



## Instructions

**Warning!** — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Only for use by children 8 years of age and older. Use only under careful supervision of adults who have familiarized themselves with the kit's written safety precautions.

**Caution!** — Contains some chemicals categorized as hazardous to health. Read the instructions before use, follow them, and keep them on hand for reference.

Individual parts may have sharp points, corners, or edges. Do not injure yourself! Never bring the chemicals into contact with any part of your body, especially mouth and eyes. Keep small children and animals away from the experiments. Store the kit out of the reach of small children. Eye protection for adults not included.

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## Contents



Goggles	2 Stoppers for test tubes
Pipette	2 Measuring spoon (with two heads)
2 Measuring cups, 30 ml	pH Test strips
2 Measuring cup lids	Die-cut cardboard sheet
2 Test tubes	

### Additional Items

You will need these 16 test substances:

- |                                  |                                                                                                                                  |                                                  |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| • salt                           | • finely ground white pepper                                                                                                     | • tea leaves (from a tea bag)                    |
| • white flour                    | • washing soda (sodium carbonate, from the supermarket)                                                                          | • borax (from the supermarket)                   |
| • rice                           | • citric acid (or instant lemonade powder containing mostly citric acid)                                                         | • glucose tablets (dextrose, from the drugstore) |
| • granulated sugar               | • flavored sugar such as vanilla sugar (you can make your own by adding a drop of flavor extract to a few table-spoons of sugar) |                                                  |
| • baking soda                    |                                                                                                                                  |                                                  |
| • baking powder                  |                                                                                                                                  |                                                  |
| • white laundry detergent powder |                                                                                                                                  |                                                  |
| • coffee powder                  |                                                                                                                                  |                                                  |
| • cocoa powder                   |                                                                                                                                  |                                                  |

You will also need a tea light candle, paper towels, paper plates, and glass jars.

### Instructions for Using the Safety Goggles (Item No. 052279)

**Use:** The safety goggles are only to be used with the experiment kit.

Any other type of application is not permitted. Wear the goggles in such a way that the eye area is protected. If necessary, adjust the elastic band to the child's head circumference. The safety goggles can be used with contact lenses. Wearers of corrective eyeglasses need special safety goggles for people who wear glasses.

**Duration of Use:** Always wear the safety goggles when performing your experiments. Not intended for long-term use. The duration of wear should not exceed the time of the experiment.

**Storage:** Store safety goggles at room temperature in a dry room. After the experiment, return them to their place in the kit box, to keep them from being scratched.

**Cleaning:** Do not clean the safety goggles when they are dry. Rinse

them with clean water and, if necessary, with a mild household liquid detergent, and dry them with a soft cloth.

**Maintenance:** In case of defective safety goggles or scratched lenses, exchange them for an equivalently constructed pair.

**Inspection:** Check the safety goggles to make sure they are in good condition, and replace them if they are damaged.

**Warning:** Some extremely sensitive individuals may experience an allergic reaction after skin contact with some materials under some circumstances.

**Replacement:** These safety goggles are available as a replacement part.

The safety goggles are tested per EC guideline 89/686/EEG (personal protective equipment) and EN 166, as well as EC guideline 88/378/EEG and EN 71-4. Test center per EC guideline 89/686/EEG and EN 166 Certification Center 0196: DIN CERTO, Westliche 56, Pforzheim, Germany. Test center per EC guideline 88/378/EEG and EN 71-4 Certification Center 0197: TÜV Rheinland Product Safety GmbH, Am Grauen Stein, Köln, Germany

## Advice for Parents and Adults

This experiment kit is intended for children over 8 years of age. Select the experiments that you think are appropriate for your child. Before starting, please read through these instructions, the safety rules, and the first aid information, follow them, and keep them on hand for reference. The incorrect use of chemicals can lead to injury or other health risks. Only carry out experiments that are described in the instruction manual. The area around your work place should be kept free of all obstructions, and it should be sufficiently far from food storage areas. It should be well lit and well ventilated, and equipped with a water tap. There should be a solid table with a rugged, fire-resistant surface that you can wipe off. During all experiments, the safety glasses should be worn to protect the eyes.

### Rule for Safe Experimentation

1. Read the experiment manual before starting the experiments, follow its instructions and keep it on hand for ready reference.
2. Thoroughly prepare your work area. Clear off the table and make sure that all the things you will need are ready.
3. Only perform the experiments described in this manual. If safety precautions are mentioned, be sure to follow them.
4. Always wear the safety glasses when performing the experiments. If something gets into your eye by mistake, such as a squirt of citric acid solution, rinse your eye thoroughly with water. Let an adult help you.
5. When you are done, cleaned all the equipment that you used and always leave your work area clean. Any leftover solid substances can be thrown into the garbage, and liquids can be rinsed down the drain with plenty of water.
6. Any investigated foods must be disposed of afterwards.
7. Do not eat or drink while performing experiments.
8. Provide necessary fire protection when experimenting with candles. Set the candle on a fireproof base. Never leave burning candles unattended, and extinguish them after the experiment.
9. If you spill anything, wipe it up immediately with a paper towel.
10. When performing experiments, wear old clothes that you don't mind getting dirty.
11. Wash your hands thoroughly after completing your experiments.

### General First Aid Information

In case of contact with eyes and in case of injury: Rinse the affected area with plenty of water and in case of injury always seek medical help. In case of swallowing: Rinse mouth with water and drink fresh water. Do not induce vomiting. Seek medical help without delay. In case of inhalation of dust: Bring the individual into fresh air.

## Experiments

When a scientist finds an unidentified substance, he or she uses precise examinations and chemical tests to determine the composition of the unknown substance. This process is called **chemical analysis**.

In this kit, you will use simple tools to investigate a whole range of common household substances. You will use a few different chemical investigation methods, along with your eyes and nose. Of course, you are not allowed to use your tongue, since some of the materials might be harmful to your health. Now, let's get started.

### 01 Experiment

#### Using Your Eyes and Nose

As a chemistry detective, you should try to get to know as many different substances as possible from your environment — particularly the common chemicals found around the house.

**You will need:** measuring spoon, 16 small name cards, paper, 16 test substances from the Additional Items section on the Contents panel

Take one sample of each substance with the measuring spoon and place the samples on a piece of paper. You will have to crush up the glucose tablet into a powder. Ideally, lay your sheet of samples on a rigid piece of cardboard or a tray to support it.

Set the matching name card next to each sample. Conduct a visual inspection. Carefully observe and sniff each sample.



#### i Why?:

Many substances from the kitchen have very different appearances. With some white powders, you can see that they are made of very small crystals, while you see no crystals in baking soda, glucose powder, or powdered sugar. Rice comes in little grains. Flavored sugar, laundry detergent, coffee, cocoa, and ground pepper have a particularly noticeable aroma. Observe the appearance and aroma of each substance. That alone will be enough to identify pepper, tea, coffee, cocoa, and rice.

### 02 Experiment

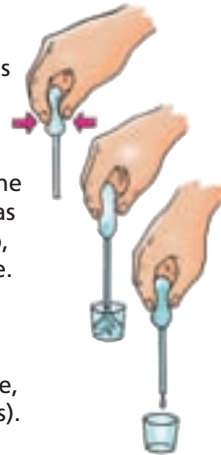
#### Into the Water

It's a little harder to tell the white substances apart. In such cases, a chemistry detective first investigates whether the substance dissolves in water.

**You will need:** measuring cup, measuring spoon, pipette, table salt, flour, baking soda, citric acid, sugar, glucose powder, borax, baking powder, flavored sugar, washing soda, laundry detergent

#### How to Use the Pipette

You will use the dropper pipettes to add liquids drop by drop. Squeeze the upper part of the pipette with your thumb and index finger and dip the tip of the pipette into the liquid. As soon as you release pressure on the bulb, the liquid will rise up the pipette. Then, with a light squeeze, you can add the liquid drop by drop. After each use, rinse the pipette thoroughly (fill with water, shake, and squeeze empty several times).



Place a small measuring spoonful of table salt in the measuring cup, add two pipettes of warm water, and stir with the measuring spoon. Wait a few minutes to see if the salt dissolves. Thoroughly rinse the measuring cup and repeat the experiment with each of the other substances. What can you determine? What does the laundry detergent do? And what happens to the baking powder when you add water?



#### i Why?:

All of the materials here except flour dissolve in water. In the process, baking powder forms gas bubbles and laundry detergent forms foam. You can use this as a simple test to tell flour, baking powder, and laundry powder apart from the other white substances.

### 03 Experiment

#### Sour or Not?

As you know, vinegar tastes sour — chemists call it an **acid**. Citric acid is also a kind of acid. On the other hand, there are other substances that are, in a manner of speaking, the counterparts or opposites of acids. They are called **bases**. Chemists are able to determine the level of acidity of a solution (its so-called pH value) without having to use their tongues. That's what the strips of paper are for. They are called pH indicator strips, and they will change color to reveal the acidity of a solution.

**You will need:** 2 measuring cups, pipette, measuring spoon, pH indicator strips, citric acid, table salt, granulated sugar, flavored sugar, washing soda, baking soda, borax, glucose

In one measuring cup, dissolve a spoonful of citric acid in water. Fill the other cup with only water. Cut each pH indicator strip into four pieces. Briefly dip a piece into each liquid. Compare the colors to the pH color scale on the other side of this instruction sheet. Repeat the experiment with each of the seven other substances listed in the materials above.

**When working with acids and bases, it is very important to wear safety goggles.**

#### i Tip:

Keep the pH indicator strips in their sealed bag until you are ready to use one, because even the moisture in the air can alter the indicator strip's color slightly. The indicator strip can also stain your fingers, so wash them thoroughly after experimentation. Put the used strips on a piece of scrap paper so they don't stain your work surface.

#### i Why?:

You can use the test strips to determine the degree of acidity of a solution, and thereby differentiate citric acid, borax, and washing soda from the other white powders.

