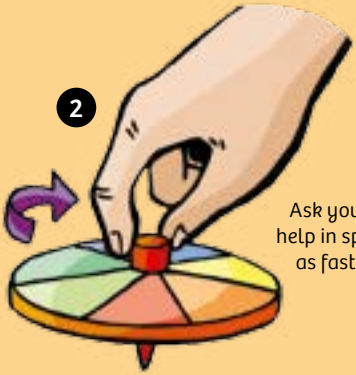
EXPERIMENT 6

Spinning colors

YOU WILL NEED







Ask your parents for help in spinning the top as fast as it can go.

Continue to experiment! Repeat the experiment with disks you have cut out and colored yourself. What happens when you make the disk blue and yellow?

WHAT'S HAPPENING?

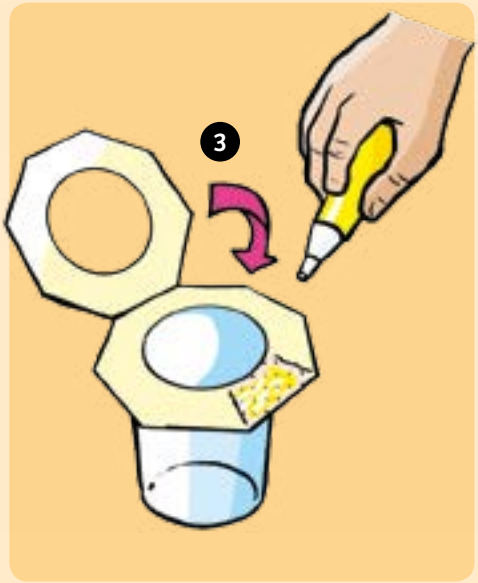
When spinning, the different colors can no longer be distinguished. They merge into a gray, almost white color. White is a mixture of all colors even though it may not seem so to us. One could also say that all colors are contained in white light. With the color wheel, it is really your eyes that are observing the change in color, because they cannot follow the fast-spinning top, rather than the object actually changing color itself.

EXPERIMENT 7

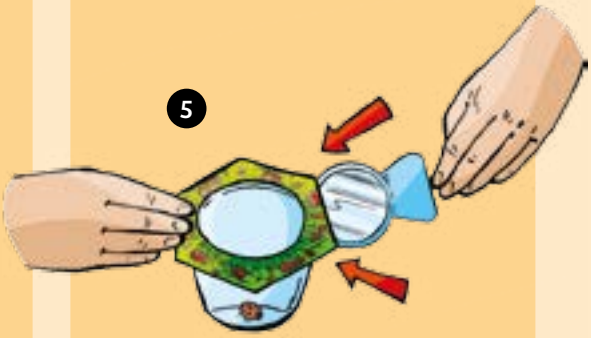
The magnifying glass

YOU WILL NEED

- Postage stamp
- Dust
- Coin
- Carpet fibers
- Glue
- Tiny bug (e.g. lady bug)



Catch the bugs very carefully. Do not hurt them. Let them out again at the same spot after you have observed them.



WHAT'S HAPPENING?

Thanks to the magnifying glass everything looks larger so that you can observe things better and more accurately. In fact, everything looks twice as large. The beaker makes sure that the small critters do not run away while you are looking at them.

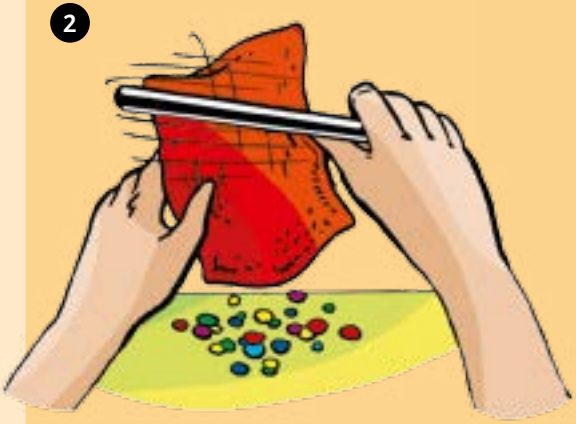
Continue to experiment! Check if other items made of glass or transparent plastic work like a magnifying glass. For example, the bottom of a drinking glass or a water drop that you put on a piece of plastic wrap.

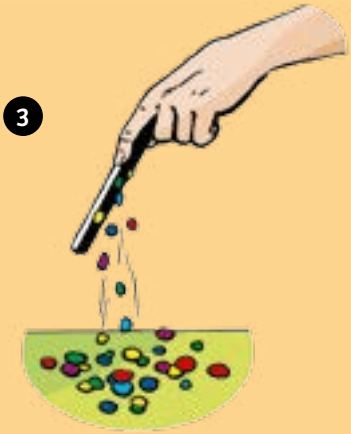
EXPERIMENT 8

The confetti magnet

YOU WILL NEED

- Confetti or small paper pieces
- Wool fabric piece





WHAT'S HAPPENING?

As if pulled by a magic force, the paper pieces fly onto the rod. When you rub the plastic rod with the wool fabric, the rod is charged with electrostatic energy. This works like a magnet although the energy does not attract things made of iron like a magnet does. It attracts paper, hair, and other very light things that have an opposite electrostatic charge.

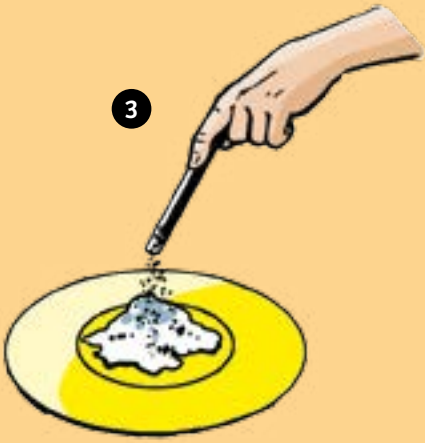
Continue to experiment! Find someone who has long hair. Put the charged rod near their hair and watch what happens. Hair is also attracted by the rod.

EXPERIMENT 9

Salt and pepper

YOU WILL NEED

- Wool fabric piece
- Salt (course ground)
- Pepper
- Saucer



WHAT'S HAPPENING?

When you hold the rod slightly above this mixture, the lighter pepper is attracted first while the heavier salt initially remains on the table. This is because gravity has a stronger pull on the heavier objects to oppose the force of the electrostatic attraction.

EXPERIMENT 10

The sun dial

YOU WILL NEED

1

2

Continue to experiment! With the help of a large rod or stick and a smooth surface in the garden or sandbox, try to make a large sun dial. For each half and full hour, draw a line in the ground where the shadow of the rod falls.

WHAT'S HAPPENING?

You have made a sundial and set the time. From now on you can read the time on your sundial. Because Earth turns around its own axis, it appears to us as if the sun turns around Earth. The shadow cast by the obelisk will therefore wander across the sundial. It is the hand of the sundial. But the sundial only works in nice weather and only from morning until night. Also don't forget that in the spring and summer we have daylight saving time. In the summer when your watch shows 12, the time according to the position of the sun is only 11 o'clock.

CHECK IT OUT

Introducing Your Child to the Scientific Method

This kit is designed to introduce children not only to the various scientific principles demonstrated by each experiment, but also to the process of scientific experimentation itself. The scientific method is the process that scientists use to answer questions. It consists of the following basic steps:

Observation – A question or problem that arises from observations and research. Why does a particular phenomenon occur?

Hypothesis – The hypothesis is an explanation for the observation that has yet to be proven. It is an educated guess as to why something happens.

Experimentation – Experimentation is the process by which the hypothesis is tested, to see if it is right or wrong. Logical reasoning is used to analyze the results of experiments.

Conclusion – The conclusion is a statement of the results of experiments, and whether they prove or disprove the hypothesis.

Repetition – Often experimentation does not result in a definitive answer, and thus the process must be repeated to refine the hypothesis or test a new hypothesis.

For each experiment you do with your child, try to incorporate the scientific method into your dialog with the child:

1. While preparing an experiment, ask your child what they think the parts might be used for and what the parts remind them of.

2. After preparing and experiment, but before actually conducting the experiment, ask your child what they think will happen during the experiment. In a sense, you are asking them to come up with a hypothesis.

3. After the experiment, ask them what they observed and how it was similar or different to their hypothesis.

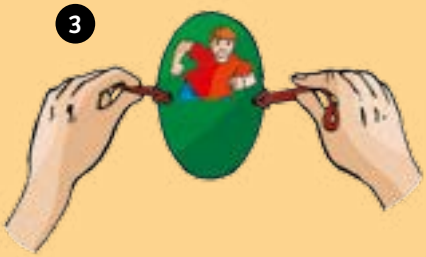
4. Finally, ask them to come up with a conclusion based on the experiment, and discuss with them any ideas they might have for additional experiments which might relate to the experiment.

EXPERIMENT 11

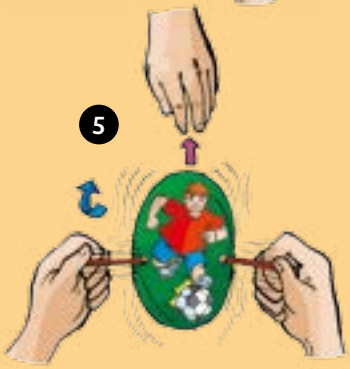
Two become one

YOU WILL NEED

+ Glue
+ Assistant



Wind up 50 times.



WHAT'S HAPPENING?

When the soccer player is let loose, the disk turns rapidly between your fingers. And instead of the two halves of the soccer player, you see the entire player ready to kick.

Continue to experiment! Cut a piece of cardboard into a suitable size. Make two holes in it and repeat the experiment with a drawing of yourself or a photograph that you cut in half at the middle. Notice carefully how the two half pictures must be arranged on a cardboard piece.

CHECK IT OUT

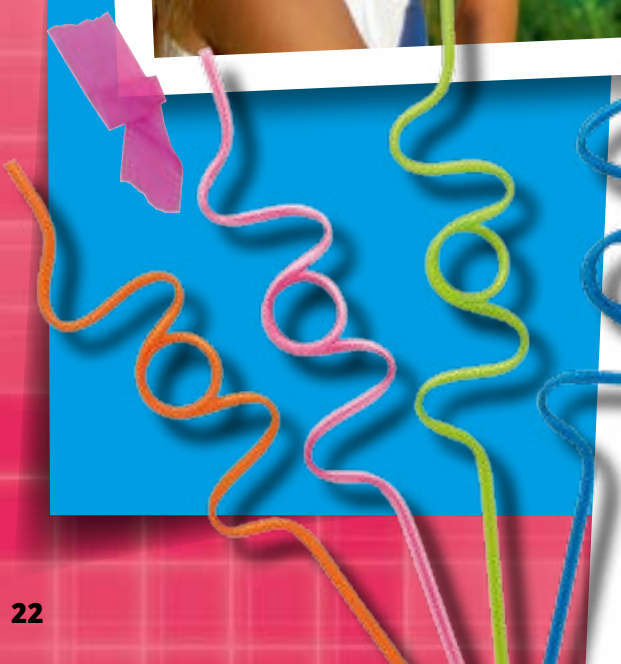
Larger than Life

All objects reflect light rays that first come from the sun or another light source. Some of these light rays travel to your eye. Your eyes sense the light. This is how you can see an object. When the light rays pass through a magnifying glass, they are bent and pulled apart a bit. Thus, the object appears larger than it actually is.

A Blockbuster is Produced

The human eye is fairly slow. It stores each picture that it sees for a short period. In the previous experiment, the cardboard oval with the soccer player turns so rapidly that the eye still has one half stored while it already sees the next half. Inside our head the picture of a full soccer player is now formed from the two halves. We see a movie in the same way; Each second, the human eye sees 25 or so individual pictures that are put together inside our head into a continuous movement.

Experiments with Air



EXPERIMENT 12

The floating ball

YOU WILL NEED

WHAT'S HAPPENING?

When you blow powerfully into the straw, the foam ball begins to float. The ball is so light that it can be supported by the flow of air. This airflow surrounds the ball on all sides and makes sure that it rides in the middle of the air stream. This, however, works only with a ball. Other shapes are not surrounded uniformly by the flow of air and will fall down.

BONUS EXPERIMENT

Continue to experiment! Ask your parents if they will carry out this experiment with you using a hairdryer, with the heat turned off. Now the flow of air comes automatically, and you can try to make several different items float in the air.

EXPERIMENT 13

Big bang bag

YOU WILL NEED

Squeeze the opening tightly together so that the bag does not lose any air.

Hit the bag powerfully with the palm of your hand.

Continue to experiment! Repeat the experiment with other bags.

WHAT'S HAPPENING?

The bag bursts with a loud bang. When you hit the inflated paper bag, you compress the air in the bag. Because the bag is not elastic, the air has no place to go. Therefore it rips the bag and the air escapes. The ripping bag and the suddenly escaping air cause the bursting sound. A squishy rubber beach ball, on the other hand, is elastic, so it won't pop when you hit it.

EXPERIMENT 14

The hovercraft

YOU WILL NEED

+ 3 small pieces of paper
+ Pin

1

2

The hole is slightly smaller than the funnel, so slowly and carefully twist the funnel into the hole.

3

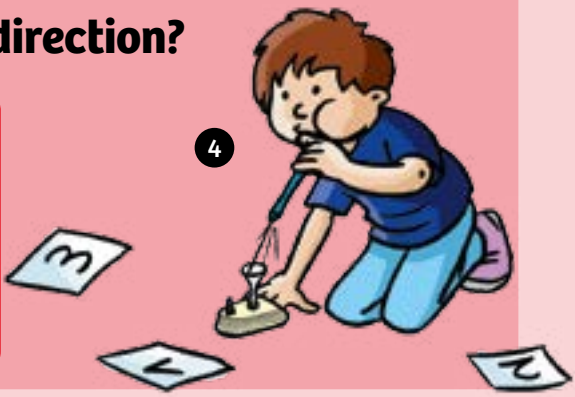
WHAT'S HAPPENING?

When air passes through the funnel, there is more air under the boat. This increases the air pressure there. The air tries to escape. It flows in all directions and lifts the boat a small amount causing the boat to float.

Can you control the direction?

Continue to experiment! Play this game with your friends: Set up a course for your hovercraft to follow and time each other to see how long it takes to complete the course. Whoever completes it the fastest is the winner!

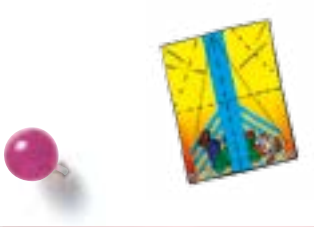
4

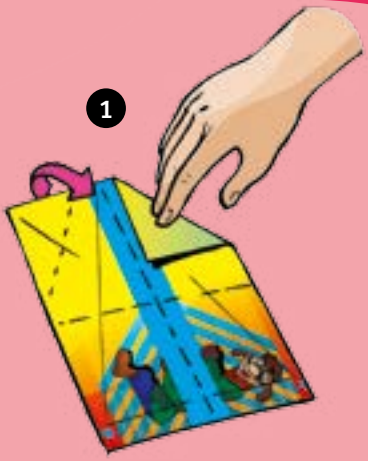


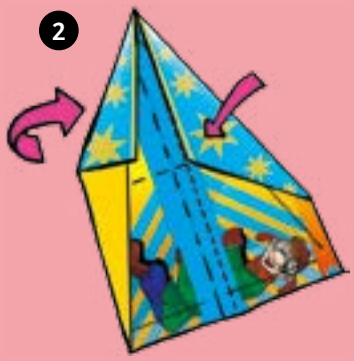
EXPERIMENT 15

Paper airplane 1

YOU WILL NEED







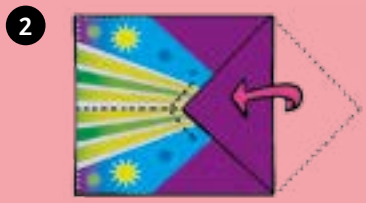
WHAT'S HAPPENING?

When you grab the glider at the tail between your thumb and index finger, and throw it gently forward into the air, it glides through the air like a real airplane. After a couple of tries, you will get the hang of throwing it.

EXPERIMENT 16

Paper airplane 2

YOU WILL NEED



WHAT'S HAPPENING?

Airplanes fly because their wings have a special shape, called an airfoil. The shape ensures that the air through which the wing moves must travel different distances above and below the wing. The distance the air travels above the wing is longer than the distance it travels below the wing. This makes the air above the wing slightly less dense, which creates a slightly lower pressure that pulls the wing upward. This only happens when the wing is moving forward fast enough.

EXPERIMENT 17

The bellowing elephant

YOU WILL NEED

+ Scissors

1

2

3

Continue to experiment! Repeat the experiment with other materials, such as with a piece of foil or a piece of cardboard of the same size. Does the experiment work?

WHAT'S HAPPENING?

When you blow into the straw, the air flows very quickly between the disk and the piece of paper. The air pressure between the disk and the paper decreases and the paper is sucked up toward the disk.

4

Hold the disk very closely over the paper!

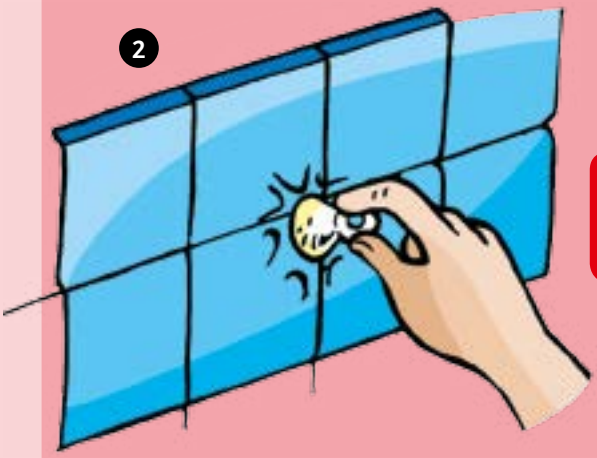
EXPERIMENT 18

The suction cup

YOU WILL NEED

+ Water

Ask your parents which surfaces in the house you can test out the suction cup on.



Tip! It works best if you moisten the suction cup first with some water.

WHAT'S HAPPENING?

When you press the suction cup onto a surface, some air escapes from the cavity on the underside. This creates a small space in which there is less air than there was before. Therefore, there is a lower air pressure than on the outside of the suction cup. Or said another way: There is a higher air pressure outside than in the cavity of the suction cup. This higher air pressure presses the suction cup to the surface. If, however, air seeps into the cavity, the air pressure is equalized and the suction cup loosens.

CHECK IT OUT

More Airplanes

There are many ways to fold paper airplanes. Can you think up other designs? You could ask your family members for their best paper airplane designs. Test out which aircraft flies at best. You can also try making the same plane in different types of paper or even thin cardboard.

SUCTION FORCES

Try sticking the suction cup to rough surfaces. You will see that on rough or porous surfaces the suction cup cannot hold on because it cannot make an airtight seal. A lower air pressure cannot be created in the cavity. You can also test to see how much weight the suction cup will hold. Can it hold up a hanger with an item of clothing on it?

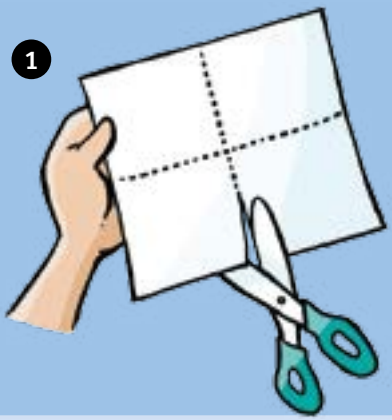
Experiments with Water

EXPERIMENT 19

The floating paper clip

YOU WILL NEED

+ Scissors
+ Glass bowl
+ Water



Carefully place the blotting paper with the paper clip onto the surface of the water.

WHAT'S HAPPENING?

After a short time, the blotting paper swells with water and sinks. But the paper clip remains floating on the surface. If it does not work the first time, try it again.

Continue to experiment! Repeat the experiment with other lightweight items, such as a blunt sewing needle or a strip of aluminum foil.

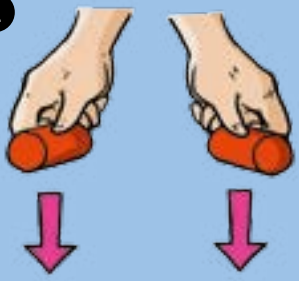
EXPERIMENT 20

The clay boat

YOU WILL NEED

+ Large glass bowl
+ Water

1



2

Make a ball and a boat with thin walls.

3

Put the ball and boat into the water at the same time.

4

WHAT'S HAPPENING?

Even though they are about the same weight, the boat will float on the water while the ball sinks immediately. The important factor is not the weight but the shape.

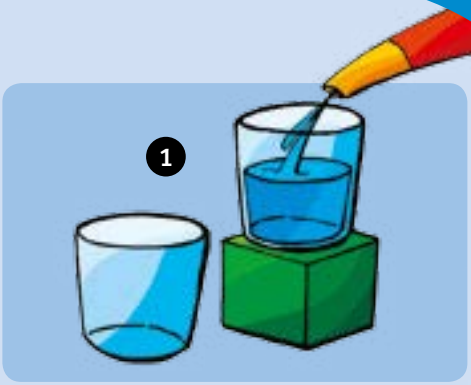
Continue to experiment! Make a lot of small balls from the large one and try to load the boat. How many balls can it carry before it sinks?

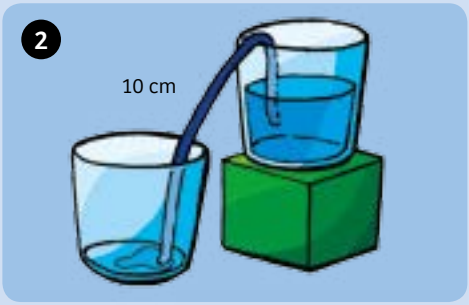
EXPERIMENT 21

The string pipe

YOU WILL NEED

+ Building block
+ Scissors
+ Water





WHAT'S HAPPENING?

After a little while, water slowly flows through the string from the full cup into the empty cup. Between the string's fibers there is air, like in a sponge. These spaces fill up with water. When the string has filled entirely, water begins to drip out of its lower end. As additional water flows in from above, the small water pipe continues to run.

Make sure that the water cup is always higher than the flowerpot.

Continue to experiment!
You can use the water pipe to supply water to your flowers in the windowsill. Find out what happens if the measuring cup and flower pot are at the same elevation.

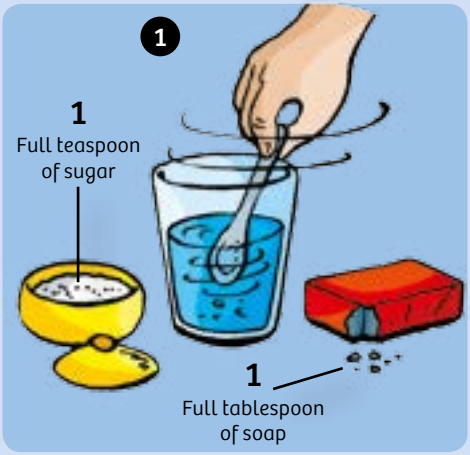
EXPERIMENT 22

Super soap bubbles

YOU WILL NEED

- Sugar
- Bar of soap or soap flakes
- Drinking glass
- Soup bowl
- Water
- Teaspoon
- Tablespoon

Warning! The soapy water is not for consumption and must not come in contact with eyes. If it should do so, flush the eye with running water.



Tip! You can also try liquid dish detergent instead of soap.

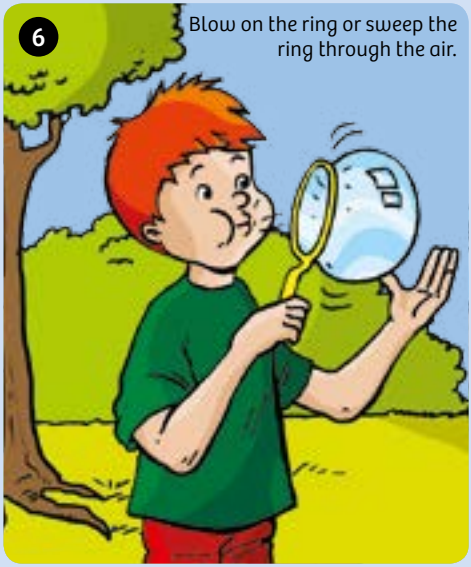
Do this experiment outside!

4

5

Now try it with the funnel. What makes the nicest bubbles?

6



Blow on the ring or sweep the ring through the air.

WHAT'S HAPPENING?

Sugar and soap make water into a tough solution. You pick up a film of this solution with the straw, ring, and funnel. When you blow air into it, the film stretches and forms a bubble, which encloses the air blown into it. Because the air pressure inside the bubble is slightly higher than outside, the bubble remains round and stable. The bubble bursts when it gets a hole in it.

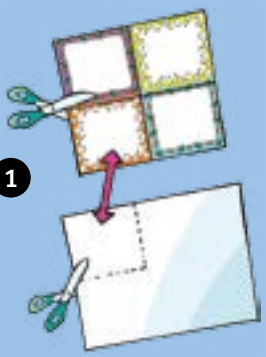
Continue to experiment! While a soap bubble is floating in the air, try to stick the straw into it and blow a second soap bubble inside the first.

EXPERIMENT 23

Secret writing paper

YOU WILL NEED

- White paper
- Ballpoint pen
- Scissors
- Bowl
- Water

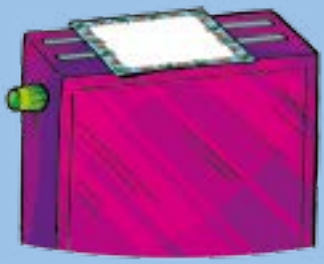


1

2

3

4



Tip! Throw the dry piece of paper away and place the wet one in the sun or on a radiator to dry out.

5

Continue to experiment! Repeat the experiment with different kinds of paper. Find out which is best for this type of secret writing.

WHAT'S HAPPENING?

The fibers in the wet paper are compressed by the pen. When the paper is dry, these places can no longer be seen. Only when you dunk the paper into water will the writing become visible again. This makes the paper transparent to light except at the compressed spots of your secret message.

CHECK IT OUT

Floating iron

A ship has thin walls and is hollow inside, so it displaces a volume of water that weighs more than its own weight. An entire ship made of heavy iron with air inside of it is lighter than the water and is therefore able to float on top of it.

THE WATER'S SKIN

Water forms a kind of skin on its surface. This skin is also called "surface tension" and keeps the water together fairly well; at least so well that small, lightweight things do not sink. This surface tension is used by water bugs that can walk on the surface of water. You can observe these insects on a pond or slow stream.

Experiments in Chemistry

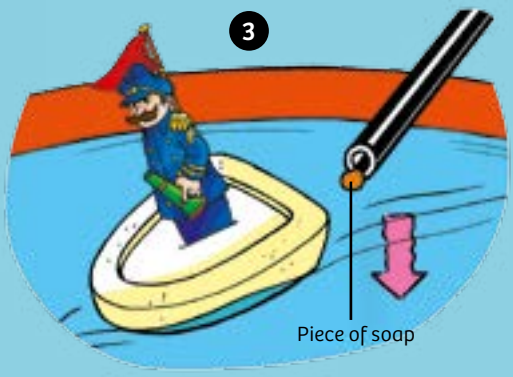
EXPERIMENT 24

The soap boat

YOU WILL NEED

- Bar of soap
- Large bowl or basin
- Water

Wait until the water is calm and flat!



WHAT'S HAPPENING?

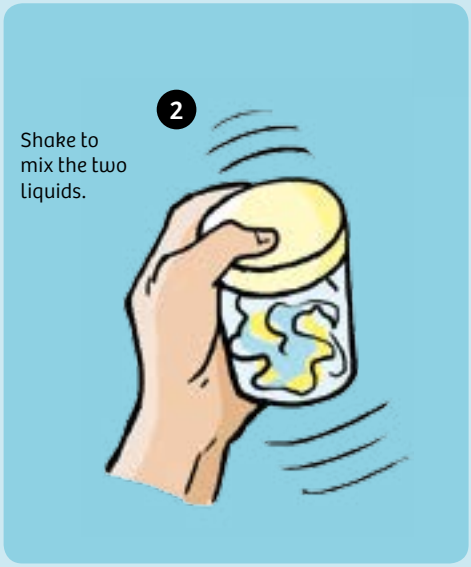
When you dip the soap-tipped wand into the water, the boat suddenly begins to move, as if by magic. The soap disturbs this surface tension. This puts the water at the surface into motion, and as it flows around it takes the boat along with it.

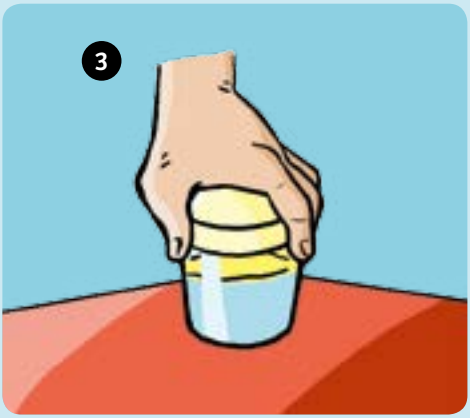
EXPERIMENT 25

Oil and water

YOU WILL NEED

+ Vegetable oil
+ Water





WHAT'S HAPPENING?

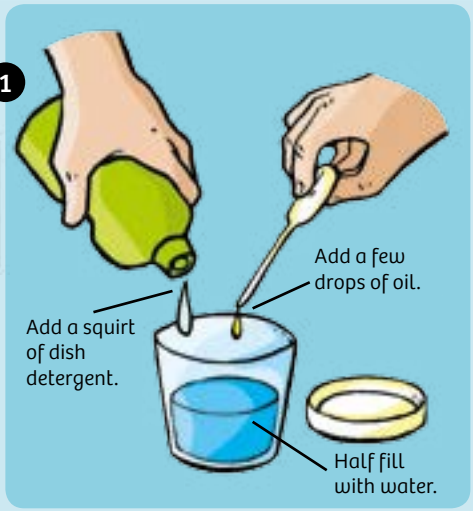
After a short while, the two liquids will separate again with the oil floating on top of the water. Water and oil repel each other. You could say they don't like each other! This is why it is so difficult to wash oil off with water.

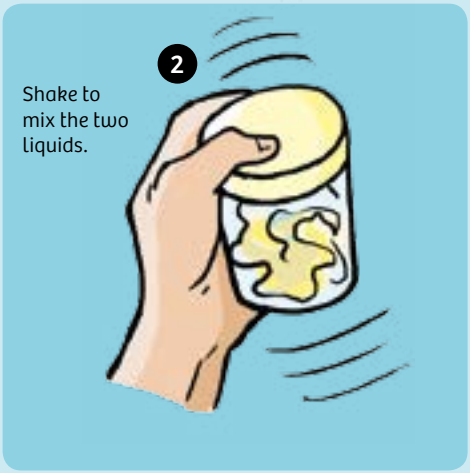
EXPERIMENT 26

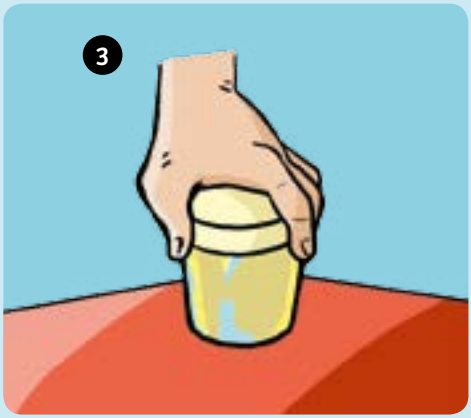
Dish detergent magic

YOU WILL NEED

+ Vegetable oil
+ Water
+ Dish detergent







WHAT'S HAPPENING?

Watch the liquid you shook up. It is a cloudy, milky mixture that does not separate again in water and oil as in the previous experiment. This is caused by a special chemical property of the dish detergent.

EXPERIMENT 27

Evaporation

YOU WILL NEED

+ Salt
+ Water

1

2

Shake until the salt has dissolved!

3

4

Continue to experiment! Repeat the experiment and use sugar instead of salt. Will the sugar also remain in the dish?

WHAT'S HAPPENING?

The next day, or the day after at the very latest, the water will have evaporated. Only the salt is left in the plastic dish.

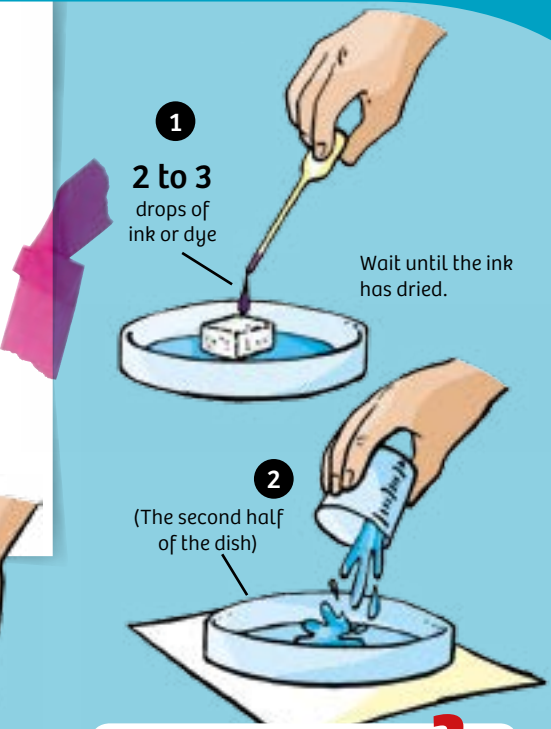
5

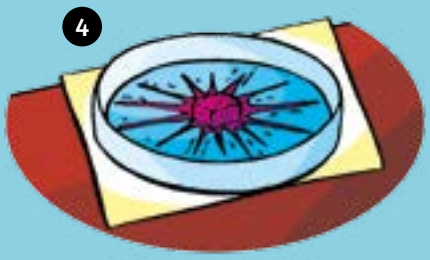
EXPERIMENT 28

The colorful sugar star

YOU WILL NEED

- Colorful ink or dye
- Sugar cubes
- White paper
- Water





WHAT'S HAPPENING?

The sugar and ink dissolve into the water. The sugar particles will thereby move towards the edge of the dish and the ink follows along. In this way, a beautiful sugar star shape is created.

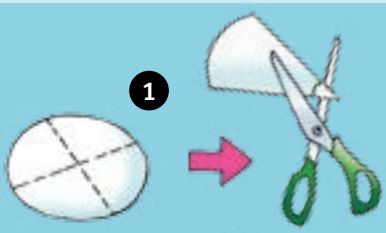
Continue to experiment! Repeat the experiment, but this time with two sugar cubes. Add different colors to each cube. This will create a wonderful two-colored star. You will get a large star when you try the experiment on a flat dinner plate.

EXPERIMENT 29

Color detective

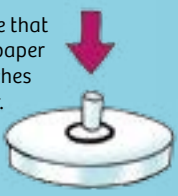
YOU WILL NEED

- Scissors
- Water-based black marker or pen
- Water



Cut the filter paper into 3 equal pieces.

Make sure that only the paper wick touches the water.



WHAT'S HAPPENING?

Many other colors are hidden in the black ink. They are separated by the water because they move at different speeds through the filter paper.

Tip! You can use the same wick several times.

One final experiment:

Color the filter paper with different colors! Also try different patterns or lots of colors at the same time. You can also color in the whole paper. You will get another little piece of abstract art each time.

Tip! You can also drop colored water onto the center of the filter paper with a pipette and watch the changing patterns of the gradients.

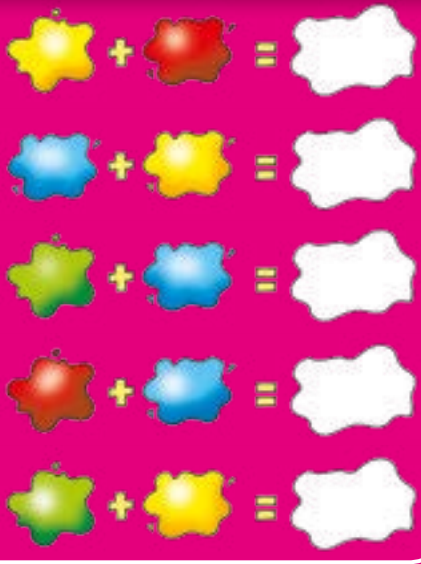
CHECK IT OUT

SALT AND WATER

Water consists of tiny parts that can be absorbed by the air. This is why water evaporates. This happens wherever water comes in contact with air: for example, on the wet pieces of laundry on the drying line or in a puddle of water. Salt can be completely dissolved in water. It doesn't disappear though. It will show up again as crystals when the water evaporates.

Color Theory

By mixing different colors you can create new colors. This is illustrated by the three primary colors: blue, red, and yellow. Look at the picture of the colored circles below and try to solve the tasks to the right by using markers to fill in the white space with the color that would result from mixing the two colors shown.



CHECK IT OUT

SOAP ...

... is available in solid or in liquid form. Your parents use different soaps to wash dirty clothes, to clean different surfaces in your home, to wash their hair, and of course you can wash yourself with it! Soap can be a lot of fun, especially when it foams up in the bathtub. Foam is made of lots of tiny soap bubbles like the ones you made in your experiments.

Making Friends

Water and oil don't mix. Despite this, how can you use water to wash oil and fat off pots and plates? Very simply, you use an agent that "makes friends" of the two liquids. This agent is soap. It allows the blending of water and oil, because a single soap particle has both a "water-loving" and an "oil-loving" side.

Making Soap

Ask your parents to help you collect the small leftover bits of bathing soap bars. Shave them down into tiny bits and then press them all together to form a brand new bar of soap, in whatever shape you want!

Kosmos Quality and Safety

More than one hundred years of expertise in publishing science experiment 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, regardless of origin, follow the same rigid quality standards.

2nd Edition 2014

Pfizerstrasse 5 – 7, 70184 Stuttgart, Germany.
Tel. +49 (0)711 2191-343

Project management: Annette Büchele
Product development: Monika Schall
Concept: Dr. Bernd Flessner
Revision and proofreading: lektorat & textlabor, Christiane Theis, Gärtringen
Manual design: Atelier Bea Klenk, Berlin
Manual layout and illustrations: komuniki – Michael Schlegel, Würzburg; Andrea Mangold, München
Packaging design concept and layout: Peter Schmidt Group GmbH, Hamburg
Packaging illustrations: Andrea Mangold, München
Manual photos: abcmedia p.40 l (sugar); Alekss, p. 1 tl, 12 (beetle); Anna Khomulo, p. 40 b (foam); Anterovium p. 22 (balloons); blende40, p. 11 tr; Carola Schubbel, U2 (pots), p. 4 (pots), 11 l; ChaotiC_Photography, p. 3 tli, 12 (boy); Claudia Paulussen, p. 4 (girl); dd, p. 1 br, 32 bl (boat); erico, p. 12 (magnifying glass); focus finder, p. 39 b; frank peters: p. 3 br, 40 (test tubes); Inge Knol, p. 48 l; Jose Vida, p. 3 bl, 32 (bubbles); K.-U. Häßler, p. 4 (cress), 21; macroart, p. 1 or, 4 (sheet); Maxim Malevich, p. 48 tr; Michael Flippo, p. 47 tr; Monia, p. 22 (girl); picsfive, p. 12 (hands); reinobjektiv, p. 32 br (faucet); rotoGraphics, p. 22 br (straws); Sander, p. 32 tr (boat); Sascha Burkard, p. 39 t; seen, p. 47 tl; Thomas Graf, p. 32 b (mineral water); unpict, p. 11 br; Valentina Rusinova, p. 12 (sun); valiantmind, p. 30/31 (fish); vesnanonstop, p. 48 br; Viola Joyner, U2 (straws), p. 22 bl (straws); Yantra, p. 31, 40 (bear) (alle vorigen ©fotolia.com); TMg, p. 47 br (© Wikipedia, CC-BY-SA-2.5); pro-studios, Michael Flaig, Stuttgart, p. 2 (contents).
Packaging photos: pro-studios, Michael Flaig, Stuttgart.

The publisher has made every effort to locate the holders of image rights for all of the photos used. If in any individual cases any holders of image rights have not been acknowledged, they are asked to provide evidence to the publisher of their image rights so that they may be paid an image fee in line with the industry standard.

4th English Edition © 2011, 2015 Thames & Kosmos, LLC, Providence, RI, USA
Thames & Kosmos® is a registered trademark of Thames & Kosmos, LLC.
Editing: Ted McGuire
Additional Graphics and Layout: Dan Freitas

Distributed in North America by Thames & Kosmos, LLC.
Providence, RI 02903
Phone: 800-587-2872; Web: www.thamesandkosmos.com

Distributed in United Kingdom by Thames & Kosmos UK, LP.
Goudhurst, Kent TN17 2QZ
Phone: 01580 212000; Web: www.thamesandkosmos.co.uk

We reserve the right to make technical changes.

Printed in Germany / Imprimé en Allemagne

567001-03-020315