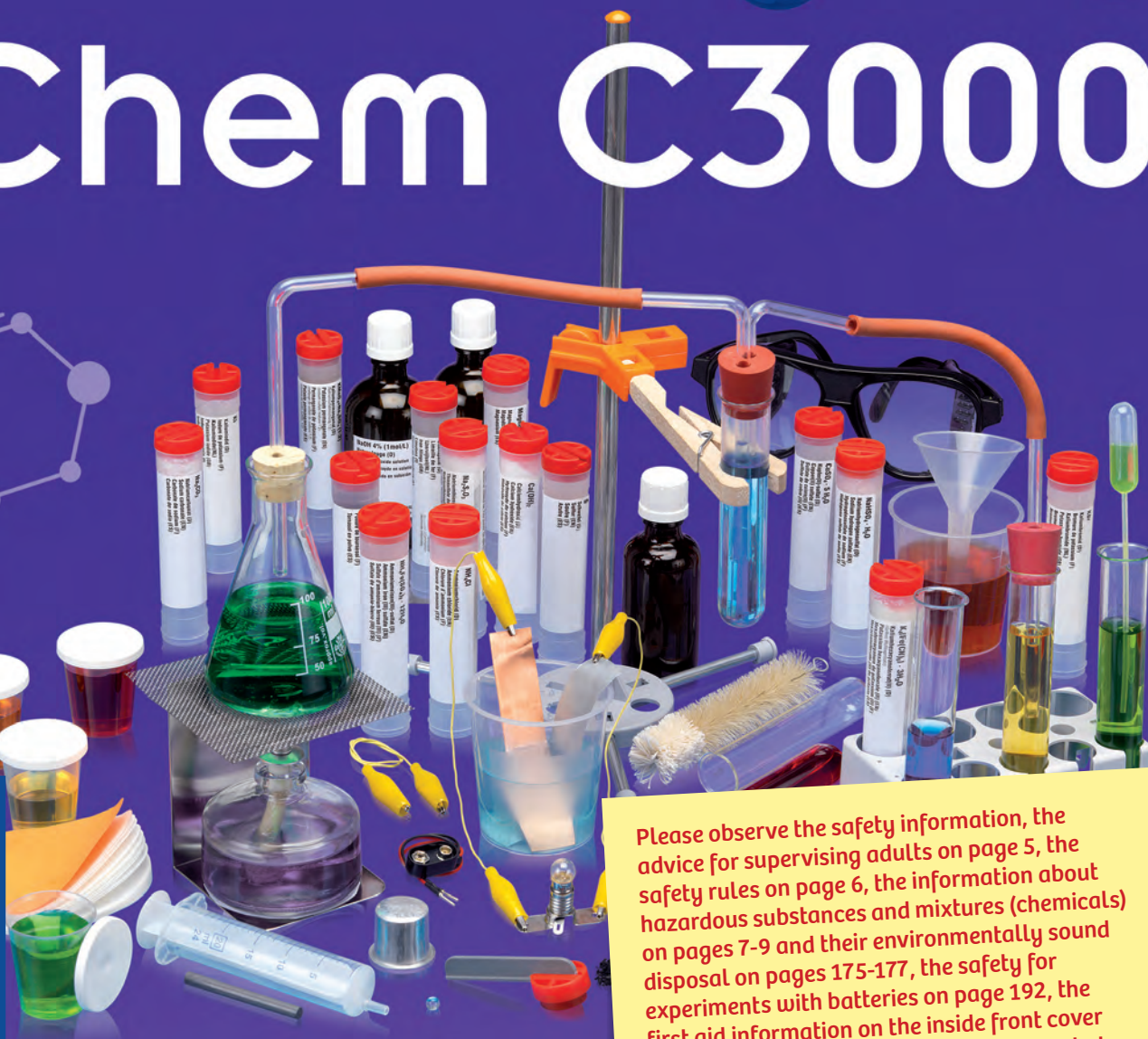


Chem C3000

THAMES & KOSMOS



Please observe the safety information, the advice for supervising adults on page 5, the safety rules on page 6, the information about hazardous substances and mixtures (chemicals) on pages 7-9 and their environmentally sound disposal on pages 175-177, the safety for experiments with batteries on page 192, the first aid information on the inside front cover and the instructions on the use of the alcohol burner on page 12.

WARNING. Not suitable for children under 12 years. For use under adult supervision. Contains some chemicals which present a hazard to health. Read the instructions before use, follow them and keep them for reference. Do not allow chemicals to come into contact with any part of the body, particularly the mouth and eyes. Keep small children and animals away from experiments. Keep the experimental set out of reach of children under 12 years old. Eye protection for supervising adults is not included.

WARNING — Chemistry Set. This set contains chemicals 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.

First Aid Information

When conducting experiments with chemicals and in case any accidents should happen during experimentation:

In case of injury, seek immediate medical help.

1. **In case of eye contact:** Wash out eye with plenty of water, holding eye open if necessary. Rinse from the nose outward. Seek immediate medical advice.
2. **If swallowed:** Wash out mouth with water, drink some fresh water. Do not induce vomiting. Seek immediate medical advice.
3. **In case of inhalation:** Remove person to fresh air. For example, move person into another room with open windows or outside.
4. **In case of skin contact and burns:** Wash affected area with plenty of water for at least 10 minutes. Cover burns with a bandage. Never apply oil, powder, or flour to the wound. Do not lance blisters. For larger burns, seek immediate medical help.
5. **In case of doubt, seek medical advice without delay.** Take the chemical and its container with you.
6. **In case of injury always seek medical advice.**
7. **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 germ-free, dry first-aid bandage. Foreign objects such as glass splinters should only be removed from the wound by a doctor. Seek medical advice if you feel a sharp or throbbing pain.

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

Local Hospital or Poison Centre (Europe)

Record the telephone number of your local hospital or poison centre here:

Write the number down now so you do not have to search for it in an emergency.

Warning! Contains functional sharp points or edges that pose a risk of injury.

Keep the packaging and instructions as they contain important information.



Substance/mixture

- is unstable, explosive
- contains explosives



Substance/mixture

- is flammable
- is self-igniting
- forms flammable gases with water



Substance/mixture

- may intensify fire (is an oxidizer)



Compressed gas cylinders

- compacted/under pressure
- liquefied
- frozen
- dissolved gases may explode



Substance/mixture causes

- corrosion (destruction) of metals
- burns on skin
- severe eye damage



Substance/mixture

- has life-threatening acute toxicity
- is acutely toxic if swallowed, if on skin, or if inhaled



Substance/mixture is

- acutely harmful if swallowed, in contact with skin, or inhaled
- an irritant to skin, eyes and respiratory tract
- sensitizing to skin
- narcotic



Substance/mixture can

- cause cancer
- mutate genes
- harm fertility
- damage organs
- sensitize the airways
- be fatal if swallowed or inhaled



Substance/mixture is

- acutely very toxic
- very toxic or toxic with long lasting effects to aquatic life

Brief Explanation of the GHS Hazard Pictograms

The chart to the left shows the Globally Harmonized System (GHS) pictograms. The text under each symbol cites dangers associated with substances that are designated with the pictogram.

A substance/mixture designated with a pictogram may be associated with one or more of the hazards listed under that pictogram. For example, copper sulfate (exclamation point) is harmful and irritant. You can find out exactly what hazards are associated with a certain substance in this kit by referring to the list on pages 7 to 9.

Chem C3000

Experiment Manual

Kurt Waselowsky

Franckh-Kosmos Verlags-GmbH & Co. KG, Stuttgart, Germany
Thames & Kosmos, LLC, Providence, RI, USA



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The Chem C3000 contains the following parts:

Component Tray 1

No .	Description	Item No.	No .	Description	Item No.
1	Two dropper pipettes	232134	26	Copper(II) sulfate, 8g	772522
2	Rubber stopper without hole	071078	27	Litmus powder, 1g	772502
3	Rubber stopper with a hole	071028	28	Five test tubes	062118
4	Cork stopper with a hole	071118	29	Small bottle for litmus solution	772510
5	Test tube brush	000036	30	Safety cap with dropper insert for litmus bottle	704092
6	Test tube holder	000026	31	Double-headed measuring spoon	035017
7	Protective goggles (safety goggles)	717019			
8	Magnesium strip	772500			
9	Lid opener tool	070177			
10	Test tube stand	070187			
11	Copper wire	000063			
12	Clip for 9-volt battery	712310			
13	Funnel	086228			
14	Two large graduated beakers	087077			
15	Two lids for large graduated beakers	087087			
16	Boiling rod	065458			
17	Angled tube	065378			
18	Pointed glass tube	065308			
19	Sodium hydrogen sulfate, 25g (also known as sodium bisulfate)	772503			
20	Calcium hydroxide, 8.5g	772506			
21	Potassium hexacyanoferrate(II), 4g	772505			
22	Sodium carbonate, 12g	772504			
23	Ammonium chloride, 10g	772508			
24	Potassium permanganate mixture, 10g (Potassium permanganate-sulfuric acid mixture 1:2 m/m)	775526			
25	Sulfur, 4.5g	772524			

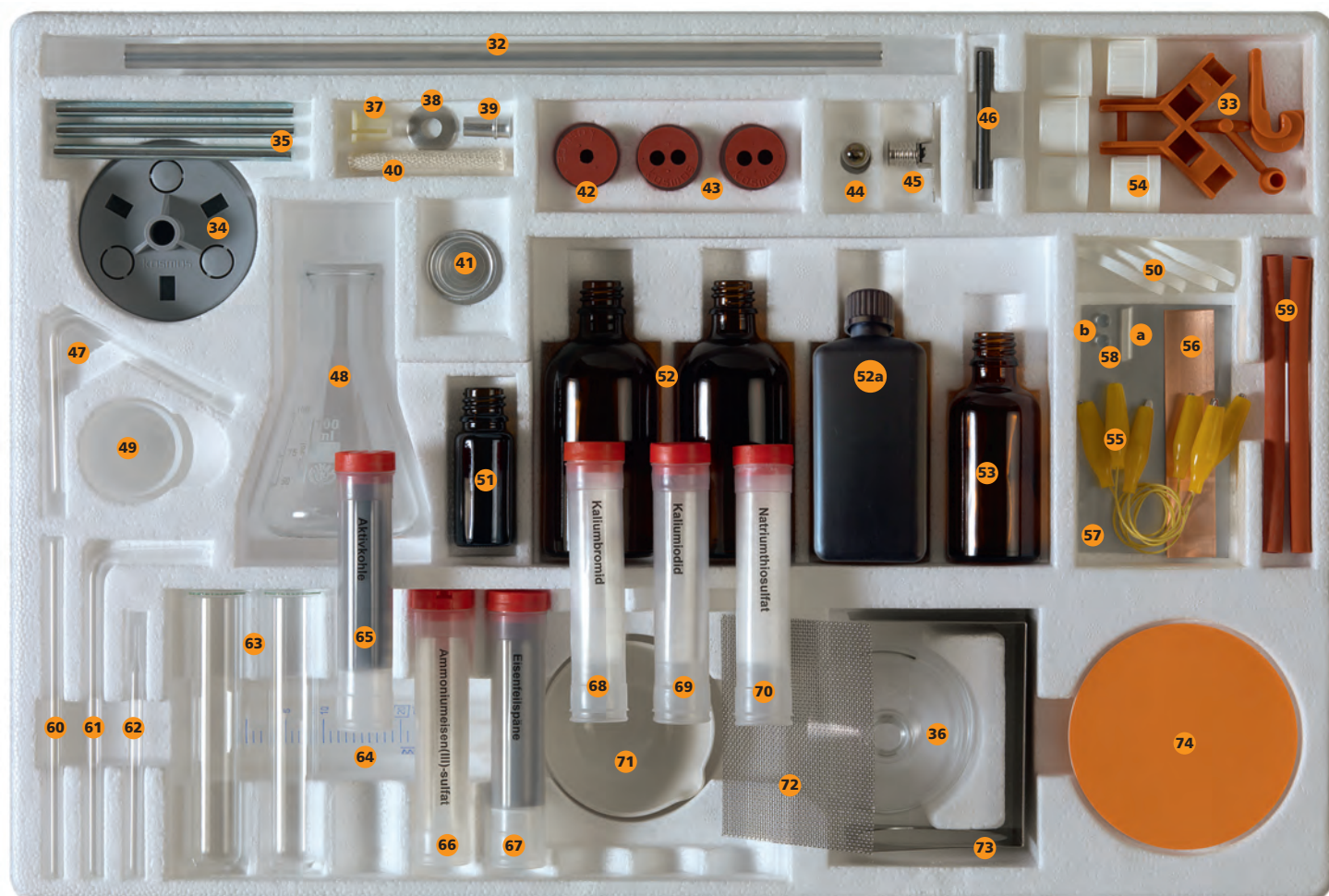
Please check to make sure that all of the parts and chemicals listed in the parts list are contained in the kit.

How can individual parts be reordered?

Contact Thames & Kosmos customer service to inquire about an order.

Additional materials required

On page 16, we have made a list of the additional materials required for a number of experiments.



Component Tray 2

No . Description	Item No.	No . Description	Item No.
32 Tripod stand consisting of		52 Two bottles, 100 ml (for sodium hydroxide and hydrochloric acid)	each 703853
33 Tripod pipe	035057	52a Plastic bottle, 100 ml (for hydrogen peroxide)	263160
34 Tripod collar	035056	53 Bottle, 50 ml (for ammonia solution)	701413
35 Three rods for tripod base	083247	54 Five safety lids for bottles each	075088
	011307	55 Three wires, double-ended with alligator clips each	000267
Alcohol burner consisting of		56 Copper sheet	703858
36 Burner base	061117	57 Zinc sheet	771431
37 Insulating piece	048067	58 Bag with silicone hose coupler (a) and two glass balls (b)	771432
38 Aluminum disk	021787	59 Two rubber hoses each	044473
39 Wick holder	021777	60 Straight glass tube	065188
40 Wick	051056	61 Angled tube	065378
41 Burner cap	021797	62 Pointed glass tube	065308
42 Rubber stopper with a hole	071028	63 Two test tubes each	062118
43 Two rubber stoppers with two holes	071038	64 Plastic syringe	086258
44 Light bulb (6 V; 50 mA)	704094	65 Activated charcoal, 8g	772518
45 Bulb socket	702218	66 Ammonium iron(III) sulfate, 5g	772507
46 Carbon electrode	026217	67 Iron powder (iron filings), 13g	772516
47 Acute-angle glass tube	065268	68 Potassium bromide, 15g	772521
48 Erlenmeyer flask	062138	69 Potassium iodide, 6g	772520
49 Four small graduated beakers	061150	70 Sodium thiosulfate, 12g	772523
50 Four lids for small graduated beakers	061160	71 Evaporating dish	063057
51 Bottle, 10 ml (for silver nitrate solution)	701883	72 Wire netting (wire mesh)	100187
		73 Burner stand	703859
		74 Filter paper (round filter)	080156
		75 Label sheet (not pictured)	711466

Safety Information

Advice for Supervising Adults

What you need to know about chemistry experiment kits and using them

You are about to accompany your child or student on an expedition through several realms in the vast world of chemistry. Congratulations! In doing this, you will be doing your part to get the next generation interested in science and technology at an early age. With the Chem C3000 chemistry kit, every day can be a day of scientific discovery, during which your child can investigate a countless number of materials from his or her everyday life.

Like all Thames & Kosmos experiment kits, Chem C3000 assumes users have no prior knowledge of chemistry. All of the work techniques are described in complete detail, and all important concepts are thoroughly explained. Safety alone would require this, but it is also necessary for providing an effective learning experience. The scientific explanations that accompany each experiment are primarily addressed to teenagers who already know about a lot of the topics from school. The quiz questions (p. 185) are mainly intended for them as well.

With a chemistry experiment kit, you will of course be wondering about the issue of safety. This kit complies with all applicable US consumer product safety regulations, including those for chemistry sets. Moreover, this kit complies with the more rigorous **European safety standard EN 71-4**, in which the safety requirements for chemistry experiment kits are established, to reduce risks to a minimum. This standard forms the reliable basis of all Thames & Kosmos chemistry experiment kits. The standard contains requirements for the manufacturer, for example that no particularly hazardous substances can be used. They also require the manufacturer to carefully inform the parents or adult supervisors of the possible hazards and to require them to accompany their children in their new hobby with a helping hand.

Therefore, please read all of the safety information prescribed by EN 71-4 listed in the box on the right as well as the advice below. Emphasize to your child the importance of following all of this information, and the importance of carrying out only those experiments that are described in this manual.

The safety rules (pages 6 and 192), the information about hazardous substances and mixtures (pages 7 – 9), and the safety information accompanying the experiments inform you of the risks and help you to estimate the suitability of the experiments for your child. In case anything should happen, please find the first aid information and the poison control center contact information on the inside front cover. To avoid injuries please inform your child of how to handle glass tubes as described on page 15 (inserting it into the rubber stop and removing it from the stopper), how to use the alcohol burner (page 12), how to heat liquids in the test tubes (Experiments 1 and 2). Please do the following steps yourself: filling the burner with alcohol (page 12) and filling the additional chemicals (page 16) into the designated bottles.

Setting up the working area is described on page 11. The proper waste disposal is described on pages 175 – 177. A list of additionally required materials can be found on page 16.

We propose that you carry out the experiments in the prescribed order, because the knowledge of working techniques described in the earlier experiments is a prerequisite for the later ones.

We hope your young chemist, and you as well, have a lot of fun and success with the experiments!

Tips and information for you and the child performing experiments

- Safety rules for chemical experiments (p. 6)
- Safety for experiments with batteries (p. 192)
- Hazardous substances and mixtures/chemicals (p. 7 – 9)
- Setting up the workplace (p. 11)
- Handling denatured alcohol and using the alcohol burner (p. 12)
- Handling glass tubes (p. 15)
- Additional materials required (p. 16)
- Preparing the litmus solution (p. 27)
- Proper waste disposal (p. 175 – 177)
- Information about the safety goggles (inside back cover)
- Poison control centers (inside front cover)
- First aid information (inside front cover)

Advice for Supervising Adults

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

B. The incorrect use of chemicals can cause injury and damage to health. Only carry out those experiments which are listed in the instructions.

C. This experimental set is for use only by children over 12 years.

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

E. The supervising adult should discuss the warnings and safety information with the child or children before commencing the experiments. Particular attention should be paid to the safe handling of acids (e.g. citric acid), alkalis (bases, e.g. sodium carbonate) and flammable liquids (denatured alcohol).

F. The area surrounding the experiment 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. Instructions for the use of the burner (see page 12).

Safety Rules

All of the experiments that are described in this manual can be performed without danger if you carefully follow the tips and rules summarized below and on p. 192.

Safety rules for chemical experiments

1. **Read these instructions before use, follow them and keep them for reference.** Pay special attention to the quantity specifications and the sequence of the individual tasks. Only perform experiments that are described in this instruction manual.
2. **Keep young children, animals and those not wearing eye protection away from the experimental area.**
3. **Always wear eye protection.** If you wear corrective eyeglasses, you will need protective goggles for those who wear eyeglasses. When working, wear appropriate protective clothing (old smock and smooth fingered gloves)
4. **Store this experimental set out of reach of children under 12 years of age.** As well as the additional materials, for example in a lockable cabinet.
5. **Clean all equipment after use.**
6. **Make sure that all containers are fully closed and properly stored after use.**
7. **Ensure that all empty containers are disposed of properly.**
8. **Wash hands after carrying out experiments.** Chemicals that accidentally get onto your skin must be rinsed off immediately under running water.
9. **Do not use any equipment which has not been supplied with the set or recommended in the instructions for use.**
10. **Do not eat or drink in the experimental area.** Do not use any eating, drinking or other kitchen utensils for your experiments unless it is specifically recommended. Any containers or equipment you use in your work should not be used in the kitchen afterwards. Dispose of used drinking straws in the garbage immediately after the experiment. Do not save and reuse them.
11. **Do not allow chemicals to come into contact with the eyes or mouth.**
12. **Do not replace foodstuffs in original container. Dispose of immediately (in the household trash or the sink).** If you are investigating food products (e.g., sugar, flour, table salt), fill the required amount into one of the graduated beakers (do not use the double-headed measuring spoon for this). Make note on the beaker of what it contains and the date it was filled.
13. During the experiments with open flame, be sure that there are no flammable objects or liquids nearby. Extinguish the flame at the end of the experiment at the latest as well as when you leave the experiment area even just for a moment. The tealight candle required for some experiments has to be placed on a fire-resistant surface (such as an old plate). Have a bucket or box with sand ready for extinguishing any fires. If the fire can't be extinguished right away notify the fire department immediately
14. When heating test tubes, always hold them with their opening pointed away from you and other people.
15. Immediately wipe up any spilled liquids that evaporate quickly and are highly flammable (e.g. denatured alcohol), and thoroughly rinse out the rag
16. Any filled container or experimental apparatus that are to remain standing for a longer period of time (e.g., for the precipitation of substances) has to be labeled and stored out of reach of young children and animals.
17. Get any additionally required materials ready before starting an experiment.
18. Handle breakable materials (e.g. the glass test tubes or glass tubes) carefully.

Also note the information on the chemical vial labels, the information about "Hazardous substances and mixtures" on p. 7 – 9 as well as the safety and waste disposal instructions for the individual experiments (for example, regarding hazardous gases or how to properly handle the glass tube). If additional products are required, also take note of the warnings on their packaging (e.g. for denatured alcohol).

Hazardous Substances and Mixtures (Chemicals)

How they are labeled and how to properly handle them

On the following pages, we provide you with a list of the chemicals contained in this chemistry set as well as the chemicals you will be obtaining in addition that are classified as hazardous substances or hazardous mixtures. For each substance, the list shows **hazard statements** (in blue) and precautionary statements for avoiding the hazards. In the margin, you will find the corresponding **pictograms** and a **signal word** for the scope of the hazard: WARNING means limited risk, and DANGER means elevated or significant risk

All of the pictograms and the hazards they designate are presented on the inside front cover. In the following list of materials, you will see just five pictograms. In experiments in which you will be producing poisonous gases, you will also see a skull-and-crossbones pictogram. The three remaining pictograms designate hazards that are not caused by the materials with which you will be experimenting. We included these pictograms because, sooner or later, you will encounter them in your everyday life, such as the compressed gas bottle in the school lab or the human torso on a container of gas. The pictograms are a component of Regulation (EC) No. 1272/2008, also called the GHS Regulation, which went into effect in 2009. GHS stands for Globally Harmonized System, a system whose aim is to achieve a classification and designation of hazardous substances and mixtures that is uniform throughout the world.

Some of the chemicals listed below only cause limited risks. Therefore they are not labeled with a pictogram or signal word. Nevertheless, the given precautionary statements should be observed.

Activated charcoal

Not a hazardous substance

Ammonia solution (about 3.4% = 2 mol/L) (Not included)

Causes serious eye irritation. – **May cause respiratory irritation.** – **Causes skin irritation.**

Avoid breathing vapors. – Wear protective gloves and eye protection. – IF ON SKIN: Wash with plenty of soap and water. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention. – Avoid release to the environment. (Classification and hazard and precautionary statements for solutions > 5%)



Ammonium carbonate/Ammonium bicarbonate (salt of hartshorn) (Not included)

Harmful if swallowed. – **Causes serious eye irritation.** – **May cause respiratory irritation.**

Avoid breathing vapors. – Wear eye protection. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.



Ammonium chloride

Harmful if swallowed. – **Causes serious eye irritation.**

Wash face, hands and any exposed skin thoroughly after handling. – Do not eat, drink or smoke when using this product. – Wear protective gloves/protective clothing/eye protection/face protection. – Wear eye/face protection. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. – IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth.



Ammonium iron(III) sulfate

Not a hazardous substance

Obtain special instructions before use. May cause slight eye irritation. – Prolonged or repeated contact may dry skin and cause irritation.

Calcium hydroxide

Causes skin irritation. – **Causes serious eye damage.** – **May cause respiratory irritation.**

Do not breathe dust. – Wear eye protection. – IF ON SKIN: Wash with plenty of soap and water. – IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. – Get medical advice/attention. The warnings also apply to its solution in water, called **limewater** (for preparations, see Experiments 60/61).



Citric acid (Not included)

Not a hazardous substance

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Further processing of solid materials may result in the formation of combustible dusts.



DANGER

Copper(II) sulfate

Harmful if swallowed. – Toxic in contact with skin. – Causes skin irritation. – Causes serious eye irritation.

Wash face, hands and any exposed skin thoroughly after handling. – Do not eat, drink or smoke when using this product. – Wear protective gloves/protective clothing/eye protection/face protection. – Specific treatment (See first aid instructions). – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. – IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/physician if you feel unwell. Remove/Take off immediately all contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical advice/attention. – IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth.

Very toxic to aquatic life with long lasting effects.

Avoid release to the environment. Comply with the instructions for disposal in the manual. Follow instructions for disposal (A4, A5, p. 176).



DANGER

Denatured alcohol (or methylated spirits; main ingredient ethanol, ethyl alcohol) (Not included)

Highly flammable liquid or vapors

Keep away from heat/sparks/open flames/hot surfaces. No smoking. – Keep container tightly closed. Storage: Store in a well-ventilated place. Keep cool.

Request to parents: Keep denatured alcohol locked away. Fill burner yourself and decant the amount that will be required for a few experiments into the test tube.



DANGER

Hydrochloric acid (about 7% = 2 mol/L). (Not included)

Causes serious eye irritation. – May cause respiratory irritation. – Causes skin irritation.

Avoid breathing vapors. – Wear protective gloves and eye protection. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention. IF ON SKIN: Wash with plenty of soap and water. – IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. – IF SWALLOWED: rinse mouth. Do NOT induce vomiting. (Classification and hazard and precautionary statements for solutions 10–25%)

Hydrogen peroxide (3%) (Not included)

Do not get in eyes or on skin.



WARNING

Iron powder (iron filings)

Flammable solids.

Wash face, hands and any exposed skin thoroughly after handling. – Do not eat, drink or smoke when using this product. – Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Ground/bond container and receiving equipment. – Use explosion-proof electrical/ventilating/lighting/equipment. – Wear protective gloves/protective clothing/eye protection/face protection. – IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth. – In case of fire: Use CO₂, dry chemical, or foam for extinction.

Litmus powder

Not a hazardous substance



DANGER

Magnesium strip

Flammable solids.

Wash face, hands and any exposed skin thoroughly after handling. – Do not eat, drink or smoke when using this product. – Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Ground/bond container and receiving equipment. – Use explosion-proof electrical/ventilating/lighting/equipment. – Wear protective gloves/protective clothing/eye protection/face protection. – IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth. – In case of fire: Use CO₂, dry chemical, or foam for extinction.



WARNING

Potassium bromide

Causes serious eye irritation.

Wash face, hands and any exposed skin thoroughly after handling. – Wear protective gloves/protective clothing/eye protection/face protection. – Wear eye/face protection. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Potassium hexacyanoferrate(II)

Not a hazardous substance

Obtain special instructions before use. May be harmful if swallowed. – Harmful to aquatic life with long lasting effects. – May cause slight eye irritation.



WARNING

Potassium iodide

Causes serious eye irritation. – Causes skin irritation.

If medical advice is needed, have product container or label at hand. – Read label before use. – Wash skin thoroughly after handling. – Wear protective gloves/protective clothing/eye protection/face protection. – IF ON SKIN: Wash with soap and water. – Specific treatment (See first aid instructions). – If skin irritation occurs: Get medical advice/attention. – Take off contaminated clothing and wash before reuse. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Potassium permanganate preparation (Mixture 1:2 with Sodium sulfate)

Harmful if swallowed. – Harmful in contact with skin. – May intensify fire, oxidizer.

Wash face, hands and any exposed skin thoroughly after handling. – Do not eat, drink or smoke when using this product. – Do not breathe dust/fume/gas/mist/vapors/spray. – Wear protective gloves/protective clothing/eye protection/face protection. – Keep away from heat/sparks/open flames/hot surfaces. – No smoking. – Keep/Store away from clothing/combustible materials. – Take any precaution to avoid mixing with combustibles. – Wear fire/flame resistant/retardant clothing. – Immediately call a POISON CENTER or doctor/physician. – Specific treatment (See first aid instructions). – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. – Wash contaminated clothing before reuse. – IF ON CLOTHING: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes. Rinse skin with water/shower. – IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician. – IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth. Do NOT induce vomiting. – In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion. – In case of fire: Use CO₂, dry chemical, or foam for extinction

Very toxic to aquatic life with long lasting effects.

Avoid release to the environment. Comply with the instructions for disposal in the manual. Follow instructions for disposal (A7, A8, p. 176).



DANGER

Salt of Hartshorn, see Ammonium carbonate/Ammonium bicarbonate (Not included)

Silver nitrate solution (1%) (Not included)

Causes serious eye irritation. – Causes skin irritation. – Very toxic to aquatic life with long lasting effects.

Wear protective gloves and eye protection. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention. – IF ON SKIN: Wash with plenty of soap and water. – Deliver solution and bottle residues to hazardous waste facility. – Avoid release to the environment. – Follow special instructions for disposal (A10, p. 177).



DANGER

Sodium carbonate

Harmful if inhaled. – Causes serious eye irritation.

Avoid breathing dust/fume/gas/mist/vapors/spray. – Use only outdoors or in a well-ventilated area. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. – IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.



WARNING

Sodium hydrogen sulfate

Causes serious eye irritation.

Wear protective gloves/protective clothing/eye protection/face protection. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.



DANGER

Sodium hydroxide solution (soda lye) (about 4% = 1 mol/L) (Not included)

Causes severe skin burns and eye damage.

Wear protective gloves, protective clothing and eye protection. – IF SWALLOWED: rinse mouth. Do NOT induce vomiting. – IF ON SKIN: Take off immediately all contaminated clothing. Rinse skin with water. – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. – IF exposed or if you feel unwell: Immediately call a POISON CENTER or doctor.



DANGER

Sodium thiosulfate

Not a hazardous substance

Sulfur

Causes skin irritation. – Flammable solids.

Wash face, hands and any exposed skin thoroughly after handling. – Wear protective gloves/protective clothing/eye protection/face protection. – Keep away from heat/sparks/open flames/hot surfaces. – No smoking. – Ground/bond container and receiving equipment. – Use explosion-proof electrical/ventilating/lighting/equipment. – Specific treatment (See first aid instructions). – IF ON SKIN: Wash with plenty of soap and water. – If skin irritation occurs: Get medical advice/attention. – Take off contaminated clothing and wash before reuse. – In case of fire: Use CO₂, dry chemical, or foam for extinction.



WARNING

Warning! The following applies to all chemicals:

Store locked up. Keep out of reach of children. This applies to all children except for the experimenting child who is being instructed and supervised by an adult.

Also follow this precautionary statement:

IF SWALLOWED: Get immediate medical advice/attention and have product container or label of chemical substance at hand.

For the sake of environmental protection: **Dispose of contents/ containers (of no-longer-needed chemicals) to a hazardous waste disposal location.**



For information on the **protective equipment**, see "Workspace and Equipment" on p. 11.

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Chemistry: The Science of Materials



*The laboratory, workplace of the chemist
(photo: Novartis Pharma)*

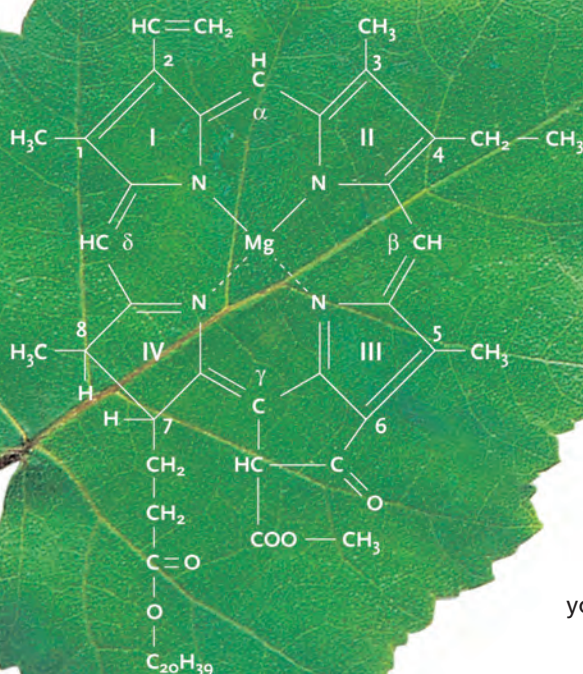
"Chemistry is the study of materials and the transformations they undergo." The introduction to most chemistry textbooks says something to that effect. By material, a chemist simply means whatever things are made of, living or not. Iron, water, carbon, dynamite, glucose, and protein are materials or mixtures of materials. Their different properties are explained in terms of their different compositions. You will learn a little about this in your foray through the worlds of organic and inorganic chemistry.

There are people who draw a sharp division between natural materials and "chemical" materials. By "chemical" materials, they mean those things that come out of the labs and factories of the chemical industry. For chemists, there is no such distinction. All materials that are studied in terms of their properties, their composition, and the changes they are capable of undergoing are the subject matter of chemistry.

Since a natural material in a test tube behaves the same as a "chemical" material, you can use the chemicals contained in this kit (such as copper sulfate) to perform tests for natural materials (such as glucose or protein in various foods). An expert would also be able to indicate the exact composition of a material, including a natural material. This kind of investigation is called an analysis (meaning a decomposition of a whole into its component parts). Based on insights gained in this way, it is often possible to produce a natural material — say, vitamin C — out of other materials. This kind of process is known as synthesis (joining together). The vitamin C synthesized in this manner, by the way, is identical to the natural substance found in a lemon or other plants.

We won't ignore the fact that there are also materials that have been developed and that have proven themselves to be problematic — certain insecticides, solvents, and medications, for example. But it isn't true that things that are dangerous to humans primarily come from "chemical" materials. Over-fertilization with nitrates can just as easily come from animal manure as artificial fertilizer, and everybody has heard about environmental dangers resulting from overuse of natural fuels — wood, coal, and petroleum.

The study of natural materials is also the task of a chemist. This is the formula for the leaf pigment chlorophyll.



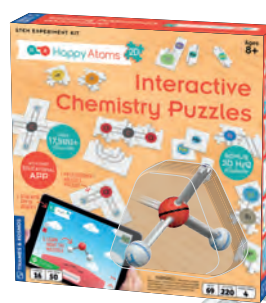
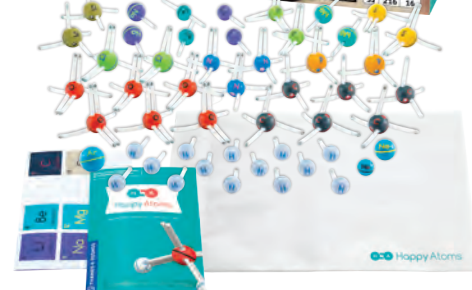
Almost all environmental problems are of a material nature, which is why it is up to chemists — specialists in materials and their transformations — to play a key role in solving them. Chemists understand methods for studying pollutants (analysis), and their skills are needed when it comes to devising processes and technologies for controlling pollution emissions (such as flue gas desulfurization and catalytic converters for automobiles). And finally, it is the task of a chemist to help in the creation of new, healthy, environmentally friendly products. Chemistry is — today more than ever — a science with a future. Maybe for you, too?



HappyAtoms

A revolutionary approach to teaching chemistry

This physical and digital system lets you discover the world of molecules in an intuitive, hands-on way. Assemble molecules using a set of magnetic atoms representing 16 different elements. Then use the included app (for iOS and Android devices) to scan and identify the molecules. The app teaches you about molecules and bonding with guided labs and open-ended discovery.



Available in various set sizes as well as a 2D version

Instructions for use for the safety goggles (Art.-Nr. 717019)

Manufacturer Frame: Georg Schmerler GmbH & Co. KG / Reitweg 7 / 90587 Veitsbronn / Germany

Manufacturer Lens: IPB NV / Steenovenstraat 30 / 8790 Waregem / Belgium

Certification Office: ECS GmbH – European Certification Service / Hüttfeldstr. 50 / 73430 Aalen, DE / Germany / Notified Body Number: 1883

GSF – Safety goggles comply with the Regulation (EU) 2016/425 on personal protective equipment (PPE), are design tested, and bear the CE symbol. The Model 610 in this kit is suitable for protection against mechanical dangers.

Identification of the frame:

GSF = Code letter of manufacturer

166 = Number of the standard

S = increased robustness

CE = EC Conformity symbol

Identification of the safety lenses:

IPB = Code letter of manufacturer

1 = Optical class

S = increased robustness

If frame and lens have differing certification marks in regards to S, F, B, or A, the lower of the two applies. Wearers with extremely sensitive skin may experience allergic reactions upon contact with some materials. There are no spare parts or additional components available for this model. If damaged please discard the safety

goggles and discontinue use. Eye protectors used for protection against high-speed particles that are worn over standard ophthalmic spectacles may transmit impacts, thus creating a hazard to the wearer. If protection against high-speed particles at extreme temperatures is required then the selected eye protector should be marked with the letter T immediately after the impact letter, i.e. FT, BT, or AT. Otherwise the eye protector should only be worn and used at room temperatures.

Accessories: No accessories are available for this product.

Storage: Store in a dry and dust free place at room temperature.

Cleaning: Clean with clear water and household detergent. (Do not use solvents!) Avoid strong scrubbing as it can cause scratches.

Disinfection: Product can be disinfected with all regular commercial disinfectants.

Disposal: Pay attention to national regulations when disposing.

Length of usage: Do not use longer than 5 years after purchase date.

Warnings: Dispose of the goggles immediately if damaged. Only use eye protection lenses with optical class 1. Do not repair damaged safety goggles.

Limitations of use: These safety goggles in particular are not suitable for high-speed particles (e.g. cartridge tools), laser beam, temperatures above 55 °C, stray light arcs, fusion metals, infectious substances, or organisms.

Declaration of Conformity: A Declaration of Conformity according to Regulation (EU) 2016/425 on PPE and the Directive 2001/95/EC on general product safety is available for this product on the following web address: <http://thamesandkosmos.com/declarations/declaration-717019.pdf>



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.

