

SCIENCE KITS

for primary and secondary school levels

2013



Welcome to the world of learning

Cornelsen

EXPERIMENTA

Contact

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Quality Assurance

It is the aim of Cornelsen Experimenta to develop and produce teaching material of high quality for activity-oriented natural science classes. Our products are of high quality and fail-safe.

Cornelsen Experimenta has established an extensive quality management system which is regularly audited, internally and externally.

Cornelsen Experimenta has been certified after ISO 9001:2008. It is ensured that the demands of the customers will be realized and fulfilled with high quality.



Fairs and Exhibitions

We will exhibit our latest innovations at the following trade fairs:

Worlddidac

Basel,

October 24–26, 2012

didacta – die Bildungsmesse

Cologne,

February 19–23, 2013

Leipzig Book Fair

March 14–17, 2013

Worlddidac

Astana,

April 9–13, 2013

Worlddidac Pavilion

Educar – Sao Paulo,

May 22–25, 2013

We are looking forward
to your visit!



Disclaimer

The products shown in this catalogue are continuously adapted to the changing technological and educational developments. Illustrations and descriptions are not binding in their entirety. Errors and omissions are excepted.

Inquiries are welcome!

Cornelsen Experimenta forwards inquiries and orders from schools, teachers and dealers to the local partners. If our products do not fit the framework requirements of the education system in your country – talk to us.

**For an overview of our product range
see pages 2/3.**

Kindergarten Kits

Anja and Leon experiment in nature and environment	4
Anja and Leon experiment with water and air	6
Anja and Leon experiment with light and sound	8

Primary Natural Science

Sound and tone	10
Floating and sinking	12
Measurement of temperature, weight and length	14
Magnet and compass	16
Air	18
Electrical circuits	20
Water purification	22
Water supply	24
Wind and weather	26
Light and shadow	28
Balances and equilibrium	30
Heat	32
Recycled paper	34
Gear and drive models	35
Vehicles to build and drive	36
Primary science	38
General science	40

Natural Science

Mini-Kit 'Mechanics'	42
Mini-Kit 'Air and water'	42
Mini-Kit 'Sound'	43
Mini-Kit 'Heat'	43
Mini-Kit 'Optics'	44
Mini-Kit 'Magnetism/Electrostatics'	44
Mini-Kit 'Electricity'	45
Mini-Kit 'Biology'	45
Tellurium N	46

Integrated Natural Science

Materials in everyday life	48
Everyday electricity and magnetism	50
Sun, heat and air	52
Exploring the world of the small	54
My body, my health	56
What you feel, what you see, what you hear	58
Forces and motion in nature and technology	60
Plants, animals, habitats	62

Physics Students Kits

Mechanics	64
Heat	68
Energy conversion	70
DynaMot	74
Optics	76
Electricity/Electronics	78

Physics Demonstration Kits

Physics	86
Mechanics	88
Dynamics	90
Centripetal forces	92
Flight and flying	94
Wind energy	96
Solar thermal energy conversion	98
Photovoltaics	100
Hydroelectric power plant	102
Geometric optics with laser	103
Geometric optics for the steel board	104
Optics for the steel board	105
Optical bench	106
Functional human eye model	108

Electrostatics	109
Wimshurst Machine	110
Van de Graaff Generator	111
DynaMot	112
Fundamental physics	114

Chemistry Students Kits

Distillation	115
Extraction	116
Gas generator	117
Electrochemistry	118
Molecule construction boxes	119

Biology Students Kits

Biology	120
Gemination-Units	122
Soil types and plant growth	124
Agricultural crops	126
Climate – Environment	128
Measurements with sensors	132

Supporting Equipment

Stand material	134
Power supplies	136
Measuring instruments	138

Index	142
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Cornelsen International



Our offer encompasses textbooks for all subjects (with a focus on GFL, EFL and other foreign languages) and levels including pre-school education, reference books, teaching materials for professional and adult education, various types of supplementary materials, learning aids and educational literature as well as multimedia learning software and online-products.

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Welcome to the world of learning

Cornelsen

Cornelsen Experimenta

Cornelsen Experimenta develops, produces and distributes teaching materials of high quality for natural scientific classes.

Cornelsen Experimenta – a subsidiary of the Cornelsen education group, headquartered in Berlin – is one of the leading suppliers of teaching materials for adaptable natural scientific education.

Cornelsen Experimenta offers complete solutions, based on an integrated media system. The components of this system – science kits and teacher's manuals – match each other.

Cornelsen Experimenta kits allow teachers to gain extra time for other important educational tasks. The kits provide the means teachers and educators need to support them to grant successful classes.

Cornelsen Experimenta has established an extensive quality management system which is regularly audited, internally and externally. Cornelsen Experimenta has been certified after ISO 9001:2008.

Cornelsen Experimenta is ready to develop tailor-made solutions that exactly meet the framework requirements of the education system in your country.

Cornelsen Experimenta acknowledges the enormous importance to introduce students to experimental learning in their daily school routine. It is our idea that students should work independently to reach sustainable learning success.

Cornelsen Experimenta offers a complete service of supplying spare parts. All components of our kits can be reordered separately.





Science kits for the Kindergarten

- Fail-safe experiments, easy to reproduce
- Laminated pictorial step-by-step plans
- Robust materials, clearly arranged and compactly stowed

The Experiments

- Support the training of hand-eye coordination,
- Encourage language and cognitive abilities,
- Help to develop and strengthen social competences



Science kits for the primary school

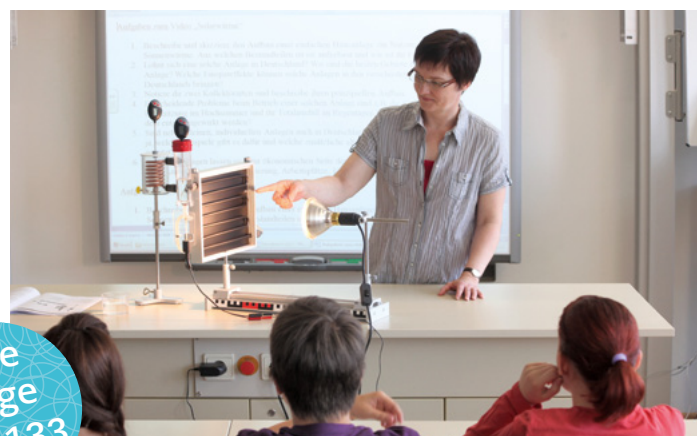
- Modern, action-oriented didactic concept
- Reproducible and sustainable learning effects
- Appropriate for different teaching methods
- All necessary materials included and clearly stored
- Detailed manuals and instructions included
- No laboratory or specialized rooms required



Science kits for the secondary school

Students kits

- Are solid and specially designed for students
- Make it possible to work simultaneously on different subjects
- Encourage the students to act independently
- Contain all necessary equipment
- Contain comprehensive, detailed manuals
- Do not require special lab



Demo

Demonstration kits

- Allow performing the fundamental experiments at all secondary school levels
- For a profound and successful science education
- No special science lab needed
- All required materials contained
- No additional equipment required
- Detailed manuals and instructions included

Anja and Leon experiment in nature and environment

On the trail of nature

The topics of nature and environment are among the most important in pre-school life. The 'Nature and environment' box contains over 30 exciting experiments to enthuse children into thinking about their environment.

They illustrate the interaction between plants, animals, people and non-living aspects of nature. Children experience that it is important to protect the environment and that they too have the opportunity to do so.

Trips can be taken to observe nature and children can simultaneously be given research tasks such as collecting plants, stones or animals for subsequent investigation. They can keep the results of this research in their own files, take pictures of what they find or make a collection. All the results can be exhibited in the kindergarten.

► In a plastic tray (312 x 427 x 150 mm) with lid:

Absorbing cardboards	Funnel
Spray bottle	Plastic beaker
Double dishes, plastic	Plastic beaker with graduation
Three-lens magnifier	Pooter for small insects
Filter paper	Plastic boxes
Droppers	Measuring jug
Dark room-germination box	Metal spoon
Cotton wad	Test tubes
Clay pots	Test tube stand
Dropping bottle	Rubber stoppers
Wooden applicator	Poly bags
Ruler	Pegs
Flower and leaf press	Thermometer
Rubber rings	Plastic pane, transparent
Gemination dishes	
Beaker lens	

Included in delivery:

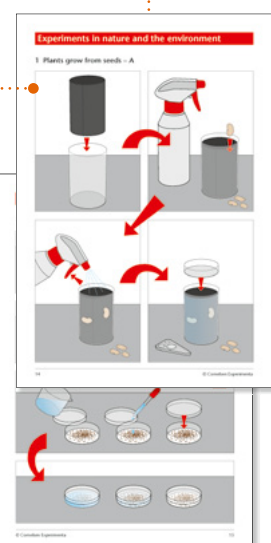
Manual

- All experiments are carefully explained along with the scientific background.
- Short stories from everyday life involving Anja and Leon provide an introduction to the topics.



Laminated step-by-step plans

- Allow children to learn from pictures how to do the experiments themselves.



Resource cards

- With the help of the cards, children can learn about the resources on the boxes and what they are called.





► Experiments from the manual
*'Anja and Leon experiment
in nature and environment':*

- Plants grow from seeds
- Plants grow towards the light
- Plants need a clean environment
- Plants grow in different ways
- Plants are made up of several parts
- There is life in the soil
- Soil is made up of various components
- Animals live everywhere
- Soil can store water
- Wind and weather are important
- Nature is a cycle
- Creatures live in different habitats
- How soil comes into existence
- What is the weather like?
- How to increase plants



Anja and Leon experiment with water and air

Water and air – really strong stuff!

Children make keen and observant researchers. They observe their environment very accurately, make assumptions and wish to check those assumptions on their own.

Here they are given a set of materials with which they can learn all about the phenomena surrounding water and air.

More than 30 exciting experiments allow the children to discover that air and water have many characteristics and are much stronger than one thinks! They will find out for example that air can lift a body or water can power wheels.

The knowledge they have gained will awaken and encourage their interest in natural sciences.

Included in delivery:

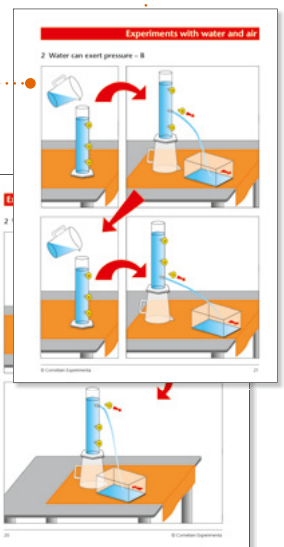
Manual

- All the experiments are carefully explained along with the scientific background.
- Short stories from everyday life involving Anja and Leon provide an introduction to the topics.



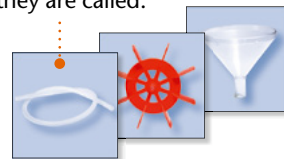
Laminated step-by-step plans

- Allow children to learn from pictures how to do the experiments themselves.



Resource cards

- With the help of the cards, children can learn about the resources on the boxes and what they are called.



► In a plastic tray (312 x 427 x 150 mm) with lid:

Measuring jug	Transparent plastic trough with holes
Propulsion vehicle with valve fork	Glass tube with and without nozzle
Air cushion disc	Funnel
Drain vessel	Pinch cock
Plastic pane	Paddle wheel
Paddle wheel	Pinch cock
Syringe, 100 ml, hose	Balloons with valve
Waterproof pad, 70 x 70 cm	Balloon pump
Immersion body	Axle, clamping bushing



85021



► Experiments from the manual
*'Anja and Leon experiment
with water and air':*

- Water can rise up
- Water can exert pressure
- Water can convey force
- Water can show how full something is
- Water can spray a long way
- Water can drive wheels
- Air can be seen and felt
- Air can open doors
- Air can lift people
- Air can keep things in place
- Air can propel cars
- Air can lift bodies
- Wind can generate energy



Anja and Leon experiment with light and sound

Light and sound – that's interesting!

This is a set of materials with which children can learn all about the phenomena surrounding light and sound.

They will for example experience that light is coloured and will be amazed that sound cannot only be heard but also seen.

The children will be interested to explore the phenomena. The easily to understand, robust materials in the box will help and encourage them.

Included in delivery:

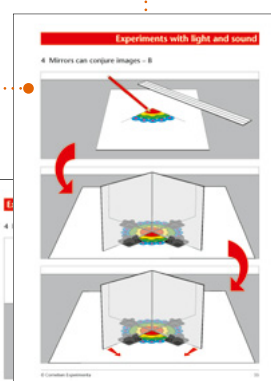
Manual

- All the experiments are carefully explained along with the scientific background.
- Short stories from everyday life involving Anja and Leon provide an introduction to the topics.



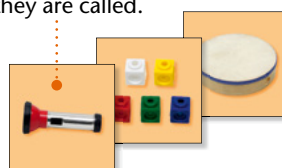
Laminated step-by-step plans

- Allow children to learn from pictures how to do the experiments themselves.



Resource cards

- With the help of the cards, children can learn about the resources on the boxes and what they are called.



► In a plastic tray (312 x 427 x 150 mm) with lid:

Sound funnel	Cubes
Tambourine	Plastic bar
Mirror/Screen	Dropper
Tube, hose, funnel	CD with listening exercises
Torch	Test tube stand
Colour paddle	Test tubes, plastic
Beaker	Mallet, plastic
Tea candles in metal holders with glass cover	Ruler
Prism, equilateral	Model tree, 8 cm
Rubber rings	Music box with crank handle
Cap with slit	
Cross base	



85022



► Experiments from the manual
*'Anja and Leon experiment
with light and sound':*

- Light moves in straight lines
- Light causes shadows
- Light can be deflected
- Mirrors can conjure images
- Behind a mirror
- Light can be deflected
- Small things can look much bigger
- Light is colourful
- Colours in the sky
- Colours of light can mix
- High-pitched and low-pitched sounds
- Sound from strings
- Vibrations cause sound
- Sound can be heard... and seen
- Sound can be conducted



Sound and tone

This experiment kit can be used for classes in lessons covering multiple disciplines including technical subjects, music and languages. The experiments are dedicated to the phenomenon of sound: how sounds and noises are caused, that they arise from vibrations, that they can be conducted and amplified and what their pitch and volume depend on.

It is not necessary to prepare much special equipment, other than to provide one or two CD players.

The resources can be used in any type of lesson, but are especially suitable for learning in pairs at specific workstations.

With the help of four CDs of noises, the children can classify sounds, identify them and name them. They can tell the difference between similar noises and play a story involving sounds.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Sound boxes, plastic	Water basins
String pegs (also whistles)	Plastic beakers with bore
Triangular bridges	Stethoscope chest-piece
Tuning forks of various pitch	Instrument strings for monochords
Test tubes, plastic	Rubber bands
Hearing tubes	Spool of thread
Ear-pieces for hearing tubes	Spools of string with dog-bone ends
Bars for 'Glockenspiel' (c, d, e, f, g)	Pan pipe, plastic
Mallets, plastic	Music boxes with crank handle
Oscillation rods	4 CDs with listening exercises
Flexible steel strips with oscillation head	
Wooden beads	

Included in delivery:

Teacher's manual

- With sheets for each work place including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips about the experiments.



31720

Materials for up to 15 work groups



► Teacher's manual 'Experiments in workstations: Sound and tone'

With copy templates covering 25 workstations, where the equipment in the kit can be used in experiments:

Hearing, recognising and naming sounds

- Assigning pictures to noises
- Recognising and naming sounds
- Pairs of sounds
- Miming a sound story

Hearing, seeing and feeling vibrations

- Secret tickling
- A tuning fork in water
- Tuning fork ball games
- Singing needles and steel strips

Making high and low tones

- The rubber band zither
- Building a xylophone
- A panpipe
- A mbira (thumb piano)

Amplifying and damping sound

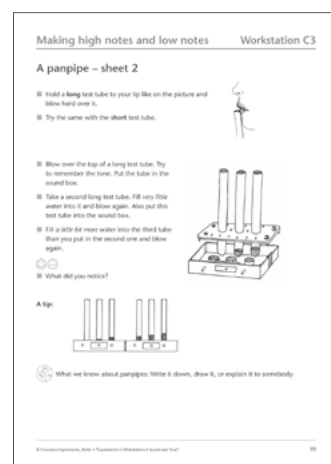
- Loud or quiet?
- The mysterious body
- A sound beaker
- A 'cackle box'

Transmitting sound

- Why do we have two ears?
- Along the string and into your ear
- A string telephone
- Sound travels
- The magic finger
- A stethoscope
- Hearing through plastic tubes

Conclusion

- Accompanying a story with suitable noises



Copy templates from the 'Teacher's manual', DIN A4.

Floating and sinking

The workstations in the 'Floating and sinking' kit allow children to observe all the essential phenomena involving floating and sinking. Working together they can share what they have learned until an overall picture of the phenomenon of 'floating' can be developed and an explanation that everyone can understand can be put together.

The key aspects of the experiments are based on 'boats' that the children can make from two different sorts of modelling clay: a yellow one which is lighter than water and floats and a red one which is heavier than water and therefore sinks, unless it is moulded into a shape that can float.

The box also contains balls and a cube made of materials used in the building of ships and boats: wood, steel, aluminium and plastic. Scales can be used to determine the apparent reduction in weight experienced by a body when it is immersed in water.

Included in delivery:

Teacher's manual

- With sheets for each work place including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips about the experiments.



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Light plasticine	Set of balls, consisting of:
Heavy plasticine	Steel ball, wooden ball,
Plastic knives	plastic balls (PP and POM)
Knead pads	Aluminium cube
Pastry cutters	Metal spoon
Water dishes	Suspension device,
Large and small beakers,	consisting of:
mini beakers	Rod, thread, hook and clip
Rapid scales	Paper clips
Set of weights	Displacement vessel
Displacement cube	Sponge cloth
on hook	



31900

Materials for up to 12 work groups



All phenomena are examined separately in comprehensible experiments:

The carrying capacity of ships, the displacement of a body suspended in water, the buoyancy and the surface tension of water.



► Teacher's manual 'Experiments in workstations: Floating and sinking'

With copy templates covering 14 workstations, where the equipment in the kit can be used in experiments:

- How to use plasticine for experiments
- The materials for the experiments
- Why does light plasticine float?
- What makes some balls of plasticine float?
- What are ships and boats made of?
- What does a ball do to the water it is in?
- How to make heavy plasticine float
- Comparing two ships
- Launching a ship and loading it
- When do ships sink?
- Does water have secret powers?
- What keeps ships afloat?
- The pond skater's trick.
- Whose ship can carry the biggest load?
- Make your own container ship
- From dugout to container ship
- Our workshop
- Our teacher does an experiment for us
- A competition: Will these ships float or sink?



Measurement of temperature, weight and length

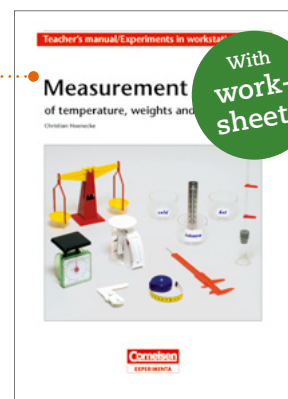
This kit contains an easy-to-use collection of measuring instruments, which can be used in primary schools whenever quantities such as temperature, weight and length need to be learned about and measured. They are well proven in technology lessons involving physical and biological investigations and also in maths lessons.

Pupils can gain contemporary knowledge suitable for their basic schooling about the conventions involving units as well as the function and use of measuring instruments. A 'Measuring triathlon' can be held in which they can demonstrate the ability to select the appropriate measuring instrument, to use it properly and to record the results.

Included in delivery:

Teacher's manual

- With sheets for each workplace including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips about the experiments.



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Measuring weight

Beam balance, capacity approx. 40 g, precision 0.1 g, consisting of:

column, beam with adjustment rider, scale pans

Set of weights (10 x 0.1 g, 10 x 1 g, 2 x 10 g)

Rapid scales, capacity approx. 100 g and 500 g

Spring scale, capacity approx. 5 kg

Balloons with cord

Measuring length

Ruler with cm and inch scale, 30 cm long

Sliding calliper without nonius, measuring range 15 cm

Tape measure, 150 cm

Measuring wheels (Metrilog)

Measuring temperature

Thermometer with Celsius and Fahrenheit scale, -10 to +50 °C

Thermometers, 50 and 100 °C

Experimental thermometer, consisting of:

erlenmeyer flask, rubber stopper with bore, capillary glass tubes, pegs, funnel, plastic dishes, dye (red food colouring)

Plastic beakers with graduation



31790

Materials for up to 18 work groups



► Teacher's manual 'Experiments in workstations: Measurement'

With copy templates covering 28 workstations, where the equipment in the kit can be used in experiments:

Measuring temperature

- Celsius and Fahrenheit invent thermometer scales
- Make your own thermometer
- Making scales for our thermometers
- Make a scale for practising reading thermometers
- Make temperature reading tasks for your partner
- Ideas for where to measure temperatures
- Set up a workstation box for mixing temperatures
- Measuring temperature at home
- Solving tasks for master measurers

Measuring weight

- Using balance scales
- Practising adding up weights
- Things to weigh with the balance scales
- Make your own 'balance scale'
- Set up a workstation box for weighing with balance scales

- Using spring scales correctly and understanding them
- Finding out how heavy satchels are
- Set up a workstation box for weighing with kitchen scales
- Solving tasks for master measurers

Measuring length

- How do we know how long a metre is?
- Making a pocket measuring tape
- Let's measure each other
- Things to measure with a measuring tape
- Set up a workstation box for measuring with a measuring tape
- Measuring, using the callipers out of the kit
- Making your own callipers
- Measuring coins with callipers
- Set up a workstation box for measuring with callipers
- Solving tasks for master measurers



Magnet and compass

The kit contains work resources for two related topics:

Lessons about **magnets**

Pupils can investigate the properties of magnets, including how every magnet has two poles, how like poles repel and unlike poles attract. They can learn this from experiments involving magnetic carriages, for example.

Half of the 30 bar magnets do not have their poles marked on them, so that pupils can determine which are the north and south poles for themselves.

Lessons about the **magnetic compass**

Experiments with bar magnets suspended from stands or floating on plates lead to an understanding of how compasses work:

- Magnets always align themselves (like compass needles) in a north-south direction.
- Pupils can use a compass card, needle and case to assemble their own compasses, identify compass points and find north on a map.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Bar magnets with and without red marked north pole	Horseshoe magnet
Mini-waggons for bar magnets	Magnetic door-closer
Floating platforms	Sight compass
Stands for bar magnets	Compasses for exercises
Water dishes	Compasses for self-assembling
Large bar magnets	Materials for attraction examination
Disc magnets	

Included in delivery:

Teacher's manual

- With sheets for each work place including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips about the experiments.



31756

Materials for 15 work groups



► Teacher's manual 'Experiments in workstations: Magnet and compass'

With copy templates covering 24 workstations, where the equipment in the kit can be used in experiments:

Magnet – Iron

- The big material test
- A 'metal exhibition'
- Uncle Scrooge's fishing game
- The big iron test
- Rusty bike?
- Using paper clips to find magnets

Magnetic force

- The swinging paper clip
- The walking scarecrow
- The dancing snake
- The floating paper clip

Pro and Contra

- The bewitched second magnet
- Magnets in a tube
- The bewitched garage
- The submarine trip

Mixed information about magnets

- How people discovered magnets
- The biggest magnet we know
- The teacher's magnet exhibition
- Make your own magnets
- Magnets without marked north poles

Hanging, floating and turning magnets

- Floating magnets
- Hanging magnets
- Making compasses, using hanging and floating magnets
- Floating compass needles
- 'Real' compass



Air

We constantly breathe air in and out. Air pressure weighs down on all of us. Air is something concrete, tangible. These are things that most younger pupils do not know.

For that reason, a lot of the properties of air, which seem to children to be obvious, need to be called into question, so that pupils can identify them.

The range of equipment in the kit allows countless simple experiments to be carried out and guarantees that the experiments can work by providing stations at which to work. Everyday technology, such as air pumps or valves, can be illustrated. In addition, it is possible for teachers to perform demonstration experiments using a hot-air balloon and a model rocket. Both those experiments are spectacular and provide plenty of material for discussion.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Water basins, transparent	Syringes with hose couplings, hoses
Suction flasks with removable base	Suction cup hooks
Funnels	Three-lens magnifiers, plastic slides with divisions
Plastic tubes	Vaseline
Beakers	Tea lights
Atomizer	Tape measures
Plates, plastic	Scissors, cord, adhesive tape
Floats	Stopwatch
Balloons with reinforced surface tension, balloon valves, balloon pump	Parachutes
Propulsion vehicles with valve fork	Rocket model
Air cushion discs	Hot air balloon made of safety foil
Air pumps with transparent cylinders	Esbit burner (nickel-plated), with heat stack, metal plate and Esbit (dry fuel)
Patent valves	

Included in delivery:

Teacher's manual

- With sheets for each workplace including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips about the experiments.



31710

Materials for up to 12 work groups



► Teacher's manual 'Experiments in workstations: Air'

With copy templates covering 31 workstations, where the equipment in the kit can be used in experiments:

Is air nothing at all?

- Air is something!
- Valves, valves, valves
- We need air to live
- A coat of air
- Fire in a water tank
- A poem about air
- The funnel trick
- The paper tissue trick
- Building underwater
- Experiments with bottles in a tank

Air exerts pressure

- Test of bravery
- Suction cups
- The balloon and beaker trick
- How Benny empties his aquarium
- The secret of the floating spheres

Air exerts force

- Compressed air
- How air pumps work
- The cheeky paper ball
- Lifting sunken ships, a tricky matter

Air in motion

- Reaction carriage
- Instructions for building a rocket cable car
- Hovercraft

Air helps you fly

- Why does a hot-air balloon rise?
- Why does an aeroplane rise?
- Parachutes, parachutes, parachutes
- Parachute workshop
- Building propeller planes
- Building jets
- Testing paper planes

For the air detective

- There's something in the air
- The air interview



Electrical circuits

Electricity is something that pupils experience everywhere and every day. The experiments in this kit help them gain insights into the use of electricity for making light, heat and motion.

These three possible applications are explained in simple experiments and then associated with the surrounding world.

The children can learn that electricity can only become truly effective if it flows within circuits of conducting material and that technically stable connections are necessary.

The simple resources in the kit use conventional connecting materials to make these elementary relationships understandable and tangible.

The topics covered include the following:

- Open and closed circuits
- Series and parallel connections
- Conducting and non-conducting materials
- Dangers of electric current
- How electricity gets to your home

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Square batteries, 4.5 V

Bulbs, 3.5 V/0.2 A

Bulbholders on base

Lever switches on base

Terminal clips

Screwdrivers, isolated

Thermometers,
–3 °C to 103 °C

Copper wire

Heating wire
with cotton insulation

Copper wire with
transparent insulation

Materials for
conductivity examination

Construction set
for vehicle

Plastic base with terminals

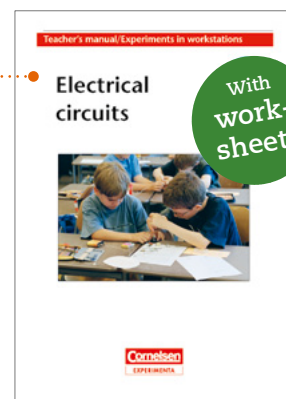
Crocodile clips

Adhesive bonding
compound

Included in delivery:

Teacher's manual

- With sheets for each work place including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips about the experiments.



31772

Materials for 15 work groups



► Teacher's manual *'Experiments in workstations: Electrical circuits'*

With copy templates covering 33 workstations, where the equipment in the kit can be used in experiments:

Stations include the following:

- Battery test
- Alessandro Volta, inventor of the battery
- Batteries are everywhere
- A battery museum
- 'Batteries have positive and negative sides'
- Batt-Man
- Batteries in cars
- Why does the light come on? – Electric circuits
- Lamps all around us
- Mister Edison invents the light bulb
- Buttonhole lamp
- Spring-loaded torch
- A fire ship
- Car lighting test
- Lights in cars
- Sascha and Derya test each other as electricians
- Switches in our homes
- Save electricity
- Four switches, on and off
- Home-made switches
- Bicycle lights
- Heat from a battery
- Heat from the mains socket
- Seven deadly dangers
- How does one protect one-self against electric shock?
- The trembling roller coaster
- Robot game



Water purification

The kits *Water purification* and *Water supply* help pupils gain an insight into the cycles of the water that is so vital to our lives. They can recognise the importance of water for our survival, learn where it comes from, how it is distributed for drinking, how it is utilised and finally rinsed away into the sewers, only to be treated and put back into the cycle.

They can gain an understanding appropriate to their age group of how to save water as a resource.

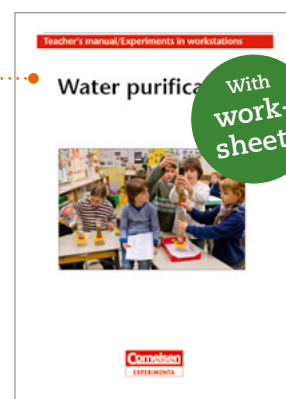
The following experiments and others can be carried out with the resources in this kit:

- Which forms of soil allow water to pass through and which don't
- Discovering that sand and gravel filter beds trap solids in the water, while dissolved substances (like oil, salt or detergent) cannot be removed from water by filtering
- The effect of polluted water on germinating plants
- The stages of mechanical cleansing of water
- Discovering the principle of linked water vessels and determining applications for it

Included in delivery:

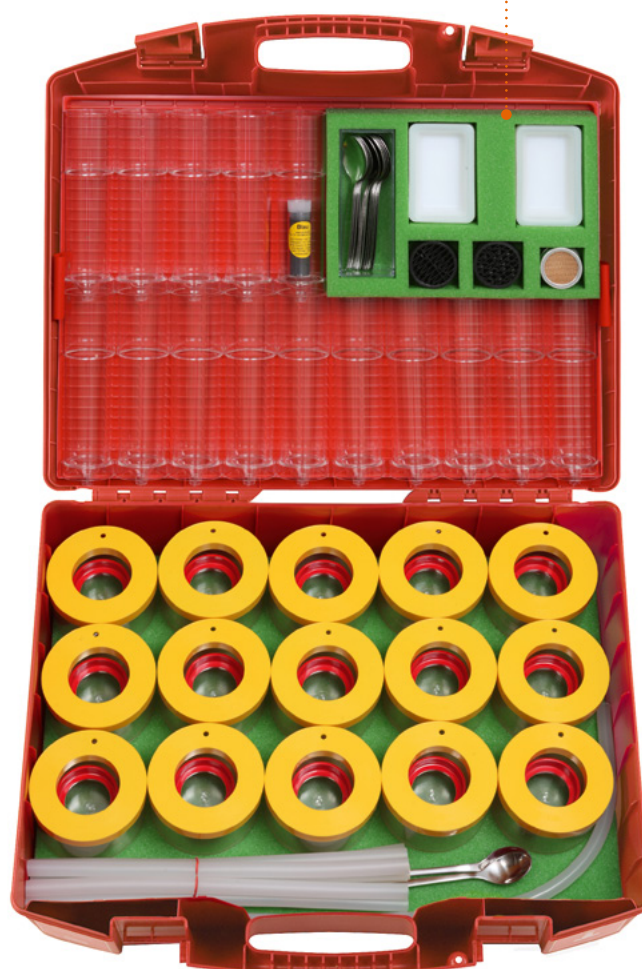
Teacher's manual

- With sheets for each work place including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips about the experiments.



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Filter set-ups, consisting of:	Germination dishes
Filter bowl, lid, push-on connector, filter tube, copper wire gauze, plastic strainer	Metal spoons
	Hoses, transparent
Plastic beakers with graduation	Dye (food colouring)



31802

Materials for 15 work groups



► Teacher's manual
'Experiments in workstations: Water purification'
With copy templates covering 24 workstations,
where the equipment in the kit can be used in
experiments:

Ground water

- What happens to rain water?
- The great soil test
- Drilling deep into the earth
- Ground water is clean, if it isn't ...
- A small water cycle
- How water gets in and out of the ground:
 - a. Building a fountain / b. Making a moving picture
- Too much/too little water

Drinking water

- Drinking water memory game
- Do water plants manufacture water?
- How does drinking water get to the tap?
- What creates the water pressure?
- Where are the pipes?
- What is in sewer water?
- Trying to clean waste water with a grate
- Trying to clean water with a filter bed
- Tiny microbes help to clean water
- The sewage plant
- What shall we do with the dirty water?

Games with water

- Floating paper clips
- Ice lolly
- Coins in a glass
- Magnifying glass made of water



Water supply

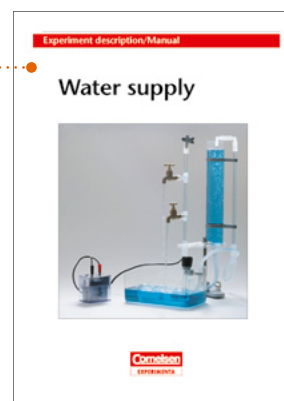
The kit *Water supply* contains a demonstration apparatus, which is easy to set up and which makes it possible to learn the following:

- Usage and function of a rotary pump for pumping water around a system of pressure pipes
- Recognising the model of a water main in the experiment for what it is and explaining what is happening
- Recognising how an elevated tank demonstration experiment works and understanding the underlying principle of linked water vessels
- How a water tower can work as a reservoir

Included in delivery:

Teacher's manual

- With description of function and of student experiments.



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Centrifugal pump with motor, hose and cables

Power supply box with batteries 3R12

Tripod stand and rod with washer and thumb nut

Water container, plastic, 500 ml

Riser with two taps

Dye (food colouring)

Elevated tank with riser

Cross-sectional model of a water tap

Water tank



8231

Materials for demonstration



*Included in delivery:
Cross-sectional model of a water tap*



Wind and weather

On the topic of the weather, the 'mobile weather station' from this kit can, in conjunction with other equipment, emerge as a brilliant aid to pupils learning the following aspects:

- Recognising, distinguishing, describing, measuring and recording temperatures, cloud cover, wind direction, wind speed and precipitation
- Reading and using various weather symbols, starting with simple pictograms to recognising selected scientific symbols used on official weather forecast charts

This trains pupils in the four basic scientific skills: use of instruments, observation, documentation and evaluation.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Thermometers, –25 °C to 50 °C	Maximum-minimum thermometer
Rain collectors	Adhesive felt boards
Large rain gauge	Weather symbols with velcro strips
Compasses with pointer lock	Plastic cards for writing
Cup anemometer with protective cover	Demonstration thermometer model, printed on both sides, adjustable column
Tripod, telescopic	Water-soluble marker
Sac for stabilizing with weight	Cleaning cloths
Clamping arm for tripod	Weather observation tables
Compass card	
Wind vane	
Compass card with adjustable arrow	
Cloud mirror	

Included in delivery:

Teacher's manual

- With sheets for each workplace including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips about the experiments.





► Teacher's manual 'Experiments in workstations: Wind and weather'

With copy templates covering 33 workstations, where the equipment in the kit can be used in experiments:

Temperature, etc.:

- How to read temperature
- Measuring temperatures in the classroom
- Observation table: Air temperature
- Maximum-minimum thermometers

Rainfall, etc.:

- What is precipitation?
- Learning to measure how much it has rained
- Reading off precipitation
- Observation table: Precipitation

Cloud cover

- How clouds come into being
- Home-made water cycle
- Various types of cloud
- How heavy is the cloud cover?

- Photographing clouds
- Observation table: Cloud cover

Wind, etc.:

- Wind meter
- How to read a wind meter
- Wind speed
- Compass
- Wind direction
- Home-made wind direction meter
- Observation table: Daily readings of wind speed and direction

Daily weather forecast

- Weather symbols
- Daily weather forecast
- Television forecast
- Observation table: Observations of the weather



Light and shadow

Pupils can use the equipment in this kit to gain their first experience and knowledge of optics and thus gain an insight into the discipline.

The following topics are covered:

- Daylight and lights at night
- Things that emit their own light
- Can you see without light?
- Light sources past and present
- When do shadows occur?
- Why do shadows move?
- Construction and use of a sundial
- Light comes back – reflection
- Mirrors and mirror images

The teacher's manual contains copy templates for some simple experiments. The interesting exercises should motivate students to think and provoke healthy discussion.

Included in delivery:

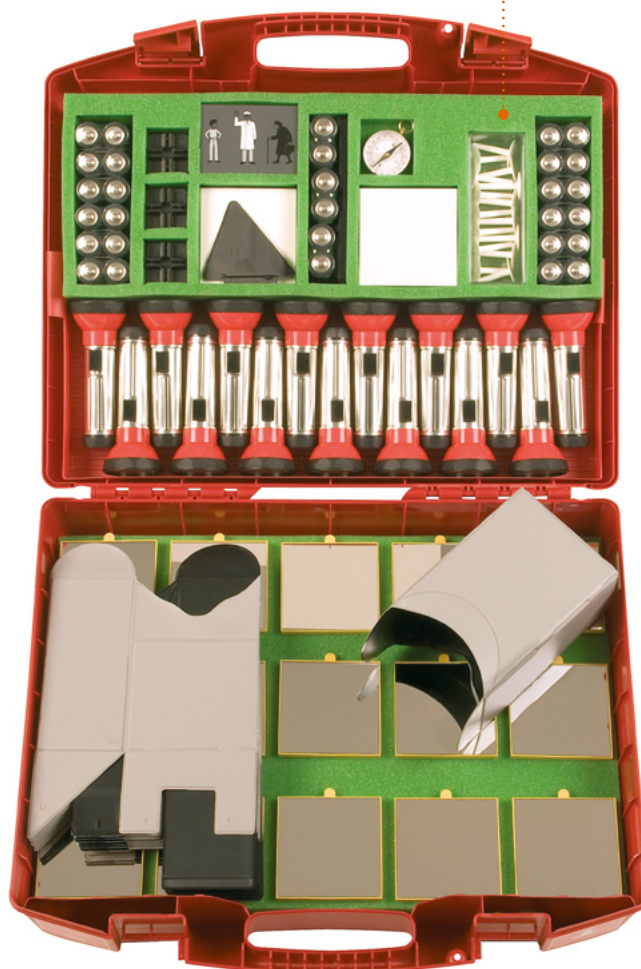
Teacher's manual

- With basic information on the topic and on the experiments plus tips on planning lessons and student experiments.
- Including copy templates.



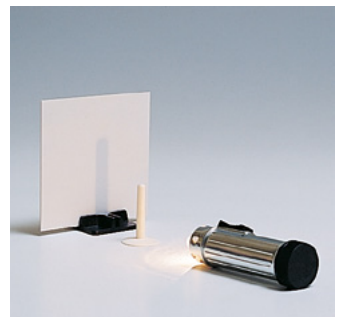
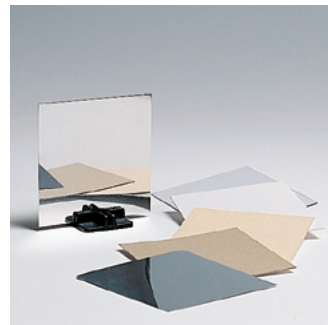
► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Mini-darkroom	Opaque screens
Torches with bulbs	Cardboards, rough/smooth
Batteries, 1.5 V	Cards showing human figures
Shadow rods	Metal foils
Tilting mirrors	Sundial with compass
Slotted stand bases	
Transparent screens	



31748

Materials for 15 work groups



Balances and equilibrium

Pupils should learn the simplest forms of seesaws, beam balances, spring balances, dial balances and balance beam (lever) calculating machines. They can learn how to use weights and practice making calculations with the system of measures. This will teach them some historical and physical aspects of scales and weighing.

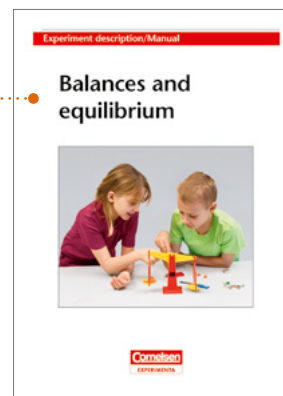
Some key learning objectives:

- Understanding the principle of a seesaw and seeing how changing the fulcrum from a horizontal one to a vertical one can change the see-saw into balance scales
- Assemble a beam balance from individual components and bring it into equilibrium using a sliding counterweight
- Use a beam balance and weights to determine which objects are heavier, lighter or the same weight
- Learning our common system of measures
- The advantages of having a common system of measures

Included in delivery:

Teacher's manual

- With basic information on the topic and on the experiments plus tips on planning lessons and student experiments.



- In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Beam balance,
capacity approx. 40 g,
precision 0.1 g,
consisting of:
column, beam with ad-
justment rider, scale pans

Seesaw

Pocket letter balance

Spring scales,
– capacity approx. 25 g
– capacity approx. 80 g
– capacity approx. 12.5 kg

Set of weights (2 x 10 g,
10 x 1 g, 10 x 0,1 g)

Small materials
and spare parts





Heat

Thermometers teaching unit

Using a home-made thermometer, pupils can learn the basic terminology and theories of heat and thermal expansion. They can then develop their own scale, read off a Celsius scale and determine the freezing and boiling points of water on a thermometer which has no scale.

Evaporation and compression teaching unit

The equipment in this kit is suitable for investigations of the topic by the relevant age group.

Included in delivery:

Teacher's manual

- With basic information on the topic and on the experiments plus tips on planning lessons and student experiments.



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Thermometers, –3 °C to 103 °C	Droppers
Thermometers without graduation	Plastic containers for activities
Pegs	Dyers (red, blue, yellow)
Plastic beakers with graduation	Thermometer model for demonstration
Insulating cases for beakers	Plastic funnel
Candles in metal holders	Atomizer
Bridge-shaped stands	Tube brush
Erlenmeyer flasks	Immersion heater
Capillary tubes	Beaker glass

Additionally recommended:

Insulated wide neck vessels, 3 pcs.

For the supply of warm and cold water as well as ice cubes for the thermometer and temperature compound experiments.

In storage tray with lid.

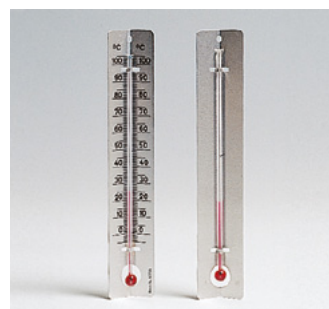
Content of each vessel: 1 litre

36680



31799

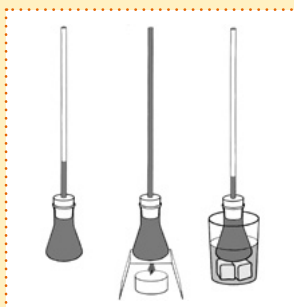
Materials for 15 work groups



► Survey of experiments:

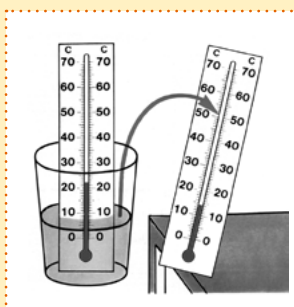
Thermometers teaching unit

- Heating and cooling water
- Heating and cooling methylated spirits
- How does a thermometer function?
- What is a thermometer for?
- The Celsius scale
- Taking temperature measurements and reading exercises



Evaporation and compression teaching unit

- Converting a liquid into a gas
- Water evaporates, vaporizes too
- Vaporizing liquids are cooling
- Can a gas be re-converted into a liquid?
- What happens when steam cools down?
- The water cycle
- How water particles unite

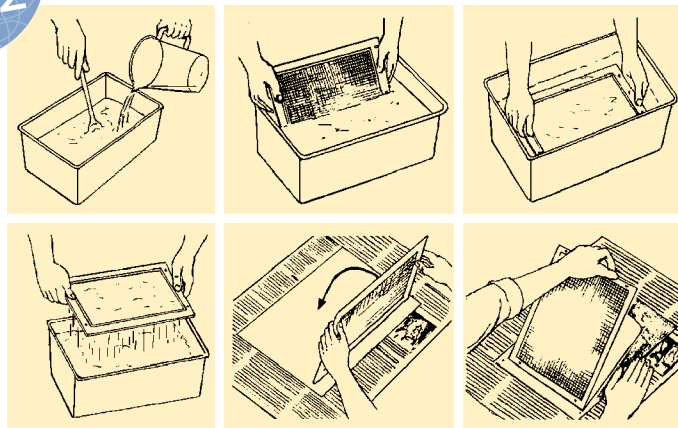


Recycled paper

Age
8–12

The 'Recycled paper' kit allows pupils to make their own paper from waste paper using a simple manufacturing process. This helps them learn that the industrial manufacture of 'recycled paper' uses far less raw materials, water and energy than conventional paper manufacture.

Apart from the manual skills used in making the paper, the students also learn more about environmental protection. The children should be able to understand what 'recycling' means in practice. This kind of 'home-made environmental protection' should stick in the memory and enhance their consciousness of the environment.



Included in delivery:

Teacher's manual

- With basic information on the topic and on the experiments plus tips on planning lessons and student experiments.



► In a plastic tray (312 x 427 x 150 mm) with lid:

Measuring jug
with graduation
Strainers, plastic
Wooden roller
Feltboards

Three-lens magnifier
Scissors, cord, Pegs,
stirring spoon
Plastic foil, copper wire

Additionally recommended:

Mixer, 600 W



Detachable bowl, 1.75 litre capacity and cable storage.
3 speeds and pulse, safety cutout.

Detachable stainless steel blade for easy cleaning.

Operating voltage:
230 V/50 Hz AC

11372



11370

Materials for 4 work groups

Age
8-16

Gear and drive models

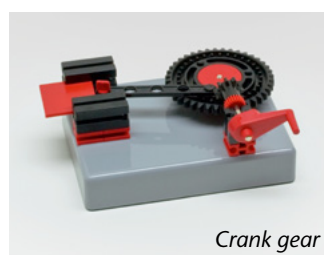
The models of the most important gears and drive systems are put together in a design ideal for educational purposes. They not only clearly demonstrate the design and function of the gears in the model but also allow students to derive basic knowledge from the models.

The models are assembled in ready to operate form on individual plastic bases and can be used immediately without any additional accessories.

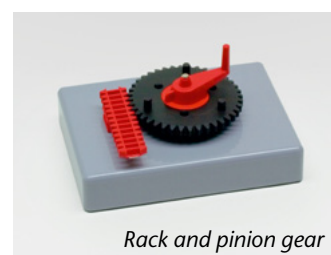
The kit contains 11 models.



Differential gear train



Crank gear

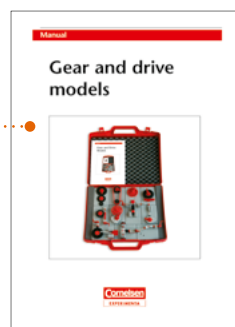


Rack and pinion gear

Included in delivery:

Description of function

- With information on the principle by which each of the models function and on typical technical applications for them.

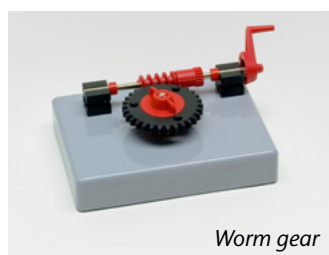


► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Spur gearbox	Reciprocating engine
Chain drive	Cam gear
Belt drive	Crank gear
Rack and pinion gear	Differential gear train
Worm gear	Cardan shaft drive
Intermitted mechanism	Size of bases: 120 x 90 mm



Spur gearbox



Worm gear

65500

Materials for 1 work group or demonstration

Vehicles to build and drive

This kit contains 6 x 68544 *learning sets* plus additional materials for 6 groups and a teacher's manual.

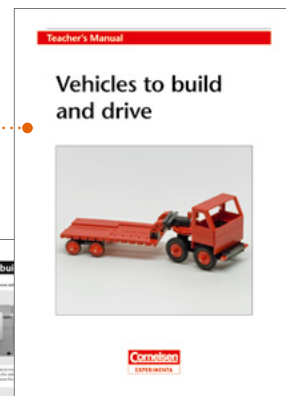
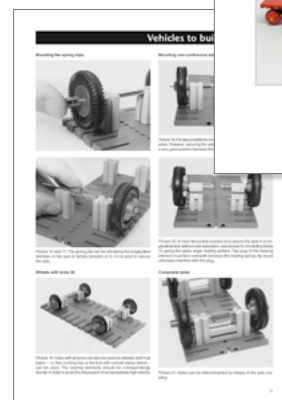
Using Fischer Technik components, it is easy to build vehicles, apparatus and machines as an introduction to technology. Basic technical connections can be made quickly and easily in such a way that it is easy to see how they work. The precision of the individual parts makes it possible to create fully operable models.

The vehicles can be set in motion using interesting alternative drive systems such as spring rods, rubber bands, sails or balloons.

Included in delivery:

Teacher's manual

- With more than 40 suggested models.



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Building blocks 30	<i>Additional materials:</i>
Building blocks 15	Base plates 180 x 90 mm
Building blocks 5	Sailing masts, wood
Hinged block	Sails, plastic
Angle blocks isosceles	Sails, plastic
Links (in 2 lengths)	Spring slats
Base plates (in 4 sizes)	Holders for drive materials
Driver's cab parts	Balloons
Freewheel hubs and hubs with conical clamp	Balloon exhaust pipes
Large pulley with flat hub	Rubberbands
Tires (in 2 sizes)	Clamping pieces for rubberband drive
Clips with spring ring (in 2 lengths)	Rope drums
Axle coupling clips	Spools of string
Metal axles (in 5 lengths)	Box with spare parts



64433

Materials for 6 work groups



Learning set 'Vehicles to build and drive'



The learning sets from the kit can also be ordered separately. They are supplied with brief introduction and contain:

Building blocks 30	Metal axles (in 5 lengths)
Building blocks 15	Base plates 180 x 90 mm
Building blocks 5	Sailing masts, wood
Hinged block	Sails, plastic
Angle blocks isosceles	Spring slats
Links (in 2 lengths)	Holders for drive materials
Base plates (in 4 sizes)	Balloons
Driver's cab parts	Balloon exhaust pipes
Freewheel hubs and hubs with conical clamp	Rubberbands
Large pulley with flat hub	Clamping pieces for rubberband drive
Tires (in 2 sizes)	Rope drums
Clips with spring ring (in 2 lengths)	Spools of string
Axle coupling clips	Box with spare parts

68544

Additionally recommended:

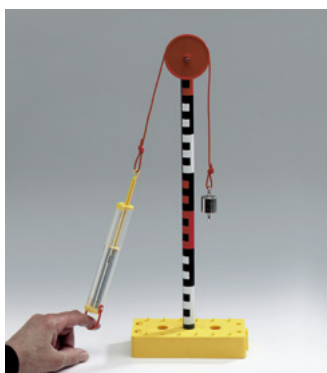
644336 Teacher's manual
'Vehicles to build and drive'



► Survey of experiments:

Force/Energy

- What is a force?
- Force and counterforce
- Forces ...
 - change motions
 - at the tug-of-war
- Weighing with a spring balance
- Levers
- The double beam balance
- Levers make the work easier
- How strong a tree stands
- It works easier with pulleys
- Rolling and sliding
- It goes better on wheels
- How to lift alone a heavy load
- The steeper the heavier
- Can energy be stored?
- Energy from water power
- How the wind can be used
- Rubber belt as motor
- A solar oven
- A rocket car

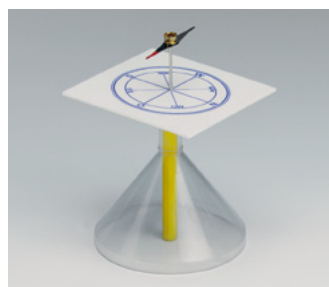


Magnets

- Magnets have a force
- Do all materials react on a magnet?
- When two magnets encounter
- Penetrating forces
- How a magnet can be produced
- Can a magnet float?
- How a magnet can be used
- A magnet roller
- A magnetic motor

Air and sound

- Is air also a body?
- Air is an elastic body
- Can air displace water?
- How the diving bell works
- When air comes under pressure
- Air can transport a force
- Which one is stronger: air or water?
- How the atmospheric pressure can be seen
- Floating water
- Cold air – Hot air
- A machine driven by hot air
- Can air be consumed?
- Air transports the sound
- How sound waves can be seen
- Can the sound go round the corner?
- Sounds: high and low, soft and loud



Electric current

- A simple electric circuit
- A bridge for the current
- Lamps side by side in parallel
- Lamps one behind the other in series
- Good and bad conductors
- Can the current also flow through water?
- Hot current
- The electromagnet



Heat

- A water thermometer
- How steam ...
 - is made from water
 - will become water again
- How seawater can be made drinkable
- When does a material melt?
- Can ice be cooked?
- Cooling by evaporation
- Why one can burn the fingers without touching a flame
- Can heat be collected?
- Concentrated heat radiation
- Heat has an energy
- Heat without a flame
- Temperature and work

Light

- Which way does the light take?
- How the light can be controlled
- An object in the light beam
- Can light be swallowed?
- Can light be concentrated?
- In front of and behind a mirror
- Thick and thin, tall and small
- Fire under water
- How water can bend a rod
- Can an alighted candle stand on its head?
- How you can see an object magnified
- How a photo is taken
- What colour has the light?
- Small pictures very large

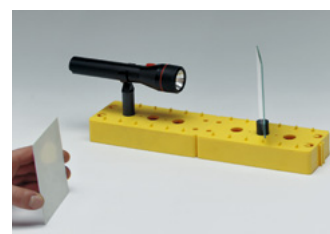
Water

- Is water a body?
- Can water displace air?
- Can water stand inclined?
- Where does the water go?
- How high the water stands
- How water can rise
- What divers feel under water
- Lighter by water?
- Water can also rise without pressure
- Can solid bodies become invisible
- Can iron swim?
- Swimming – Sinking – Floating



Plants

- How plants drink
- Plants need light
- When plants sweat in the sun
- Plants improve the air
- Plants produce oxygen
- Oxygen is consumed
- Plants produce carbon dioxide
- Cereals contain water



General science

The kit was developed for schools which require a small but complete collection of teaching materials for experiments in science. The kit can accompany basic courses in elementary schools.

The special value of the 'General science' kit lies in the ease of use and reliability of the equipment for the suggested experiments.

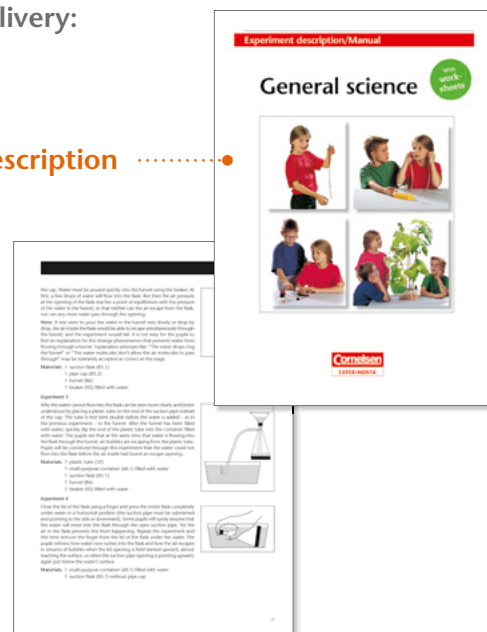
Teaching aims can be easily realized.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

106 different parts, e.g.:	Torch, shadow rod, mirrors
Set of germination unit	Syringes, tubes
Flower press components	Plastic plates, cardboards
Set of double dishes	Thermometers, with and without graduation
Triple magnifier	Various bar magnets
Glass and plastic test tubes, test tube holder	Mini-waggon
Balance beam, column, scale pans, set of weights	Floating platform for bar magnets
Dynamometer	Propulsion vehicle
Spring scale	Air-cushion disc
Seesaw	Balloons, balloon valve
Filter tubes	Compass cards with brass bearings and needles
Rain collector	Floating platform for compass needle
Suction flask, funnel	Compass with pointer lock
Sound box, strings	Lever switch, terminal clips
Stethoscope chest-piece	Copper wire
'Glockenspiel', mallet	Heating wire with insulation
Tuning fork (440 Hz)	Bulbs and bulbholders
Flexible strip with oscillation head, hearing tubes	
Heat-resistant beaker with insulating case, dye	
Beaker with graduation	
Mini-darkroom	

Included in delivery:

Experiment description



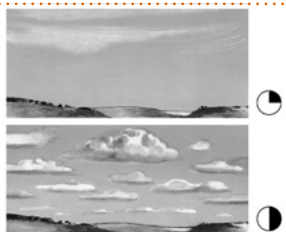
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Materials for 1 work group or demonstration

► Survey of experiments:

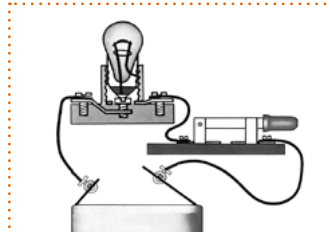
Weather

- What makes the weather?
- Recording the temperature
- Measuring the temperature day by day
- Clouds/Wind direction
- Recording the rainfall



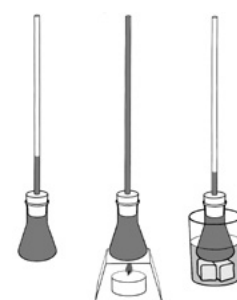
Electrical circuits

- Battery and bulb
- The glass of the bulb
- Simple circuit
- The switch in the circuit
- Series and parallel circuit
- Electric current generates heat
- The electromagnet



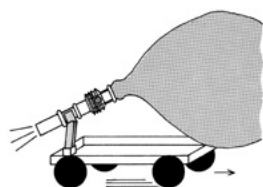
Heat

- Heating and cooling water
- Heating and cooling methylated spirits
- How does a thermometer function?
- What is a thermometer for?
- The Celsius scale
- Temperature measurements and reading exercises
- Converting a liquid into a gas
- Evaporation/Vaporization
- Can a gas be re-converted into a liquid?
- What happens when steam cools down?
- The water cycle
- How water particles unite



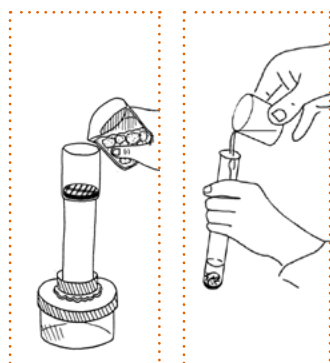
Air

- Air occupies space
- Air can displace water, water can displace air
- Air can be contained within other substances
- Air exerts a force
- Compression and expansion
- The force of compressed air can be used to lift an object
- The force of an air current can be used to propel an object
- Rearward discharge as a propulsive force (thrust)
- Interaction between over- and depression
- Air acts as resistant force against bodies which are moving



Chemistry

- Dissolving table salt
- Igniting a splinter of wood
- Heating sugar lumps
- Coating a nail with copper
- What role does air play for combustion?



Sound and tone

- No sound without vibration
- Vibrations of a tuning fork can be made visible
- High and low tones
- Glockenspiel
- Air produces sounds and tones
- Sound amplification
 - by conducting surfaces
 - by direct conduction (stethoscope)
- Sound absorption
- String telephone

Magnet and compass

- The magnetic force
- Some items are attracted by a magnet, some are not
- Magnetic force exerts itself through many materials
- The poles of a magnet
- Magnets can attract and repel each other
- Constructing a compass
- A compass needle orients itself in a north-south direction
- A freely movable magnet always orients itself in a north-south direction
- Also the compass needle is a magnet
- A compass needle can be pulled from the north-south seeking position by a magnet
- Magnetization of a knitting needle
- Knitting needle as compass needle
- How to use a hiking compass with a map

Water Purification

- Which type of soil lets water pass through most rapidly?
- How does ground water get clean?
- What does/what does not get filtered out by the soil?
- How sewers help to keep our water supply clean
- Why are water towers often located on a hill?
- How does polluted water affect seeds and plants?

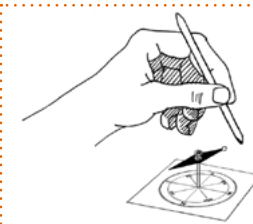


Balances and Equilibrium

- Seesaw
- From seesaw to balance
- Beam balance
- Egyptian balance
- Roman express scale
- Spring scale with calibration
- Calculator Balance (equal-arm lever)

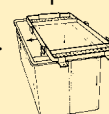
Light and shadow

- We cannot see anything without light
- How are shadows formed?
- Why does the shadow change position?
- Reflection in a mirror and from various materials



Biology: Students receive practice in observing with the aid of a magnifying glass, dissecting and preparing plants and animals.

Zoology: The multi-purpose container with transparent air-permeable lid is well-suited for use as small aquarium or terrarium for a short-term captivity and observation of small animals (e.g. small fishes, beetles and worms).



Botany: Swelling force of seeds; Growth of plant roots, stems and leaves;

Botany (cont.): Reaction of plants to light and contact-stimuli; Winding and climbing of plants; Importance of growth factors for plants such as light, warmth, air, water.

Human biology/Teeth: Comparative examinations of incisor and molar and explanation of caries as a result of inadequate tooth care.

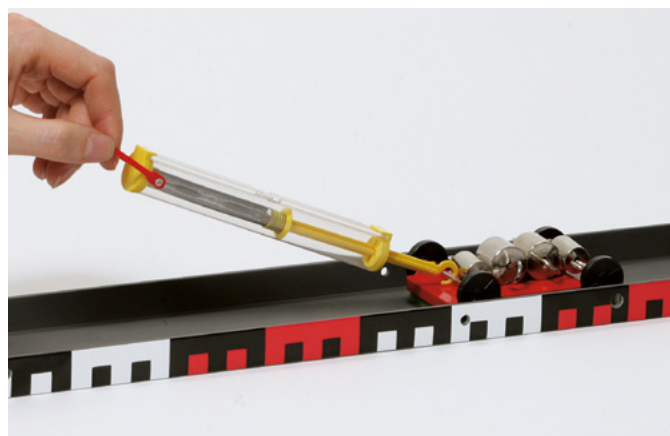
Mini-Kit 'Mechanics'

Age
8-14



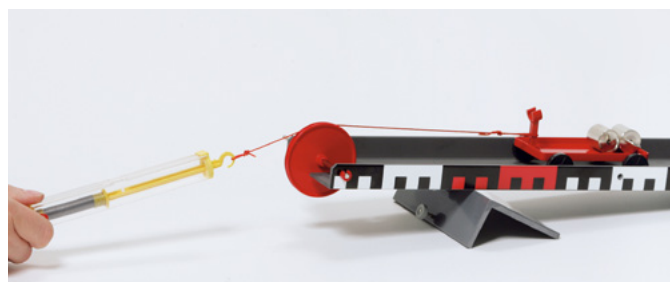
The kit contains a comprehensive manual and 17 different items for multiple use e.g. a rail profile, a stand base, a car, a dynamometer, pulleys, masses with hooks and scale pans.

Size of kit: 270 x 210 x 50 mm



Experiment description with 15 experiments:

- Effect of force
- Measuring force
- Dynamometer
- Friction forces
- Stability
- Center of gravity
- Double beam balance
- Double beam lever
- Single beam lever
- Steelyard
- Fixed pulley
- Movable pulley
- Block and tackle
- Inclined plane



16100

Mini-Kit 'Air and water'

Age
8-14

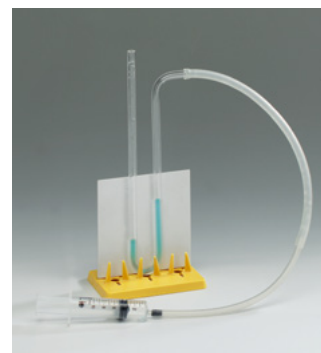


The kit contains a comprehensive manual and more than 20 different items for multiple use e.g. a stand base, a car, a paddle wheel, test tubes, U-tubes, rubber stoppers, air cushion and floating discs.

Size of kit: 270 x 210 x 50 mm

Experiment description
with 27 experiments:

- Is water a body?
- Water can displace air
- Water against air
- Fluid surface
- Communicating vessels
- Water can climb
- Propagation of pressure in liquids
- Principle of the hydraulic jack
- A simple water level
- Principle of the suction tube
- Principle of a pipette
- Floating metal
- Streaming water has a force
- Is air a body?
- Air can displace water
- Compression and expansion of gases
- Principle of the U-tube manometer
- Heating and cooling of gases
- Pressure in liquids
- Floating water
- Air against water
- A water column
- Effect of the low pressure (suction cup)
- Power transmission with air
- Flowing energy
- Principle of repulse
- Principle of an air cushion



16102

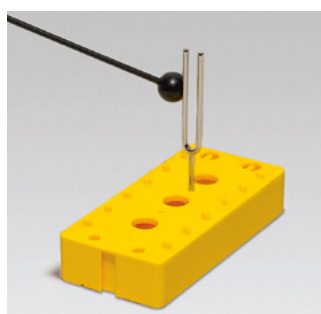
Mini-Kit 'Sound'

Age
8-14



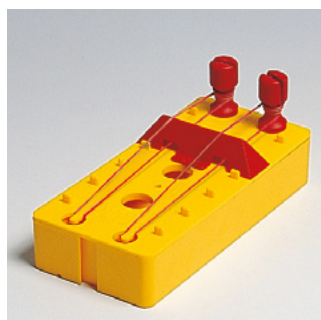
The kit contains a comprehensive manual and easy to set up equipment e.g. a sound box, a tuning fork, test tubes, sound plates, chord stretchers, rubber rings, springsteel strip and ear hoses, with which 8 basic experiments in the field of acoustics can be carried out.

Size of kit: 270 x 210 x 50 mm



Experiment description with 8 experiments:

- What is sound?
- Can sound waves be seen?
- Sound waves exert pressure
- How sound waves are amplified
- How sound waves are transmitted
- High and low tones
- Sounding air
- Sounding metal plates – the xylophone



16104

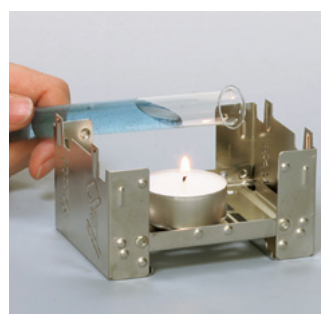
Mini-Kit 'Heat'

Age
8-14



The kit contains a comprehensive manual and 22 different items e.g. a support rod, a burner, candles, a thermometer, a bimetallic strip, dye, capillary tubes, glass tubes, rubber stoppers and Erlenmeyer flasks.

Size of kit: 270 x 210 x 50 mm



Experiment description with 10 experiments:

- Model of a thermometer
- What is a thermometer for?
- Evaporation and condensation
- Heat radiation
- Absorption of heat radiation
- Heat conduction
- Heat conduction in water
- Deformation of metals by heat
- Variation of the volume of gases
- Generation of steam by heat



16106

Mini-Kit 'Optics'

Age
8-14



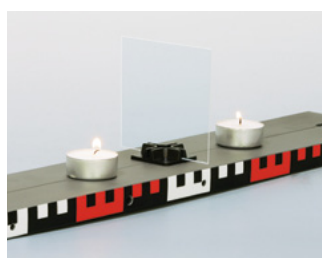
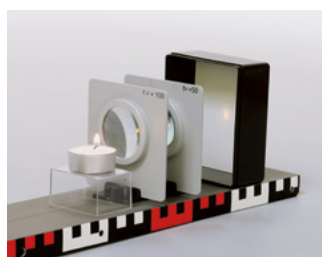
The kit contains a comprehensive manual and 19 different items e.g. an optical bench, a lamp with support, batteries, a slit diaphragm, biconvex lenses, screens and a shadow rod.

Size of kit: 270 x 210 x 50 mm



Experiment description with 15 experiments:

- Expansion of light
- Creation of shadow
- Reflection of light
- Refraction of light
- Reflection on a plane mirror
- Images on a plane mirror
- Focus of a converging lens (biconvex)
- Images of converging lenses
- Function of the eye
- Function of eye glasses
- Model of a camera
- Model of a slide projector
- Model of an astronomic telescope
- Model of a microscope
- Decomposition of the light



16110

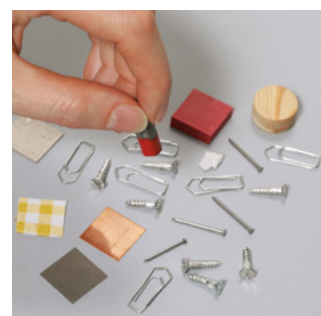
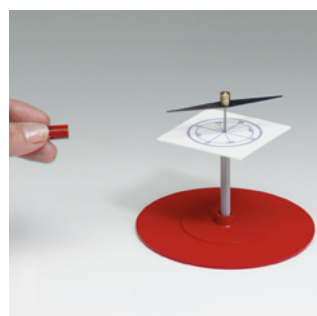
Mini-Kit 'Magnetism/Electrostatics'

Age
8-14



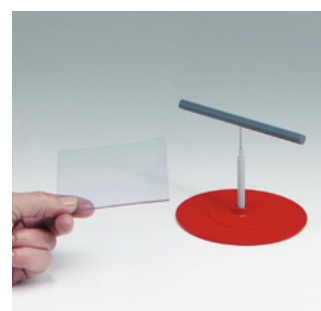
The kit contains a detailed manual and 24 different items e.g. a compass card, a magnetic needle with support, magnet rods, iron filings, small cars, a set of probes, rubbing cloth, a pith ball pendulum and a friction rod.

Size of kit: 270 x 210 x 50 mm



Experiment description with 17 experiments:

- Magnetic materials
- Magnets have a force
- Penetrating forces
- Magnetic field lines
- When two magnets encounter
- Can a magnet float?
- How a magnet can be produced
- The terrestrial magnetic field
- A magnet motor
- How magnetism can be used
- Electricity by friction
- Forces between two charged bodies
- Polarisation and influence
- The charged balloon
- Model of an electroscope
- Influence at the electroscope
- Electrostatic dance



16115

Mini-Kit 'Electricity'

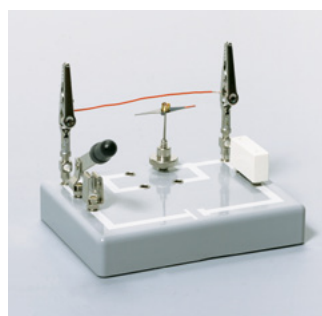
Age
8-14



A special plug-base and plug-in elements are the most essential parts in the Mini-Kit 'Electricity'.

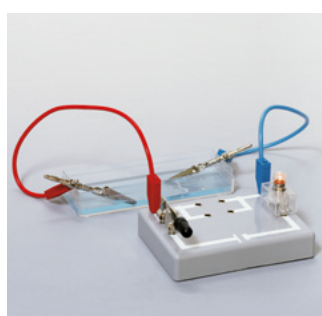
Further items e.g. batteries, lamps and Bulbholders, wire, plug leads, crocodile clips, magnetic needle and holder are also contained.

Size of kit: 270 x 210 x 50 mm



Experiment description with 11 experiments:

- The set-up of an electrical circuit
- Electrical circuit with switch
- Conductor and non-conductor
- Conduction in liquids
- Electric resistance
- Heating effect of the electric current
- Magnetic effect of the electric current
- Electromagnet
- Serial connection in a circuit
- Parallel connection in a circuit
- Chemical effect of the electric current



16120

Mini-Kit 'Biology'

Age
8-14



Students can carry out a number of tasks using the equipment in this Mini-Kit.

A very important basis for a profound and successful biological lesson is the carrying out of experiments with materials useful for this purpose.

Even if a school is not equipped with a special science lab it needs not refrain from this advantage.

Important learning aims:

- Observing with the aid of a magnifying glass
- Observing, dissecting and preparing plant parts and animals
- Preparing microscopic slides

Size of kit: 270 x 210 x 50 mm



Activity suggestions for the flower and leaf press:

- Create a herbarium
- Pressing flowers and other plant parts with one and two cotyledons (seed leaves) for comparison
- Identifying differences in the shapes of leaves (e.g. wild flowers)
- Comparison of flower petals of peas and beans
- Classifying the petals of a plant according to their size (e.g. comparison of a fading garden rose and wild rose)
- Comparison of the leaves of one type of plant taken from different locations (dandelion, plantain, lady's smock)
- Pressing different kinds of grass, ears of grains (differentiation of species) and roots
- Demonstrating the process of progressive leaf colouring in pressed leaves
- Demonstrating different stages of growth of germinating plants (e.g. bean, wheat) by pressing every day or every second day a germinating plant

With the help of the hand-held microtome it is possible to make very thin slices when dissecting plants or cutting tissue.

16180

Tellurium N

The particular innovations are the use of a Fresnel lens to produce an extra bright and parallel light beam which illuminates the earth globe completely, the focussing of a light point on the globe to demonstrate the apparent movement of the sun between the tropics and the use of a horizon disc with shadow-pin figure to show the position of the sun by the shadow fall.

The Tellurium N was designed by Prof. Dr. J. Newig, Kiel in cooperation with Cornelsen Experimenta.

► Included in delivery:

Tellurium N	Dust cover
Plug-mains appliance	Water-soluble felt pen
Lamp for replacement	Cleaning-cloth

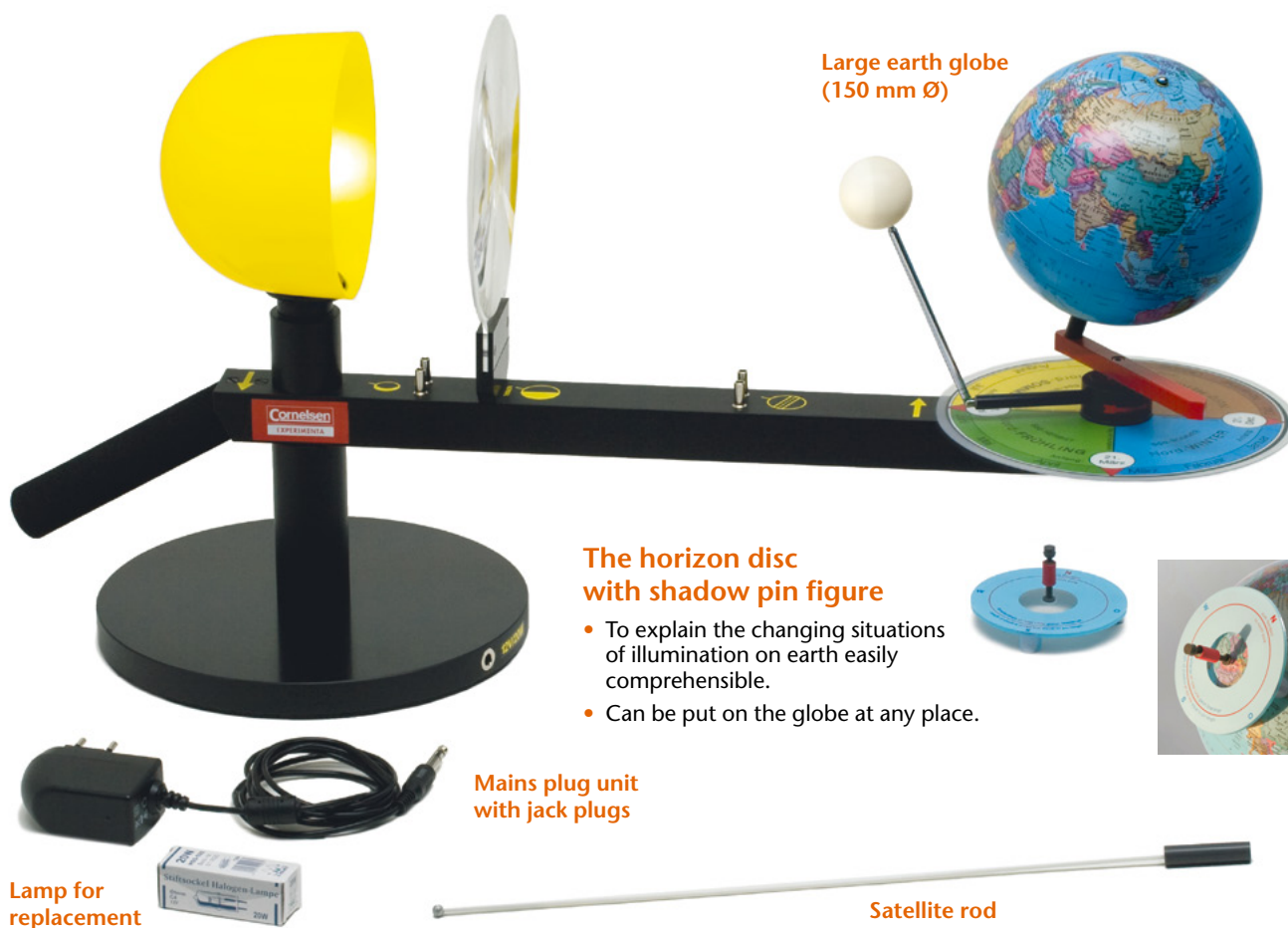


The Fresnel lens:

A short focal length provides a directed, parallel light with the result that a full half of the globe is illuminated and the shadow line (day and night) corresponds with the nature. Formerly designed Telluriums are not able to show it like this.

The three positions of the Fresnel lens:

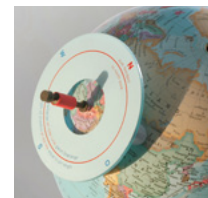
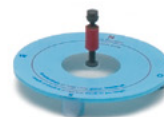
- **Day and night, seasons:** The globe is fully illuminated and the shadow line is clearly visible.
- **Tropics (sun-point):** The lens focuses a small light point with a 'hole' on the centre of the globe. When the earth is turned around the sun the light point moves across the equator between the northern and southern tropic.
- **Lunar phases:** The moon will especially be illuminated. When the moon is turned around the earth by hand the lunar phases and the eclipses can clearly be demonstrated.



Large earth globe
(150 mm Ø)

The horizon disc with shadow pin figure

- To explain the changing situations of illumination on earth easily comprehensible.
- Can be put on the globe at any place.



Mains plug unit
with jack plugs

Lamp for
replacement



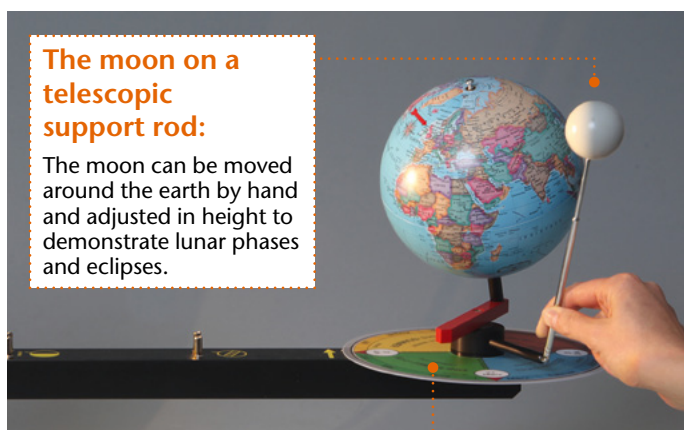
Satellite rod



31121

The moon on a telescopic support rod:

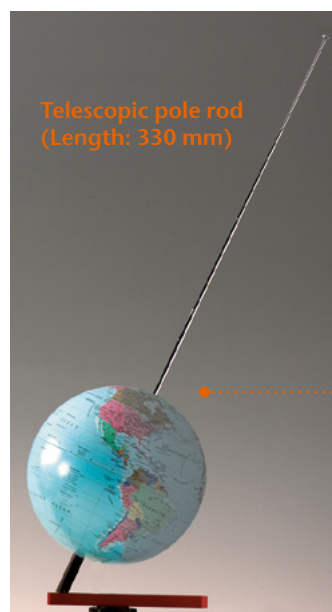
The moon can be moved around the earth by hand and adjusted in height to demonstrate lunar phases and eclipses.



The date disc and the date pointer

The earth globe is mounted on a large date pointer which moves around the date disc when the Tellurium arm is turned around the sun. Corresponding to the date pointer position the earth axis is turned towards or away from the sun (seasons). The dates of the summer- and winter solstice as well as the equinoxes are especially marked on the date disc.

The date disc is available in different languages.



Telescopic pole rod
(Length: 330 mm)

The large earth globe...

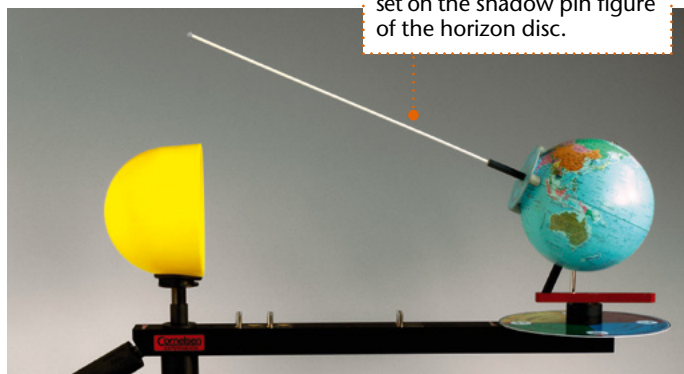
- Shadow line and other details are clearly visible on the globe even from a long distance.

... with telescopic rod

- To demonstrate the position of the earth with its direction of the earth axis to a fixed point in space (the North Star).

The satellite rod

To demonstrate the position and movement of a geostationary satellite a rod with a 'satellite' on the top can be set on the shadow pin figure of the horizon disc.



Included in delivery:

Teacher's manual

With lesson elements in detail for the following 13 topics:

- The earth as a gyroscope in space
- Day and night
- Hours
- Polar day and polar night
- Tropics
- Seasons
- Day- and night lengths at various latitudes
- Daytimes
- Lunar phases
- Eclipses



- Tides
- Eratosthenes earth circumference experiment
- Geostationary satellite



Cradle globe for students practise

- Especially suited for lessons in combination with the Tellurium N to measure distances and time differences on earth in small groups of students.
- Can be turned in all directions and is suspended in a clear acrylic support with distance and time scale at the height of the equator.
- Inscribable with a water soluble felt tip.
- Including felt tip and wipe.



Dimensions:
180 mm Ø x 90 mm height (Base); 150 mm Ø (Globe)

31118

Materials in everyday life

This kit contains equipment and resources for scientific experiments covering multiple disciplines to study various substances.

An initial section allows experiments to be carried out on basic material properties.

A second allows experimentation on mixtures of substances and separation of mixtures.

In addition, it is also possible to study changes of state between solid, liquid and gaseous substances and material changes due to chemical reactions.

Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Rail with stand material	Strainers
Dynamometer	Magnet rod
Set of material samples	Water hardness test strips
set of small parts, set of combustion samples	Nitrate/nitrite test strips
Dissecting needle, droppers	Common salt (sodium chloride), granulated sugar, citric acid, dye, vegetable oil
Plastic rods	Funnel, filter tube, filter paper
Set of metal cylinders	Erlenmeyer flask
Conical flask	Silicone hose
Tubes: glass, plexiglass, aluminium	Balloons
Spirit burner, wire gauze, tea candles	Bimetallic strip
Heat resistant pad	Thermometer
Test tubes with stand	Plastic trough, watch glass
Rubber stopper	
Universal indicator solution	



22005

Materials for 1 work group or demonstration



► Detailed instructions for 38 experiments:

Properties of materials

- Identifying and distinguishing materials
- Hardness and deformability of materials
- Density of materials
- Buoyancy of materials in liquids
- Thermal conductivity of solid materials
- Thermal conductivity of liquid materials
- Heat resistance and ignition
- Magnetic behaviour of materials

- Solubility of materials
- Acidic and alkaline solutions
- Hard and soft water
- Consequences of water hardness
- Mineral salts in water

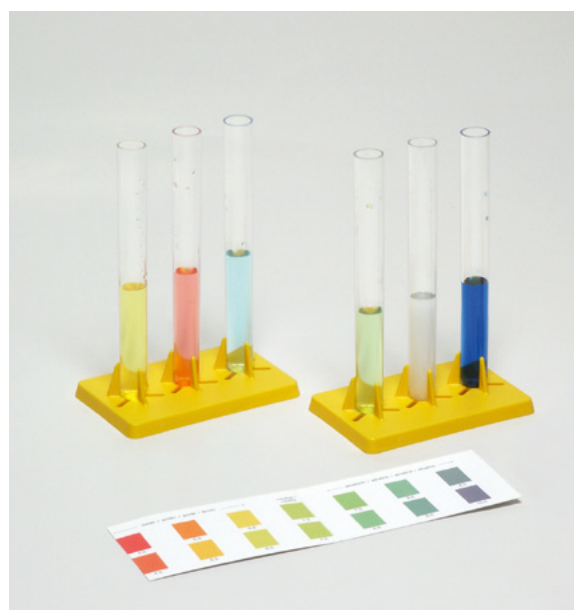
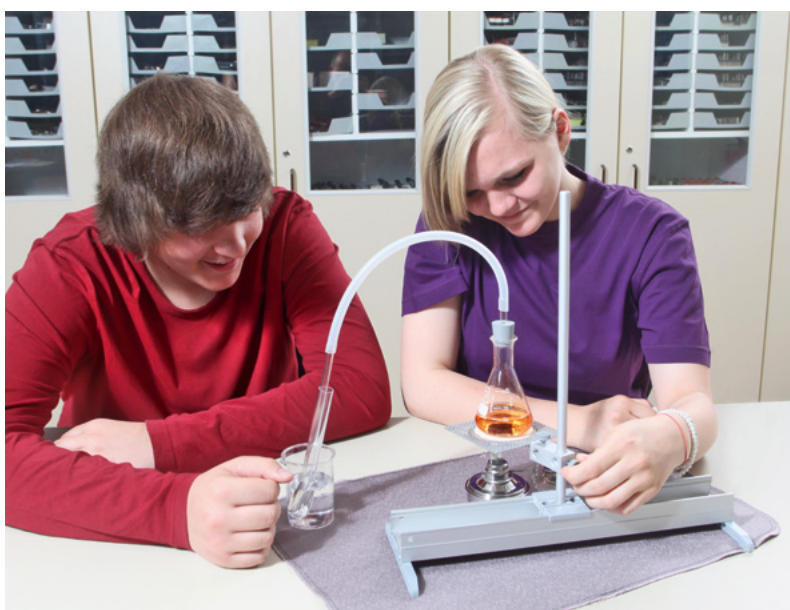
Mixtures of materials

- Mixing of solid materials
- Oil and water
- Mixing of oil and water
- Separation of oil and water
- Separation by deposition (sedimentation)
- Separation by filtration

- Separation by evaporation
- Separation by vaporization/distillation
- Separation by dissociation into constituent parts
- Production of drinking water from salt water
- Desalination of water
- Purification of dirty water by simple filtration
- Purification of dirty water by multi-layer filtration
- Magnetic separation for recycling scrap materials

Changing materials

- Changes in the state of liquids when warmed
- Changes in the state of gases when warmed
- Changes in the state of solid bodies when warmed
- Behaviour of bimetals when warmed
- Boiling of liquids
- States of aggregation of water
- Melting of materials
- Combustion and oxygen
- Release of gases
- Effect of gases
- Formation of rust



Everyday electricity and magnetism

This kit contains equipment and resources for scientific experiments covering multiple disciplines to study electrical processes and permanent magnetism.

In **electrostatics** there are experiments for demonstrating electrical charge and investigating how charges behave. In the **magnetism** section it is possible to study the properties of permanent magnets.

The key focus is on experiments to study the flow of current and on basic electrical circuits. More advanced experiments allow the effects of electrical current to be investigated.

Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



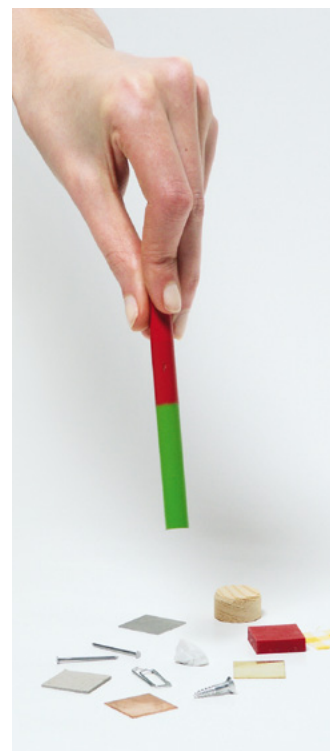
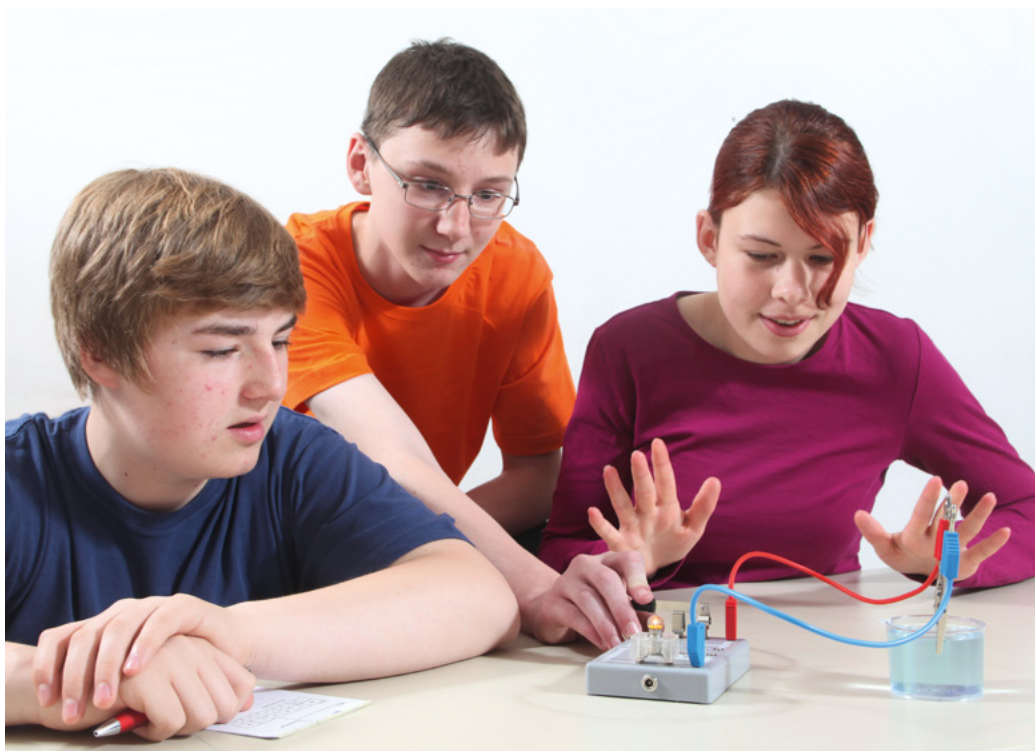
► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Plastic panes and sheets	Copper wire
Polystyrene balls	Heating filament wire
Universal plug-in board	Experiment leads
Friction rods	Set of material samples
Friction cloth	Set of small parts
Magnetic needle	Electric motor with plugs
Needle support with plug	Electric bell with plugs
Pith ball pendulum	Bar magnets
Bridge plugs (jumpers)	Mini carriages for bar magnets
Lever switch	Test tube
Lamp holder, bulbs, neon filled glow lamp	Iron wire with notches
Set of batteries	Set of compasses, compass card
Plastic beaker	
Crocodile clips with plug	



22006

Materials for 1 work group or demonstration



► Detailed instructions for 23 experiments:

Electricity

- Electric charge
- Effects of electric charge
- Forces between electric charges
- Demonstration of electric charge
- Electric circuits
- Electrical conductivity of solid substances

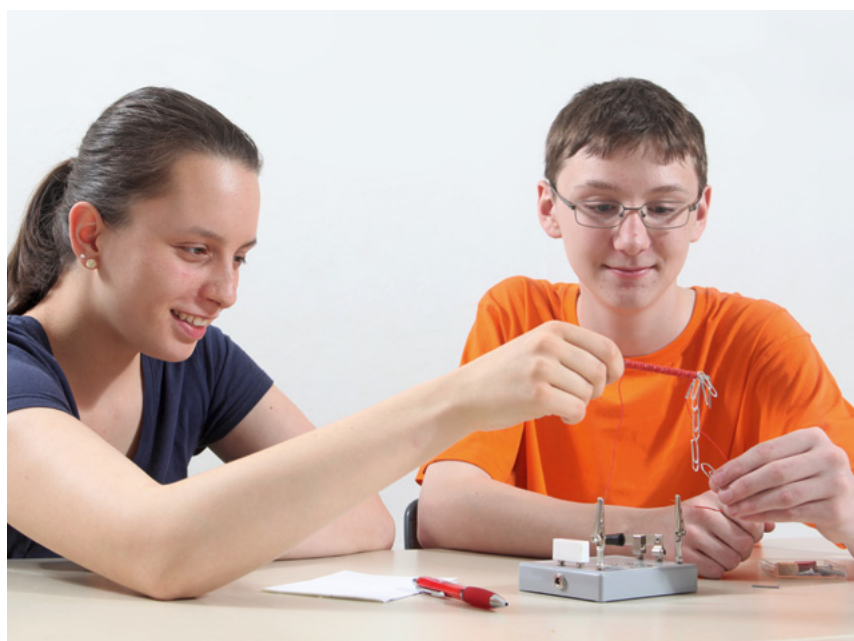
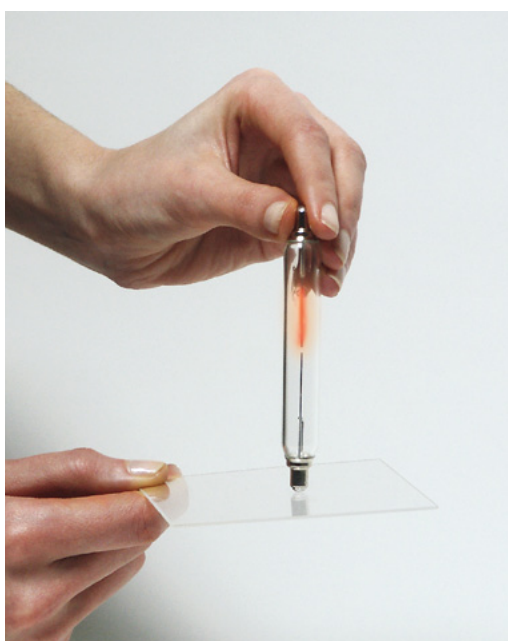
- Electrical conductivity of liquid substances
- Wiring of voltage sources
- Lamps connected in parallel
- Lamps connected in series
- Heat arising from electric current
- Magnetism arising from electric current

- How an electric door bell works
- How an electric motor works

Magnetism

- Effect of magnetism on substances
- Transfer of magnetic effects
- Forces between magnets

- Floating magnets
- Magnetisation of iron wire
- Splitting a magnet in two
- Demonstration of magnetic fields
- Model compass



Sun, heat and air

This kit contains equipment and resources for scientific experiments covering multiple disciplines to study the properties of the air around us and the nature of heat.

On the basis of a whole range of experiments, it is possible to learn about basic properties of air and the effects of air pressure.

In a further set of topics, experiments are performed to elucidate the concept of heat and how heat from the sun could be utilised.

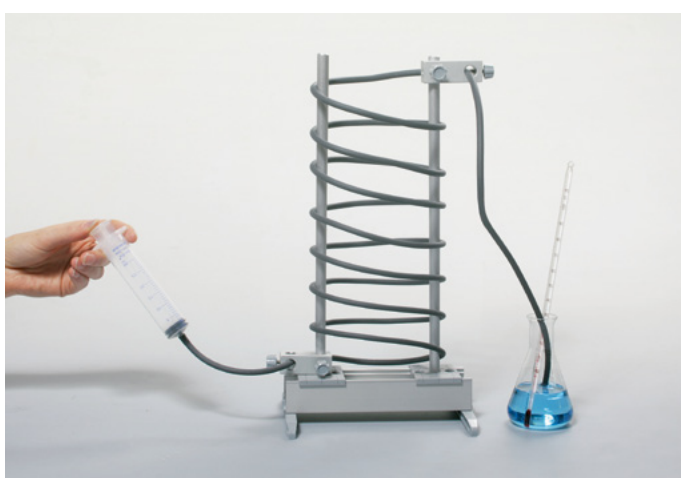
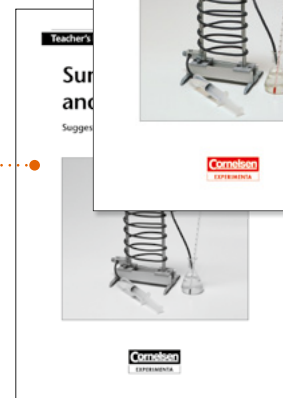
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



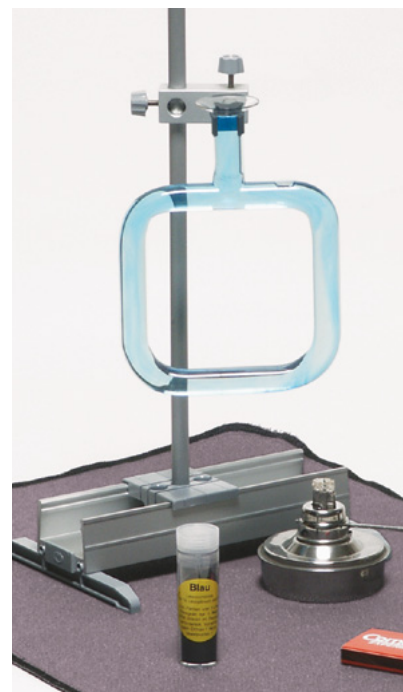
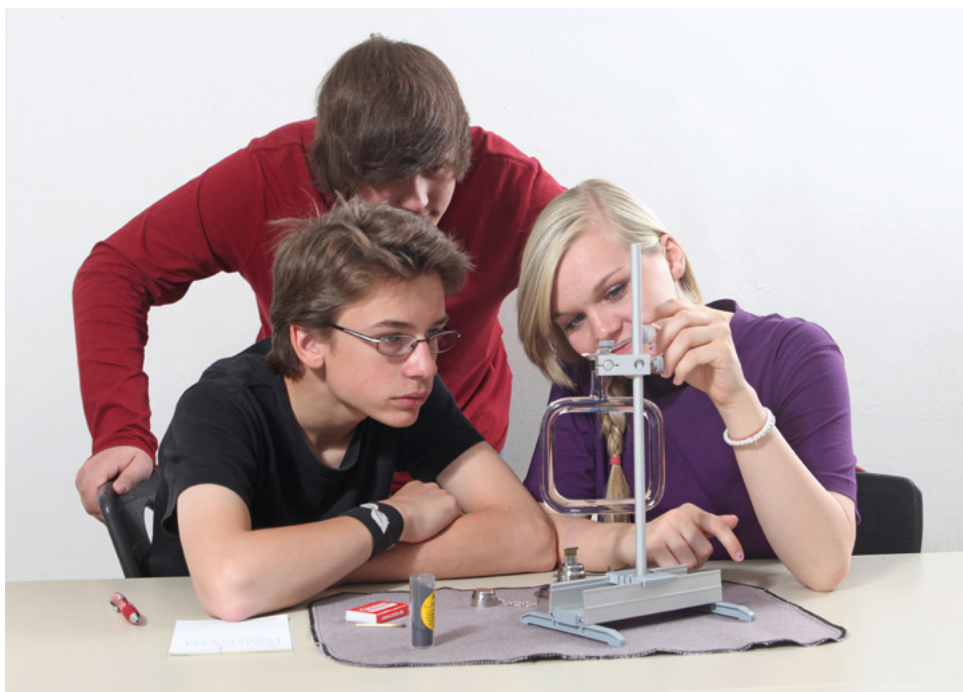
► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Stand material	Spirit burner with retaining ring and wire gauze
Plastic trough	Dye
Crucible	Hose with coupling
Erlenmeyer flask	Black rubber hose
Suction flask	Air cushion disc
Plastic beaker	Balloons with valve
Funnel	Test tube
Convection tube	Rubber stopper
Hot-air balloon with chimney	Float
Metal foil	Tea candle
Thermometer	Insulating block
Syringe	Heat resistant pad
Bimetallic strip	
Tubes: aluminium, glass	



22009

Materials for 1 work group or demonstration



► Detailed instructions for 29 experiments:

Air

- The invisible air
- What is in the air?
- Air is a body
- Air resistance
- Air versus water
- Air can raise water
- Air can store energy
- Air can transmit force
- Air can expand

- Air pressure – an invisible force
- Effects of air pressure
- Changes in pressure
- Measuring air pressure
- Movement on a cushion of air
- Lift due to hot air
- Lift due to flow of air

Heat/Sun

- Hotter or colder?
- Measurement of heat
- What is temperature?
- Use of bimetallic strips as thermometers
- Heat possesses energy
- Conduction of heat
- How heat can circulate
- Heat can be focussed
- Heat can transform substances
- Heat can be retained
- Heat can be withdrawn
- Heat from the sun
- Conversion of solar energy



Exploring the world of the small

This kit contains equipment and resources for scientific experiments covering multiple disciplines to learn the methods and procedures for observing very small objects.

After a range of initial observations of small objects through a magnifying glass, there are numerous experiments allowing students to learn step by step how to prepare tiny objects for investigation with a microscope and how to use a microscope itself.

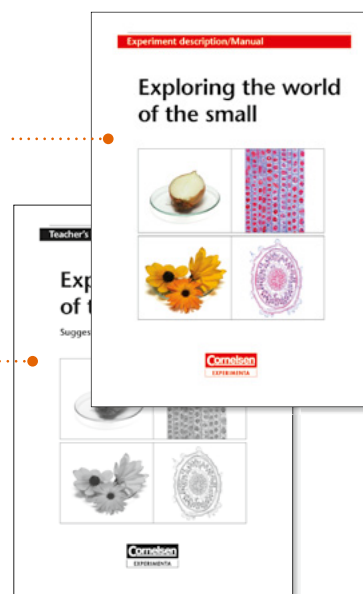
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Three-lens magnifier	Filter paper
Beaker lens	Watch glasses
Dissecting needles	Dye
Forceps	Graduated plastic beaker
Knife, brush, pair of scissors	Spatula
Droppers	Cotton wool balls
Microscopic slides, cover glasses	Iodine solution
Microtome	Polyethylene bottles
Vegetable oil	<i>Additionally required:</i>
	Microscope (see page 140)





► Detailed instructions for 20 experiments:

Observations with the microscope

- Examination of a hair
- Examination of feathers
- Examination of a butterfly wing
- Examination of onion epidermis
- Examination of waterweed or rhizomnium moss

- Examination of vacuoles (cell sap cavities)
- Examination of stinging hairs from a stinging nettle
- Examination of pollen
- Examination of the nutrient transport systems of a plant
- Examination of storage cells of a potato tuber

- Examination of the skin on the underside of a plant leaf
- Examination of cells from the lining of the mouth
- Observation of freshwater polyps
- Observation of food ingestion by a freshwater polyp
- Observation of water fleas
- Examination of insects
- Examination of pond water or stream water

- Examination of living creatures in a hay infusion

Observations with the magnifying glass

- Inspection of plant seeds
- Inspection of mosses
- Inspection of fish scales
- Inspection of feathers



My body, my health

This kit contains equipment and resources for scientific experiments covering multiple disciplines to perform simple experiments on the perception of taste and on the ingredients in food.

In addition to experiments on breathing and taste, there are others which allow the demonstration of ingredients in what we eat.

Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Filter paper	Test tubes with stand
Graduated plastic beaker	Rubber stopper
Cotton swabs	Garlic press
Common salt, dextrose, granulated sugar, modified starch	Set glucose test strips
Plastic tube	Set protein test strips
Plastic strip	Thermometer
Mass with hook	Insulating block
Watch glasses	Suction flask
Iodine solution	Hoses
Vegetable oil	Rubber bellows
Spoon, knife, dropper	Calcium hydroxide
	Polyethylene bottle





► Detailed instructions for 9 experiments:

Sense and perception, movement, respiration

- Taste cells of the tongue
- Strength of bones
- Determination of respiratory volume
- Determination of the carbon dioxide content of inhaled and exhaled air

Nutrition and digestion

- Detection of starch, fat, glucose and of protein in foodstuffs
- Confirmation of starch digestion in the mouth



What you feel, what you see, what you hear

This kit contains equipment and resources for scientific experiments covering multiple disciplines to perform simple experiments on three of the five senses, touch, hearing and sight.

Some simple experiments are used to study the propagation of light, the sense of sight and the function of key optical equipment. Others investigate the creation and propagation of sound waves.

The possibilities of this set are rounded out by experiments on the sense of touch and perception of heat.

Included in delivery:

Experiment description

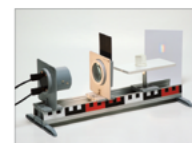
- with student worksheets

Teacher's booklet

- with suggested solutions

Experiment description/Manual

What you feel,
what you see,
what you hear



Cornelsen

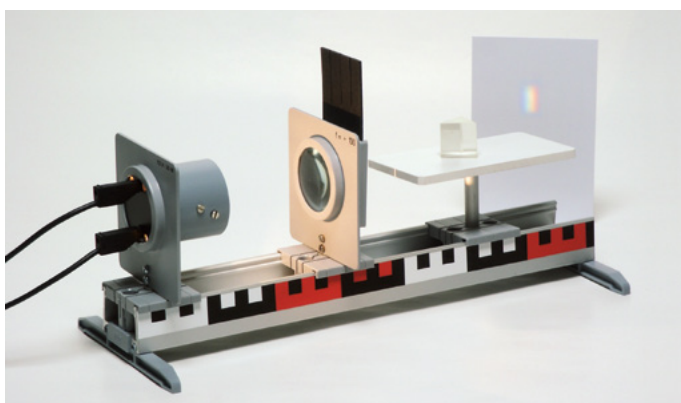
Teacher's

Wh
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Suggest



Cornelsen



► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Rail with stand material	Tuning fork
Dissecting needle	Colour slide
Set of material samples	Slides with hole and with arrow, slide holder
Lenses, biconvex and biconcave	Set of 5 optical shapes
Optical lamp	Prism, equilateral
Camera box	Leaf spring
Table with rod	Mirrors
Filter tube	Screens
Test tube brush	Cuvette
Hearing tube with ear-pieces	Screen & mirror holder
Tea candle	

Additional power supply required, e.g.:

55217 Power supply unit 12 V (see page 137)



22018

Materials for 1 work group or demonstration



► Detailed instructions for 28 experiments:

What you see

- Propagation of light
- How to create beams of light
- Light and dark
- Light and shadow
- Deflection of light
- How reflections happen
- Light can change direction

- Focusing and dispersing light
- How images are created
- How the eye sees
- Why do people need glasses?
- Not all spectacles are the same
- Principle of a camera
- Magnification of images

- Astronomical telescope
- Terrestrial telescope
- Principle of a microscope
- Light and colour

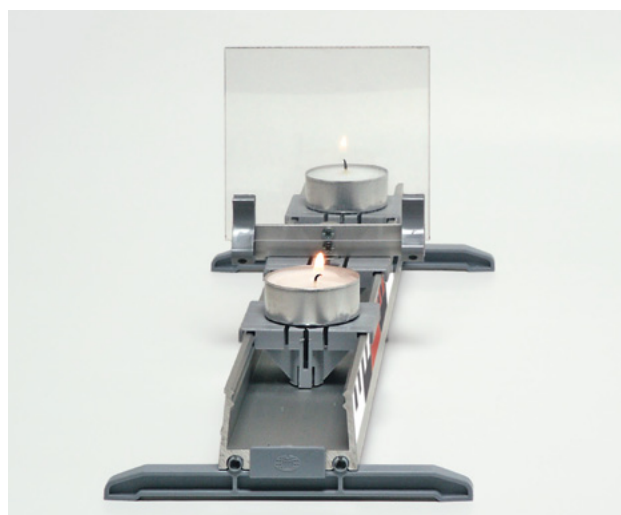
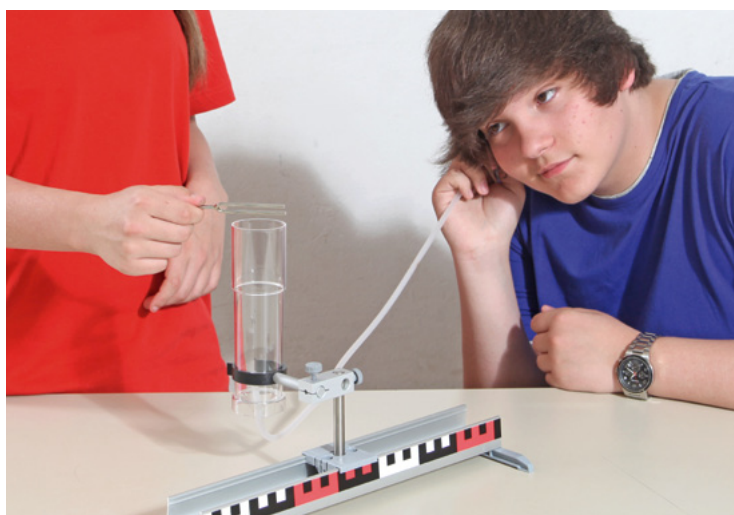
What you hear

- How sounds and sound waves arise
- Demonstration of sound waves

- Propagation of sound waves
- Sound waves cause pressure
- Excitement by sound waves
- Transport of sound

What you feel

- Sensitivity of skin
- Sense of touch
- Sensing heat
- Distinguishing by touch



Forces and motion in nature and technology

This kit contains equipment and resources for scientific experiments covering multiple disciplines to conduct simple experiments on the effects of mechanical forces.

Various effects of force are investigated in a variety of experiments, which also allow conclusions to be drawn about the technical use of such effects.

Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



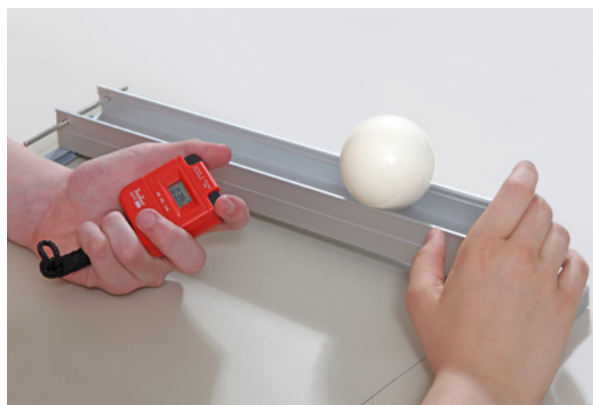
► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Rail with stand material	Cord
Mass holder	Helical spring
Slotted masses	Metal axles
Masses with hook	S-shaped hook
Steel ball	Plastic ball
Magnet rod	Plastic wedges
Dynamometer	Measuring tape
Carriage with friction foil	Stop watch
Leaf spring	
Lever arm	
Pulleys, pulleys with hook	



22021

Materials for 1 work group or demonstration



► Detailed instructions for 16 experiments:

- Loading by forces
- Deformation by forces
- Acceleration by forces
- Deceleration by forces
- Deflection by forces
- Measurement of forces
- Dragging something up a slope instead of lifting it
- Usefulness of levers
- Single-sided levers
- Redirection of forces
- Saving effort
- Redirection of forces to save effort
- Motion and inertia
- The ubiquitous force of friction
- Uniform or accelerated motion
- Fast or slow motion



Plants, animals, habitats

This kit contains equipment and resources for scientific experiments covering multiple disciplines to investigate the living conditions of plants and microscopic creatures.

Multiple experiments and observations can be carried out to investigate the processes and conditions upon which the emergence and prosperity of plant and animal life depend.



► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Three-lens magnifier	Crucible and crucible tongue
Dissecting instruments	Germination dishes, watch glasses
Measuring jug	Spirit burner with wire gauze and tripod stand
Dropper	Heat resistant pad
Syringe	pH test strips, WATESMO test strips
Hose with coupling	Vegetable oil
Rubber stopper	Filter paper
Test tubes with stand	Dye
Thermometer	Iodine solution
Cord	Spoon
Plumb line with 10 depth markers	
Polyethylene bottles	
Rapid scale with pan	

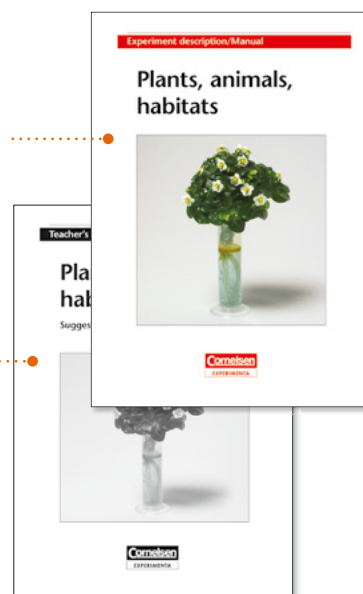
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions





► Detailed instructions for 16 experiments:

Structure and life processes of plants

- Examination of a flower
- Investigation of the uptake of water by roots
- Investigation of the water given off by plants
- Investigation of water transport in plants
- Examination of a bean seed
- Detection of starch in seed leaves
- Observing the germination of bean seeds
- Observation of root hairs
- Investigation of the conditions for germination

Water as a habitat

- Determining the quality of water bodies from their turbidity, discoloration and odour
- Measuring temperatures at various depths in bodies of water
- Determining the visibility depth of water bodies

Soil as a habitat

- Investigation of soil types
- Identifying different soil constituents
- Determining
 - the humus content of soils
 - the pH value of soil samples
 - the lime content of soil samples
- Examination of soil samples for living creatures



Mechanics 1

This kit contains equipment and resources required for investigating the basic laws of solid, liquid and gaseous bodies.

- **Solid bodies**
Forces and their effects, laws of levers, mechanical scales, processes involving pulleys or block and tackle, inertia and friction, advantages of inclined planes and much more
- **Liquids**
Properties and behaviour of surfaces open to air, propagation of pressure and lift, technical applications and much more
- **Gaseous bodies**
Effects of normal air pressure and other different pressure conditions along with principles of how heat engines function

Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



- **More than 50 individual components in two plastic trays (312 x 427 x 75 mm) with foam insert and lid:**

Rails with clamp riders and stand material
Dynamometer

Mass holder, masses
Coil spring
Set of metal cylinders

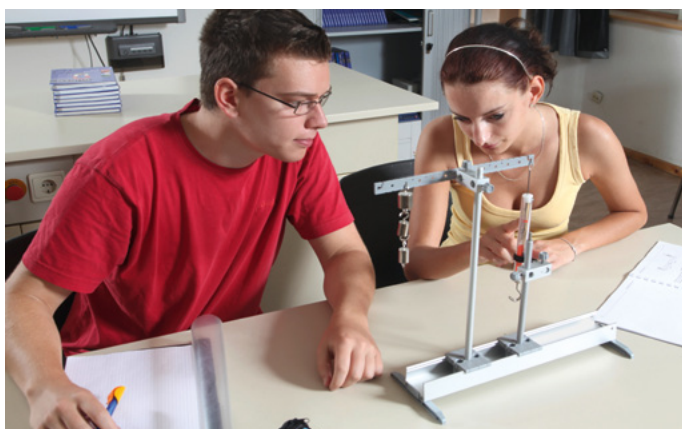
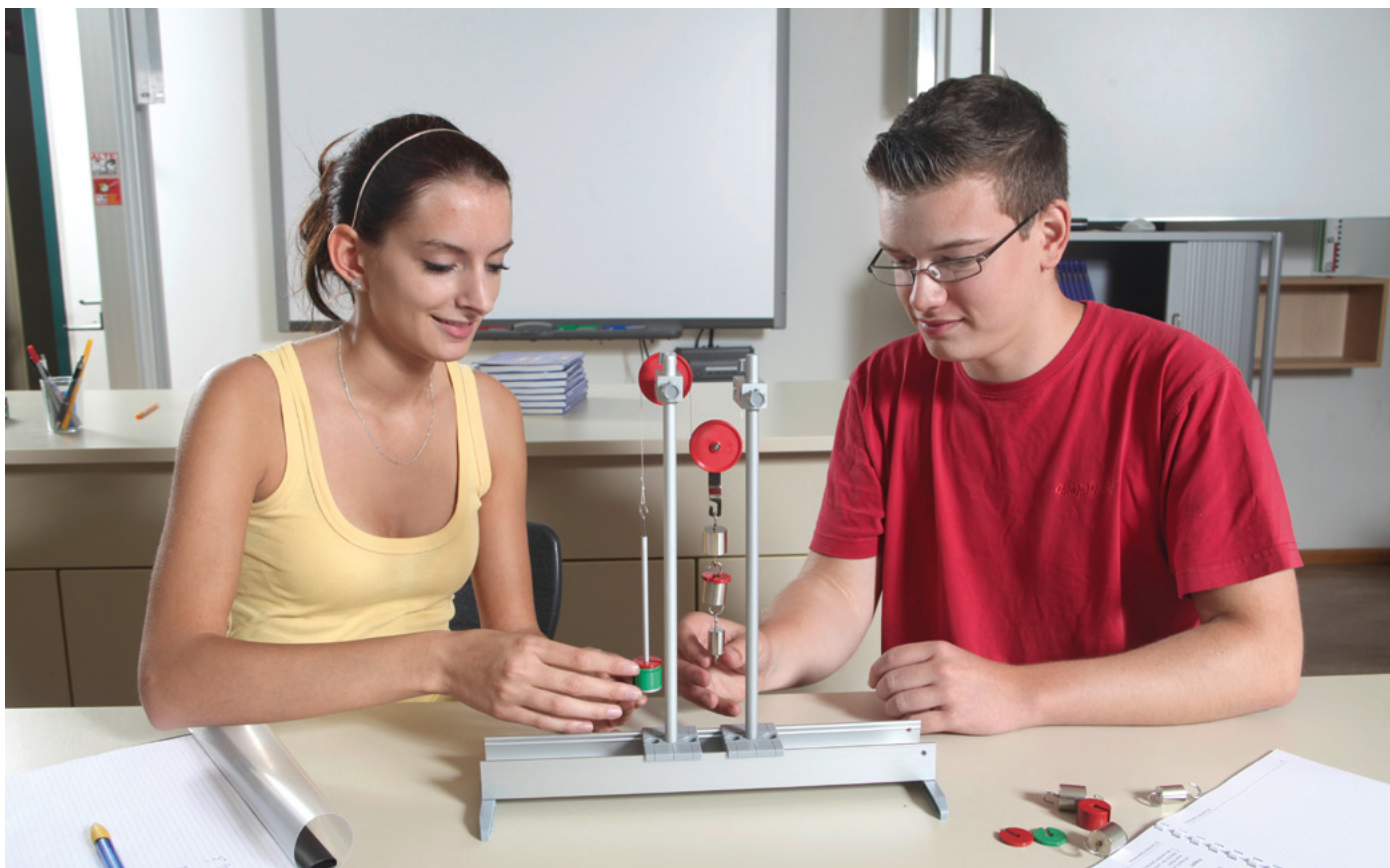
Lever arms, scale pans
Carriage, pulleys
Beaker, bowl, graduated cylinder, suction flask
Cartesian diver
Manometer tube, dye

Balloons with valves
Paddle wheel
Air cushion disc
Funnel, syringe, hoses
Test tube, rubber stoppers
Capillary tube



43000

Materials for 1 work group



► Detailed instructions for 49 experiments:

Mechanics of solids

- Volume of a body
- Density of a body
- Action of forces – extension – Hooke's law
- Spring dynamometer
- Action of forces – Bending
- Bending of a plate spring
- Directional dependence of an applied force
- Combination of forces
- Centre of gravity of a body
- Equilibrium
- Stability
- Inertia of bodies
- Friction
- First-class lever
- Second-class and third-class levers
- Beam scale
- Steelyard
- Fixed pulley
- Moveable pulley
- Fixed pulley plus moveable pulley/Tackle
- Efficiency
- Inclined plane

Mechanics of liquids

- Liquids with free surface
- Communicating vessels

- Levelling in liquids
- Transmission of pressure in liquids
- Cartesian diver
- Principle of the U-tube manometer
- Hydrostatic pressure
- Suction and force pump
- Capillarity
- Adhesive forces
- Surface tension
- Buoyancy in liquids
- Model of a hydrometer
- Floating and sinking
- Utilisation of water power

Mechanics of gases

- Air as a body
- Compression and expansion of a gas
- Effect of atmospheric pressure
- Vacuum and overpressure
- Generation of a partial vacuum
- Principle of a piston pressure gauge
- Model of a wash bottle
- Principle of a diving bell
- Effect of forces applied by a gas (3 experiments)
- Principle of heat engines

Mechanics 2 – Dynamics with CorEx Log Qt

The kit contains equipment and resources required for investigating the basic laws of motion and oscillation. The experiments use a modern timer with memory function.

Pupils can make measurements in a conventional manner irrespective of the power supply, but can also analyse the saved results on a PC later on. In addition, the timer can be used as an interface, allowing any measurement to be displayed, processed and saved on a PC or notebook computer.

The measurements are recorded by means of accurate and reliable light barriers. The precisely manufactured carriage with its own propulsion is characterised by the extremely high precision of its movement.

CorEx Log Qt Timer

The digital timer CorEx Log Qt will support your lessons in the best possible way. You can use it together with two light gates as an independent measuring instrument or to complete or modernize an existing track.

You can exactly measure

- Time
- Speed
- Acceleration
- Period of oscillation



- More than 30 individual components in a plastic tray (312 x 427 x 150 mm) with foam insert and lid:

Rail, 100 cm long
Rail with riders and stand material
Trolley with driving unit
Trolley
Light gates
Tension hook

CorEx Log Qt Digital Timer with USB-cable, 2 sensor cables, CorEx Sensing Science software, power supply, manual for logger and software
Slotted masses
Set of springs

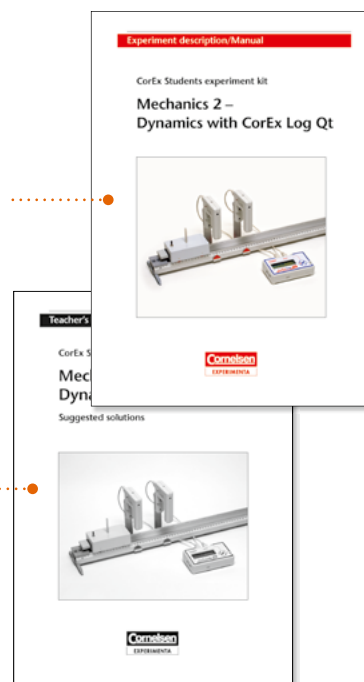
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions

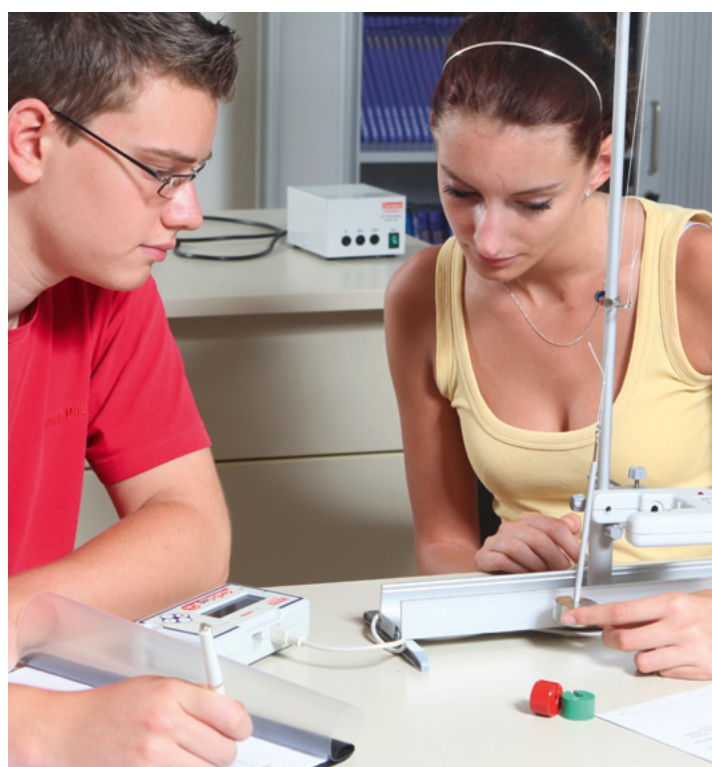
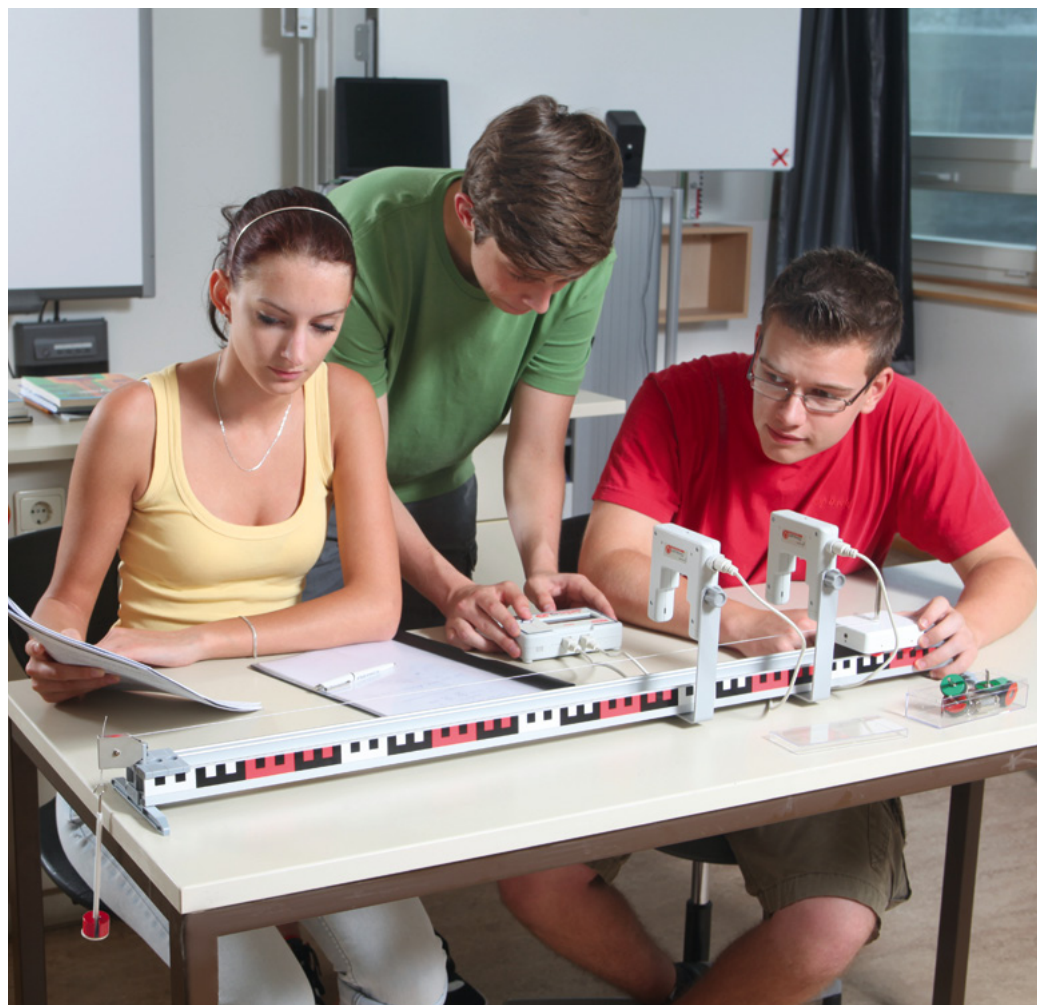


43108

Materials for 1 work group

► Detailed instructions for 25 experiments:

- Linear motion (2 experiments)
- Velocity (2 experiments)
- Momentary velocity (2 experiments)
- Accelerated motion (3 experiments)
- Horizontal throw
- Inclined throw
- Free fall
- Central elastic collision
- Central inelastic collision
- Elastic collision at a wall
- Comparison of repelling forces
- Spring swinger
- Pendulum (3 experiments)
- Spring leaf oscillator
- Coupling of spring swingers
- Damped oscillations (2 experiments)
- Enforced oscillations



Heat

This kit contains all the equipment and resources for basic experiments on thermodynamics in solid, liquid and gaseous bodies.

Apart from making simple temperature measurements, it is also possible to investigate the principles of how bodies behave in response to changes in temperature.

Further experiments allow for closer observation of the emission, reflection and absorption of thermal energy as well as how it propagates via heat radiation, conduction and convection.

Determination of specific heats and investigation of the processes of evaporation, boiling and condensation round off the range of available experiments.

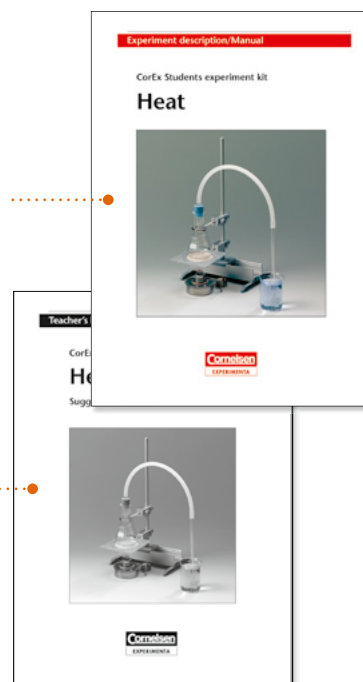
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



- More than 30 individual components in a plastic tray (312 x 427 x 150 mm) with foam insert and lid:

Rail with riders and stand material	Heat conducting rods
Spirit burner	Bimetallic strip
Glass components	Calorimeter
Tubes, rubber stoppers	Convection tube
Paddle wheel	Thermometer

Additional 6 V DC power supply required, e.g.:

68533 Power supply unit 6 V (see page 137)



48500

Materials for 1 work group



► Detailed instructions for 20 experiments:

- Model of a thermometer
- Measurement of temperatures
- Heating and cooling
- Thermic behaviour of liquids
- Thermic behaviour of gases
- Thermic behaviour of solids
- Thermal conductivity of solids
- Thermal conductivity of liquids
- Bimetal-thermometer
- Heat radiation
- Reflection of heat radiation
- Absorption of heat radiation
- Heat flow – convection
- Temperature of mixture
- Specific heat of water
- Specific heat of solids
- Vaporization and condensation
- Distillation
- Utilization of heat energy

Energy conversion 1

This kit contains all the equipment and resources for a host of experiments on conversion of energy from one form to another.

It is possible for thermal energy, mechanical energy, light energy or chemical energy to be turned into electrical energy or vice versa and in any other combination.

The possible experiments are completed by a set of exercises involving storage of energy.

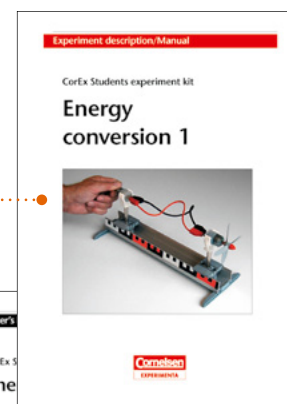
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



- More than 40 individual components in a plastic tray (312 x 427 x 150 mm) with foam insert and lid:

Rail with riders and stand material	Thermometer
Experiment leads	Parabolic mirror
Accumulator	Paddle wheel
Lamp	Base for plug-in elements
Micro motor	Solar module
Electric motors	Thermoelectric converter
Propeller	Plug-in elements: LED, resistor, bulb
Electrodes	Water decomposition device

Additional 1.5 to 12 V DC power supply required, e.g.:

55223 Power supply unit, 1.5 to 15 V/1.5 A DC (see page 136)

Additional meter required, e.g.:

54892 Digital-Multimeter (see page 139)
or

54889 Digital-Multimeter (see page 139)



48550

Materials for 1 work group

Renewable Energies



► Detailed instructions for 20 experiments:

- Streaming energy to mechanic energy (2 experiments)
- Streaming energy to buoyancy
- Steps of energy conversion
- Mechanic energy to heat energy
- Heat energy to electric energy
- Heat energy to mechanic energy
- Electric energy to heat energy
- Measuring of heat conduction by conversion
- Measuring of mechanic energy by conversion
- Mechanic energy to electric energy (2 experiments)
- Streaming energy to electric energy
- Electric energy to streaming energy
- Direct use of solar energy
- Indirect use of solar energy
- Solar cell as energy converter
- Light energy to electric energy
- Dependence of the power of a solar cell on the power of light
- Charge of a solar cell
- Cold by a heat radiation
- Chemical energy to mechanic energy
- Chemical energy to electric energy
- Electric energy to chemical energy
- Storage of electric energy by conversion to chemical energy
- Energy conversion and storage



Energy conversion 3: Solar hydrogen technology

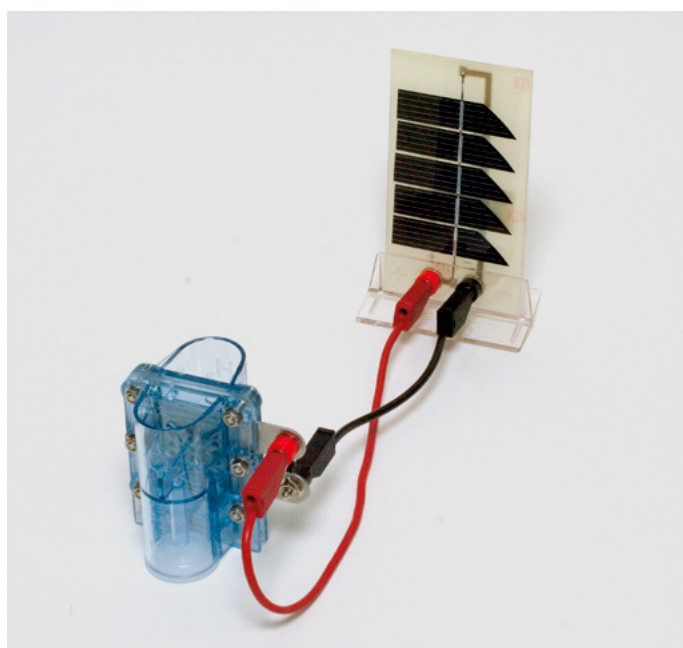
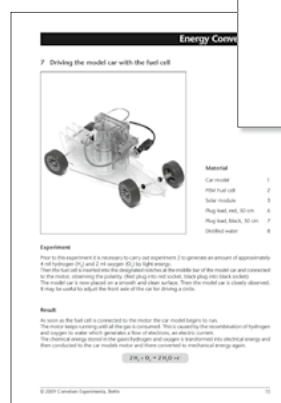
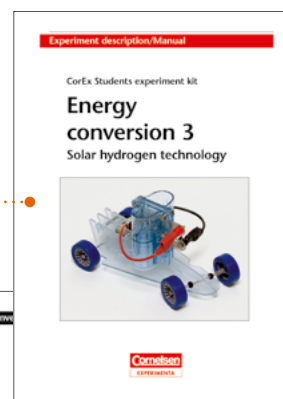
The student kit 'Energy conversion 3' contains everything you need to enter the fascinating world of modern-day energy sources and to understand their features. Pupils can learn about the basic physical and chemical interactions on the basis of multiple experiments.

Some of the experiments can even be carried out in the absence of light sources or sunshine with the aid of the supplied hand generator. The propeller model and car can be used to demonstrate various kinds of energy consumption in illustrative and interesting fashion.

The chain of conversion from mechanical energy into electrical and then into chemical energy is also made understandable for pupils.

Included in delivery:

Experiment description



► In a plastic tray (312 x 427 x 75 mm) with foam insert and lid:

Hand generator	Experiment leads
Solar module	Plug lead connectors
Reversible PEM fuel cell	Demineralised water
Motor with propeller	Model car

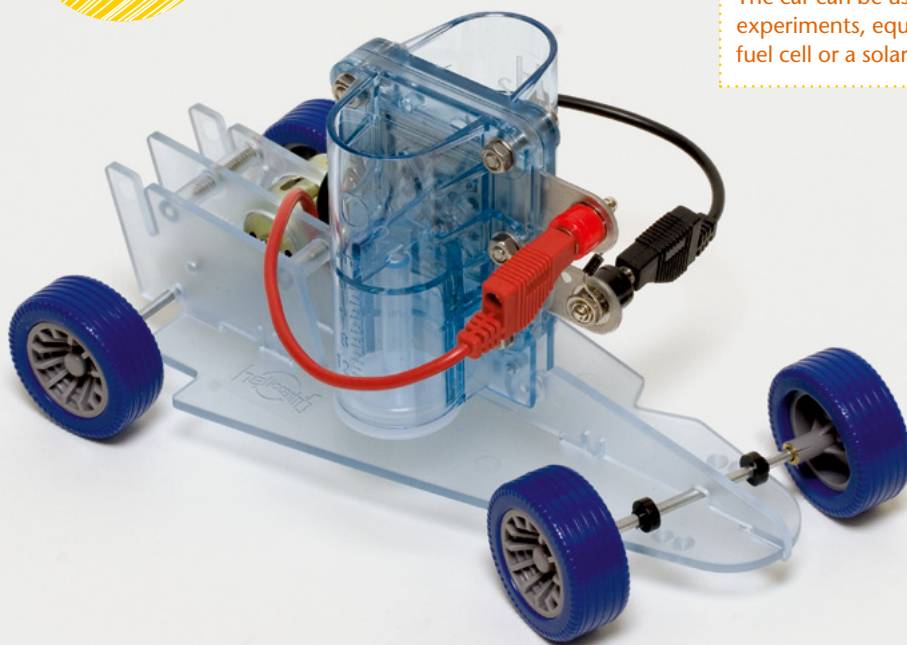


76001

Materials for 1 work group

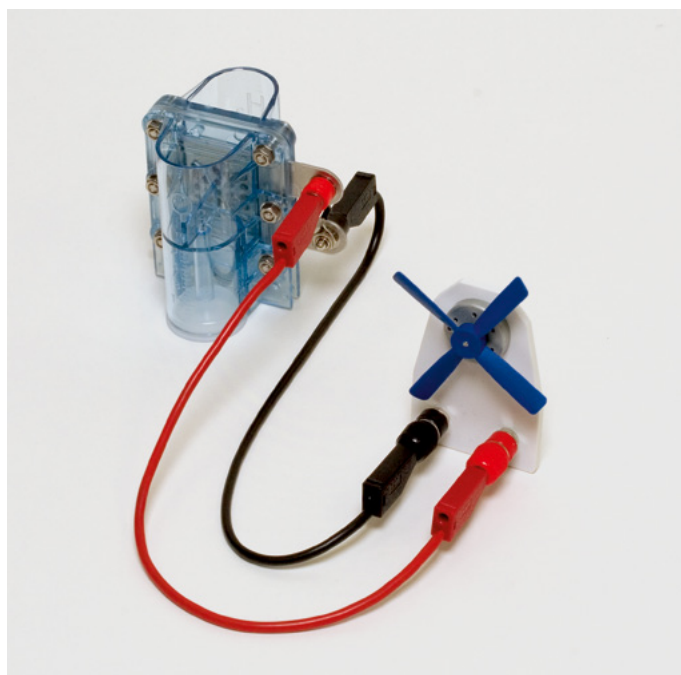
Renewable Energies

The car can be used for a wide variety of experiments, equipped either using a fuel cell or a solar module.



► Detailed instructions for 7 experiments:

- Electrolysis with the hand generator
- Electrolysis with the solar module
- Powering the fan module with the hand generator
- Powering the fan module with the fuel cell
- Driving the model car with the hand generator
- Driving the model car with the solar module
- Driving the model car with the fuel cell



DynaMot

This kit allows school experiments to be conducted using the DynaMot manually powered generator designed by Dr. Heinz Muckenfuß.

DynaMot can be used as a DC generator or motor in order to replace batteries or power supplies in introductory lessons on electricity (DC circuits).

Since the pupils can 'make' the electricity for most experiments themselves, the basic terminology and concepts about electric circuits can be firmly linked to concrete experience on the generation of electrical energy.

DynaMot makes it possible to illustrate all of the fundamental laws and terminology because it is a physical way of experiencing the physics, illustrating upon what the energy produced by electrical generators depends.

Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



- More than 25 individual components in a plastic tray (312 x 427 x 150 mm) with foam insert and lid:

Generator DynaMot	Set of bulbs for DynaMot experiments
Table clamp	Heating wire
Experiment leads	Crocodile clips with plug
Lamp holder with 4 sockets MES	Bridge plugs (jumpers)
Lamp holder SES	

Additional meter required, e.g.:

54977 Ammeter for students (see page 138)
or

54978 Voltmeter for students (see page 138)



54853

Materials for 1 work group



Hand driven generator as power supply and alive teaching support for the formation of concepts in electricity

► Detailed instructions for 8 experiments:

- Energy flux – Flow of electrons
- Measurement of the flow of electrons
- Energy flux and amperage in parallel connections
- Energy flux and voltage
- Energy flux and voltage in series connections
- Energy conversion – Caloric energy
- Energy conversion – Mechanical energy
- Energy conversion – Chemical energy



Optics 1

This kit contains all the equipment and resources for conducting basic experiments on ray optics and imaging.

The experiments on ray optics allow laws describing propagation, refraction and reflection of light to be investigated.

The experiments on imaging make it possible to observe more closely the various types of lenses and their properties. In addition, the design and function of the eye as well as the range of optical instruments and equipment can all be investigated in great detail.

The possibilities are completed by experiments on the dispersion and composition of white light.

■ **Note:**

For experiments on *wave optics* this kit can be supplemented by the 'Optics 2' kit.

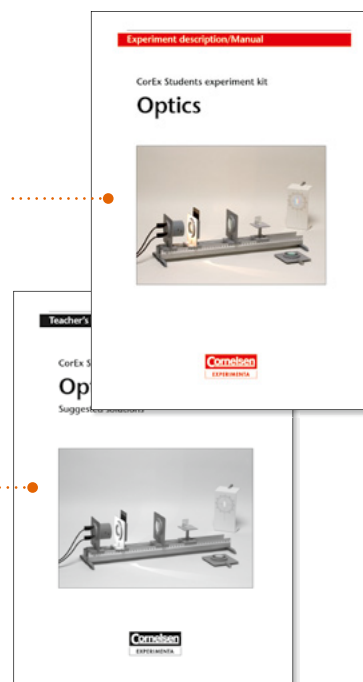
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



- **More than 30 individual components in a plastic tray (312 x 427 x 150 mm) with foam insert and lid:**

Optical bench	Experiment leads
Clamp sliders	Projection table
Lamp	Set geometrical optics models
Diaphragms: slit, arrow, hole	Mirrors
Colour slides	Equilateral prism
Biconvex lenses in frame	Cuvette
Biconcave lens in frame	Set colour filters
Screens	

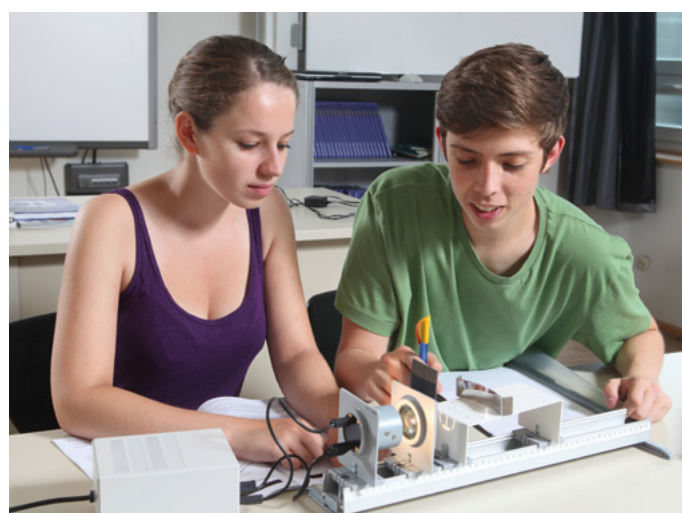
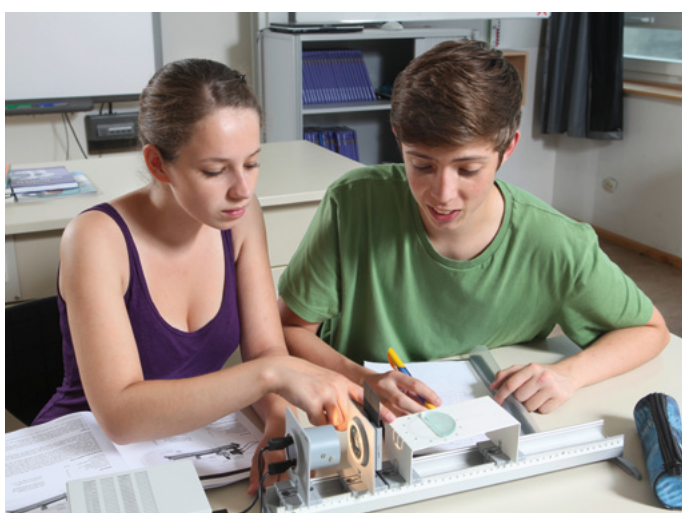
Additional power supply required, e.g.:

55217 Power supply unit 12 V (see page 137)



47525

Materials for 1 work group



► Detailed instructions for 27 experiments:

Experiments which can be carried out with 'Optics 1'

Geometrical optics

- Expansion of light
- Silhouettes
- Pin hole camera
- Reflection at a plain mirror
- Reflection at a curved mirror
- Refraction of light
- Refraction of light in water
- Converging lens
- Diverging lens
- Focal length of converging lenses
- Model of an eye
- Correction of
 - Short-sightedness
 - Long-sightedness
- Magnifier
- Astronomic telescope

- Terrestrial telescope
- Slide projector
- Microscope
- Dispersion
- Absorption of spectral colours

Experiments which can be carried out with 'Optics 1' supplemented by 'Optics 2':

Wave optics

- Diffraction/Interference
- Diffraction at a grating
- Polarisation
- Polarisation by double diffraction
- Double diffraction by tension
- Chromatic polarisation
- Rotation of the polarisation plane

Optics 2

The additional kit contains materials and devices for 7 additional wave optics experiments: diffraction of light, diffraction at a grating, principle of polarisation, double diffraction at crystals, rotation of the polar axis (frequency-dependent), photoelasticity.



The kit 'Optics 1' is necessary for carrying out the experiments. The parts of the kit 'Optics 2' will be stored in the box of Kit 1.

Contents of the additional kit:
 Slit, adjustable
 Polariser and analyser in frame
 Calcspars-crystal
 Slide with cross
 Slide with mica probe

Slide with grating (300 lines/mm)
 Slide with grating (80 lines/mm)
 Glass pan
 Tubing

47550

Electricity

This kit contains equipment and resources required for investigating the basic laws of electrical processes.

In the magnetism section, the possibilities include illustration of the properties of permanent magnets and in electrostatics there are experiments which demonstrate electrical charge and how charges behave.

One key focus is on experiments to study the flow of current and on basic electrical circuits. More advanced experiments allow the effects of electrical current and selected technical applications to be investigated.

The range of experiments is supplemented by experiments on electromagnetism and electromagnetic induction, again involving a selection of example technical applications.

The equipment in the kit also allows experiments to be carried out on the fundamentals of electrochemistry.

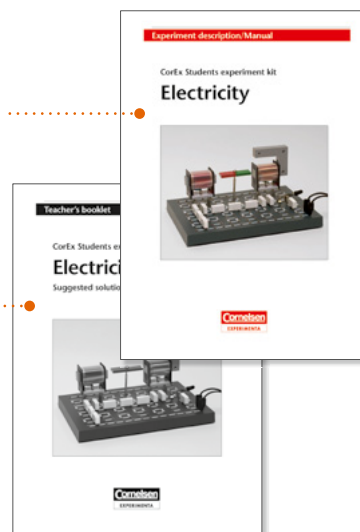
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



- **More than 90 individual components in two plastic trays (312 x 427 x 150/75 mm) with foam insert and lid:**

Plug-in elements:

Lever-switches
Lamp holders
Bulbs
Bridge plugs

Bimetallic strip
Electric motor
Relay
Coils, U-core, I-core
Capacitor, potentiometer

LEDs
Resistors NTC; PTC
Magnetic needle, pivot bearing
Electroscope, metal beaker
Short-circuit ring
Leads, wires
Rod magnet
Compasses, iron powder

Set of material samples
Friction cloths and rods
Pith ball pendulum
Glow lamps
Electrodes: carbon, zinc, copper, Iron
Citric acid, copper sulphate, litmus paper

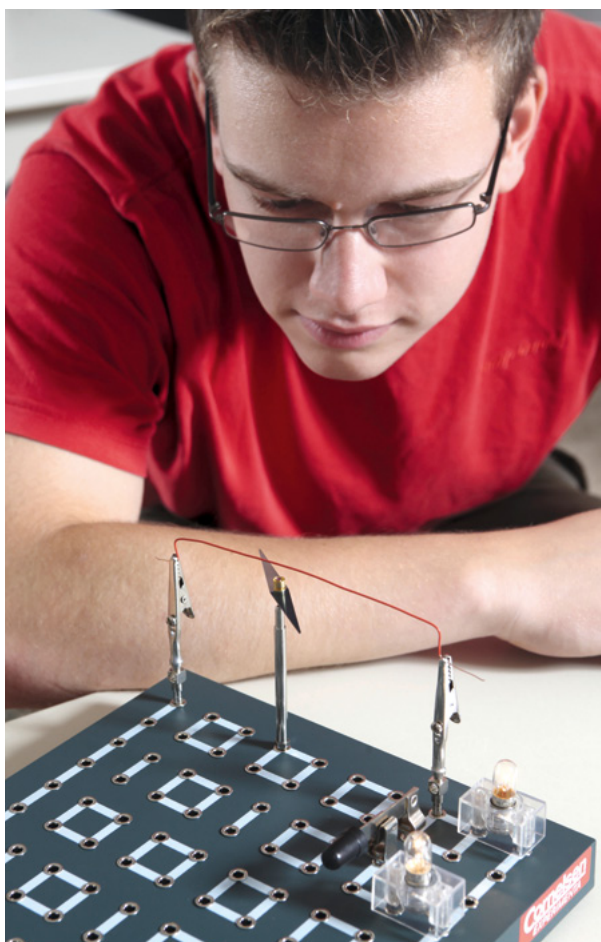
Also required for setting up experiments:

20402 Universal circuit board (see page 141)



23100

Materials for 1 work group



► Detailed instructions for 62 experiments:

Magnetism:

- Magnetic actions
- Magnetic field
- Forces acting between magnets
- Magnetic induction
- Geomagnetism/Compass

Electrostatics:

- Frictional electricity
- Forces acting between charged bodies
- Model of an electroscope
- Electroscope
- Polarisation/induction
- Induction at the electroscope
- Storing charges
- Faraday beaker
- Capacitor

Basics of the electricity:

- Electrical circuit
- Conductor/Non-conductor
- Current conduction in liquids
- Voltage
- Amperage
- Electrical resistance
- Ohm's law
- Series connection of incandescent lamps
- Series connection of resistors
- Parallel connection of incandescent lamps
- Parallel connection of resistors
- Dropping resistor
- Voltage divider
- Specific resistance
- Resistance and temperature

- Thermally influenced resistor
- Bridge circuit
- Measuring resistances
- Wattage
- Electric work

Heat energy:

- Heat energy
- Conversion into heat energy
- Light action
- Conductor and resistance wire
- Fuse
- Bimetallic switch
- Hot-wire ammeter

Electromagnetism:

- Magnetic field of a conductor
- Magnetic field of a coil
- Electromagnet
- Relay
- Automatic interrupter

- Lorentz force
- Electric motor (2 experiments)

Electromagnetic induction

- Induction
- Induction with DC voltage
- Self-induction
- Principle of a generator
- Alternator
- Lenz's law
- AC motor
- Transformer
- Impedance of a coil
- Impedance of a capacitor

Electrochemistry

- Electrolysis
- Galvanisation
- Electrochemical element
- Electrochemical potentials

Additional power supply required, e.g.:

68533 Power supply unit 6 V (see page 137)

or

55222 Power supply unit, 12 V/3 A (see page 136)

Additional meter required, e.g.:

54980 Multimeter for students (see page 138)

or

54892 Digital-Multimeter (see page 139)

Electronics

This kit contains all the components and equipment necessary for carrying out experiments on the function and behaviour of electronic components and circuits.

This means that all the basic properties of semiconductor components can be determined in individual experiments. In addition, countless experiments are possible on the interaction between electronic components in standard electronic circuits as well as in practical applications.

One set-up makes it possible to do experiments on the transmission of voice and music by means of light.

- In a plastic tray (312 x 427 x 75 mm) with foam insert and lid:

Photodiode	Experiment leads
Photoresistor	Audio jack lead
NTC thermistor	Jack sockets
PTC thermistor	Resistors
Transistors	Variable resistors
Field effect transistors	Electrolytic capacitors
Earpiece	Diode
Bridge plugs	LEDs (white; red; green)

Also required for setting up experiments:

20402 Universal circuit board (see page 141)

Additional power supply required, e.g.:

68533 Power supply unit 6 V (see page 137)

Additional meter required, e.g.:

54892 Digital-Multimeter (see page 139)

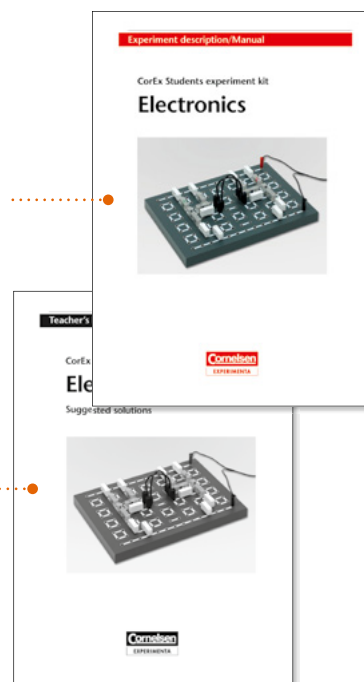
Included in delivery:

Experiment description

- with student worksheets

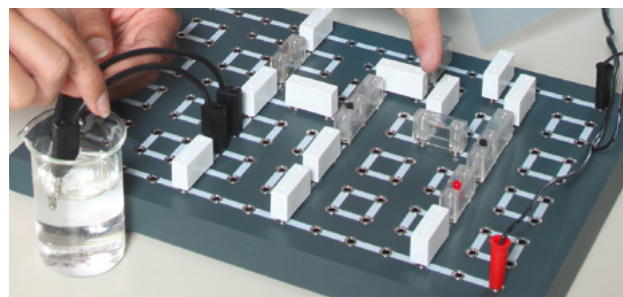
Teacher's booklet

- with suggested solutions



20410

Materials for 1 work group



► Detailed instructions for 47 experiments:

- Diode
 - basic wiring
 - characteristic curve
 - behaving as a rectifier
- LED – basic wiring
- Voltage divider
- Bridge circuit
- NTC thermistor
- PTC thermistor
- Photoresistor
- Transistor
 - characteristic curve
 - behaving as a switch; amplifier; variable resistor
- Common emitter transistor circuit
- Common collector transistor circuit
- Photoelectric control (2 experiments)
- Light barrier
 - switching when illuminated; ... when not illuminated
- Twilight switch
- Short-delay switch
- Long-delay switch
- Temperature control
 - using NTC thermistor
 - using PTC thermistor
- Temperature monitor
 - using NTC thermistor
 - using PTC thermistor
- Flashing unit
- Schmitt trigger
- Moisture switch
- Dryness switch
- Differential amplifier
- Astable multivibrator
- Monostable multivibrator
- Bistable multivibrator
- AND gate
- OR gate
- NAND gate
- Field effect transistor: principle; demonstration of electric charge
 - basic wiring
 - input resistance
 - characteristic curve
- Opto-electronics using field effect transistors (2 experiments)
- Flip flop circuit using field effect transistors
- Using light to transmit music, transmitter and receiver

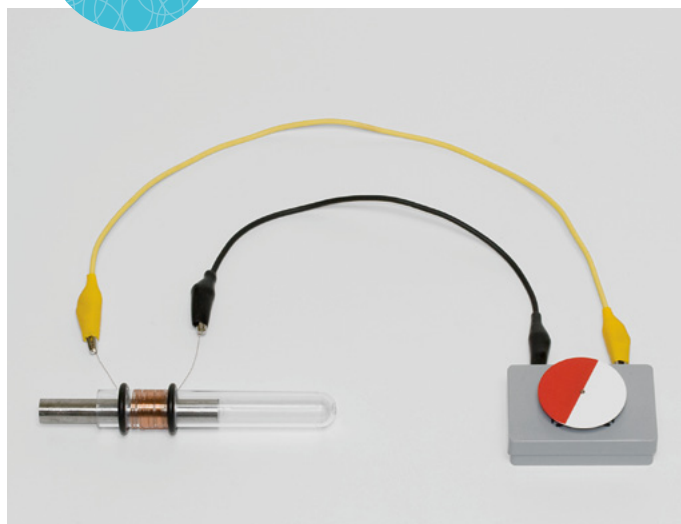


Electrical energy sources

For school experiments involving sources of electrical energy, which can be carried out within the time frame of a single lesson.

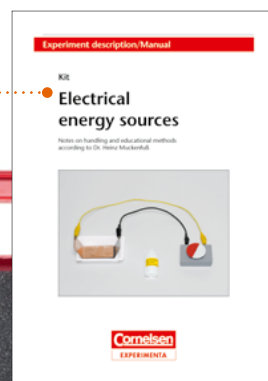
The equipment is designed to be particularly simple and easy to understand and can be handled with ease by groups of pupils in the first year of secondary school.

As an indication of the electrical energy generated, a highly sensitive micro-motor is provided, which has a coloured disc on its shaft in order to demonstrate speed and direction of rotation.



Included in delivery:

Experiment description



The principles of electrical generation from the following sources can be illustrated:

- Radiant energy – solar cell
- Chemical energy – galvanic cell
- Mechanical energy – induction coil

► In a case (260 x 197 x 45 mm) with foam insert:

Miniature electric motor, 100 mV/10 mA	Felt board strips
Solar cell, 0.5 V/300 mA	Citric acid
Torch	Plastic test tube with two rubber rings
Connecting leads	Magnet rod ALCOMAX
Electrolysis dish	Varnished copper wire
Copper- and zinc-electrode	

23001

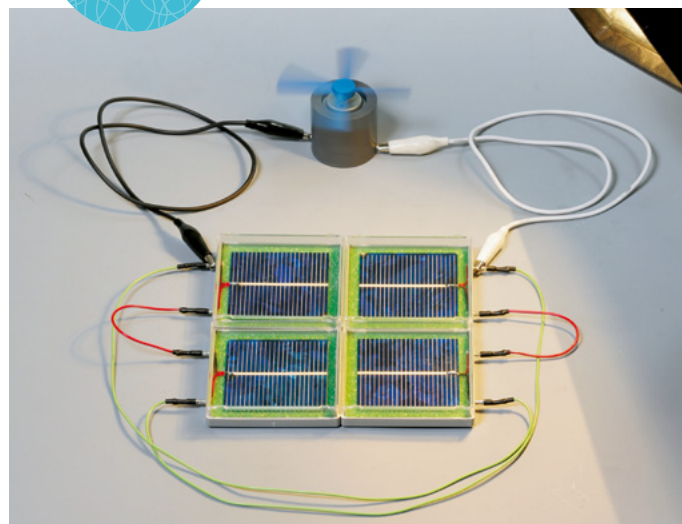
Materials for 1 work group

Age
13–18

Solar cell

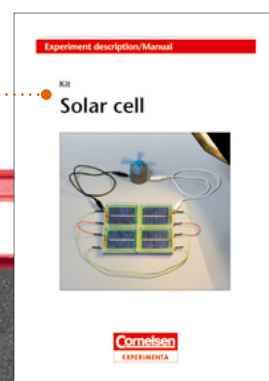
For school experiments using solar cells, which can be carried out within the time frame of a single lesson.

The various elements are designed to be particularly simple and easy to understand and can be handled with ease by groups of pupils. No other equipment is necessary except for the provision of additional sources of light to illuminate the solar cells at times of year when there is less sunlight available, along with simple school measuring instruments to measure electrical quantities.



Included in delivery:

Experiment description



The experiments that can be carried out include the following:

- No-load voltage and short-circuit current
- Series- and parallel connection
- Power characteristic line of a solar generator
- Influence of illuminance and of the illumination angle
- Conversion of solar energy to mechanical energy and to luminous energy
- Solar production of hydrogen

► In a case (260 x 197 x 45 mm) with foam insert:

6 solar cells,
0.5 V/300 mA
Electric motor
with propeller
Electrolysis dish

Pair of carbon electrodes
LED
Sodium chloride
Connecting leads

Additionally required:

47100 Reflector lamp (see page 140)

15670 Tripod stand plate with socket and screw (see page 140)

Renewable
Energies



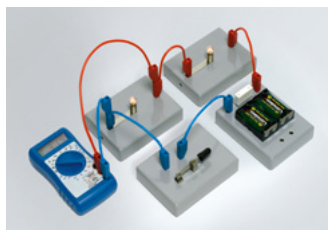
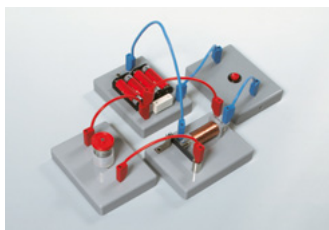
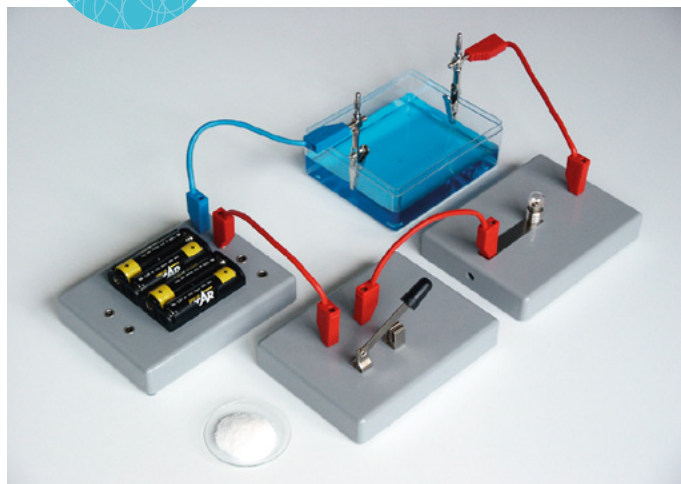
23060

Materials for 1 work group

Age
13–18

Basic electrical circuits

This kit provides an easy way to carry out experiments on conduction and electrical circuits. Further experiments allow the effects of electric current and the functioning of electrical equipment to be investigated.



► Detailed instructions for 18 experiments:

- Simple electric circuit
- Electric circuit with switch
- Conductors/Non-conductors
- Electric conduction in liquids
- Electric circuit with change-over switch
- Series connection
- Parallel connection
- Series connection of batteries
- Measuring of voltage
- Measuring of current
- Electric resistance
- Heating effect of the electric current
- Electromagnet
- Electric bell
- Relay: operating contact; rest contact
- Electric motor
- Electric generator

► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Base modules:

Lamp holders MES
Knife switch
Change over knife switch
Plug base
Relay base
Push button
Battery holder
Size of the bases:
120 x 90 x 23 mm

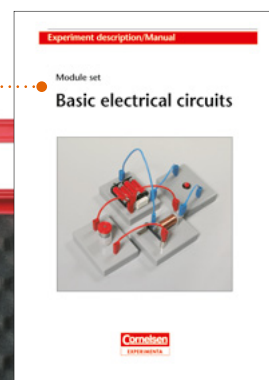
Plug-in elements:

Electric motor with pulley
Crank with belt and axis
Coil with core
Relay contacts
Electric bell
Resistors
Crocodile clips

Digital-Multimeter
Set material samples
Heating wire, battery cells, bulbs MES, experiment leads

Included in delivery:

Experiment description



Recommended for power supply in place of batteries:

55225 Power supply unit 1 to 6 V/2.5 A DC
(see page 137)

52200

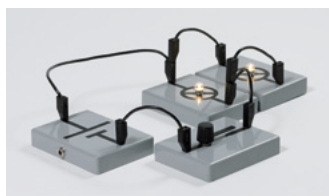
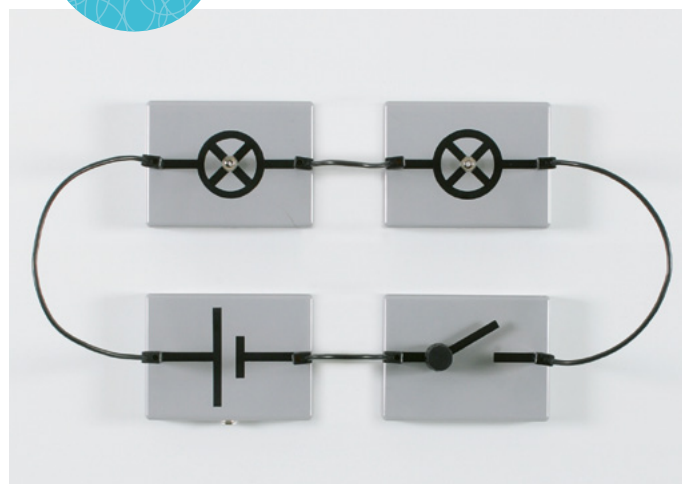
Materials for 1 work group

Age
11-18

Electrical circuits for the steel board

The bases for components are magnetically attachable and the top is printed with the relevant circuit symbol and wiring. They can either be placed horizontally on a bench or attached vertically to a steel board.

The electrical components are mounted inside an open socket but are not visible from above. All the bases are equipped with 4-mm sockets. The power supply component is equipped with a battery compartment for two AA (Mignon) batteries and a low-voltage socket for alternative connection of plug-in power supply 68534.



► Detailed instructions for 7 experiments:

- Simple circuit with lamp
- Circuit with lamp and switch
- Series/Parallel circuit with two lamps
- Electrical conductors and non-conductors
- Logic AND
- Logic OR

► In a case with foam insert for transport and storage (320 x 245 x 50 mm):

Set material samples:
aluminium, iron, glass,
rubber, wood, porcelain,
copper, nickel, cardboard,
wool, carbon, foam, zinc,
plastic

Experiment leads

Bulbs MES

Batteries

Base modules:

Power supply element 3 V

Lamp holders MES

Switch element

Test Stand element

Size of the bases:

120 x 90 x 23 mm

Recommended for power supply in place of batteries:

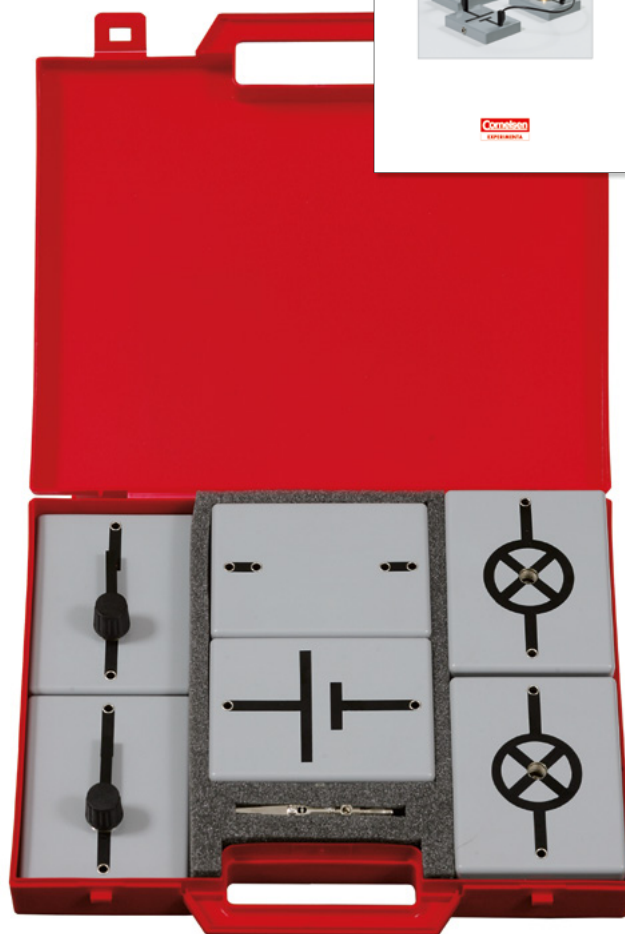
68534 Power supply unit 3 V (see page 137)

Additionally required:

41621 Steel board with stand (see page 141)

Included in delivery:

Experiment description



53540

Materials for 1 work group or demonstration

Physics

A very important basis for a profound and successful physics lesson is the demonstration of experiments. Even if your school is not equipped with a special science lab you need not refrain from this advantage.

The kit contains all the required materials, which are used to carry out the most important experiments which form the fundamentals of Physics. The stable and universal design of all parts allows a secure experimenting and guarantees a long durability.

No additional equipment is required for the execution of the experiments which can be carried out at any place and under nearly every climatic condition. Only for the demonstrations in the field of electricity a simple power supply is required in addition.

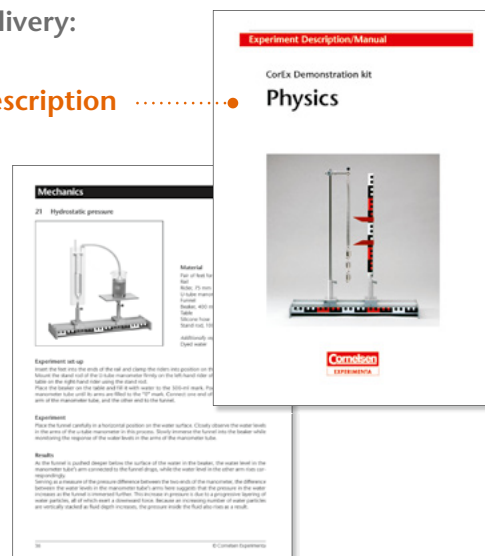
The parts are compatible with the other parts of our program, so that the kit can always be supplemented.

Additional power supply required, e.g.:

55262 Power supply unit, 12 V/5 A (see page 136)

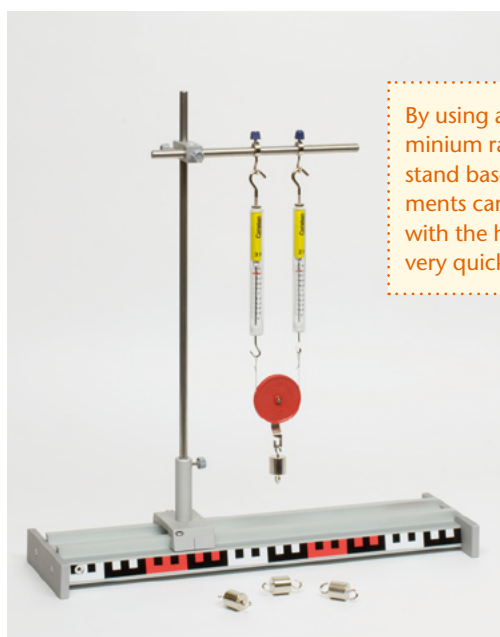
Included in delivery:

Experiment description



16500

Materials for 1 work group or demonstration



By using a special aluminium rail profile as stand base the experiments can be built up with the help of riders very quickly and stable.



► In two cases with foam insert for transport and storage (540 x 450 x 150 mm)

Basic equipment:

Rail with feet, riders, rods, bossheads, supporting ring, clip holders, table
Scale with pointers
Tape measure
Scale
Set of weights

Mechanics:

Pulleys/lever arm
Scale pans
Mass pieces
Helical springs
Dynamometers
Friction block
Sphere, carriage
Vessel with drains
Buoyancy body
Manometer
Plastic bowl
Glass syringe, glass devices
Rubber stopper
Burner, metal gauze
Thermometer

Heat:

Alcohol burner, wire gauze, retaining ring, thermometer
Cork powder
Copper tube

Optics:

Optical light source
Condenser
Diaphragm- and slide support
Pin- and arrow diaphragm
1/3-slit diaphragm
Screens
Lenses, biconvex
Shadow sphere
Multipurpose mirror
Optical bodies
Candle supports with candles

Electricity:

Friction rods, electroscope
Rod magnets, horseshoe magnet, iron powder, magnetic needles with bearing
Electrodes with support
Lamp holders
Incandescent lamps, switch
Connection leads, wires
Insulating rods
U-shaped wire, moving coil
Potentiometer
Coils, u-core and i-core
Voltmeter, ammeter, galvanometer

► Detailed instructions for 74 experiments:

Mechanics (31 experiments):

- Measurement of length, circumference and volume
- Force actions
- Pressure
- Tension
- Spring dynamometer
- Forces of friction
- Levers and pulleys
- Inclined plane
- Uniform motion
- Acceleration
- Storage, transmission and conversion of Energy
- Communicating vessels
- Lateral pressure in liquids
- Hydrostatic pressure
- Transmission of pressure in liquids
- Hydraulic principle
- Buoyancy in liquids
- Determination of density

- Cartesian diver
- Principle of the suction and force pump
- Surface tension
- Change in gas volume
- Pressure and volume of gases

Heat (7 experiments):

- Model of a thermometer
- Boiling, melting and solidification
- Heat convection – Heat conduction
- Demonstration of steam energy

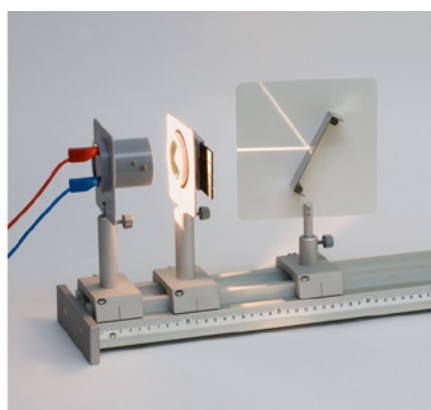
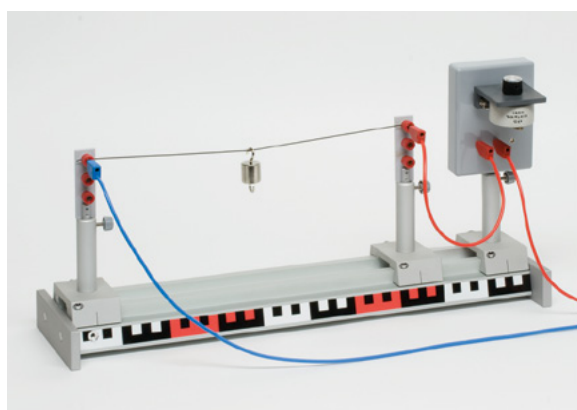
Optics (8 experiments):

- Propagation of light
- Silhouettes
- Reflection at a plane mirror
- Images on a plane mirror
- Refraction of light

- Converging and diverging lenses
- Principle of the pinhole camera

Electricity (28 experiments):

- Electrostatics
- Electrochemistry
- Electric circuits
- Series and parallel connections
- Measurements of current and voltage
- Effects of electric current
- Electric power and electric work
- Magnetic forces and magnetic fields
- Principle of the electric motor
- Induction
- Electromagnetic coupling
- Transformer

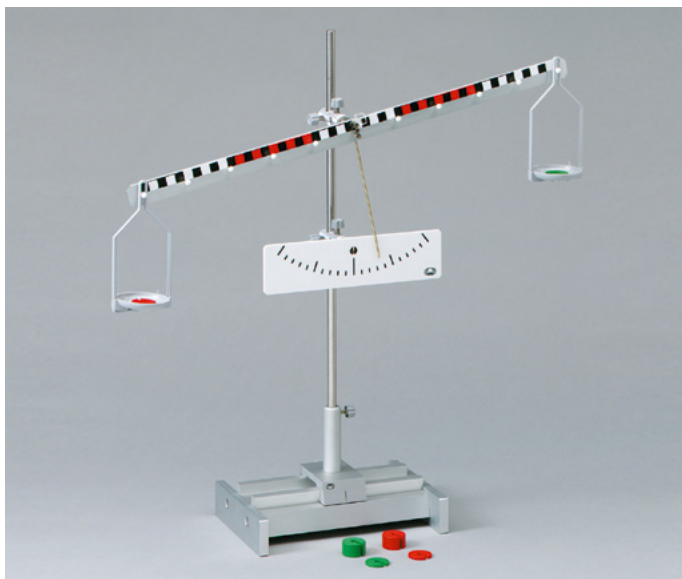
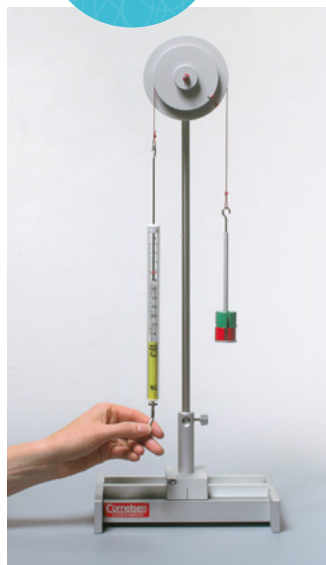


Mechanics

Demo

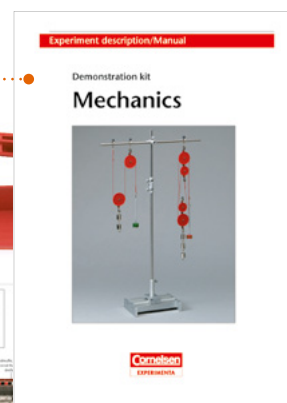
For the demonstration of various laws of mechanics with levers, pulleys, pulley blocks and dynamometers.

The experimental setup and the execution of the experiments can be done without any additional equipment in every classroom.



Included in delivery:

Experiment description



► Detailed instructions for 10 experiments:

- Spring dynamometer
- Beam scale
- First-class lever
- Second-class and third-class levers
- Fixed pulley
- Moveable pulley
- Fixed and moveable pulley
- Pulley block (2 experiments)
- Multiple diameter pulley

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

- | | |
|--------------------------------|--|
| Rail with stand material | Fixed and movable pulleys |
| Scale, pair of scale pans | Pulley block, 2 pulleys |
| Lever with support and pointer | Blocks with 2 pulleys |
| Dynamometer | Masses with double hook |
| Multiple diameter pulley | Set of slotted masses with mass holder |
| Axes on a rod | |
| Rings with hook | |
| Helical spring | Cord |



43080

Materials for demonstration

Demo

Mechanics for the steel board

For the demonstration of the basic laws of mechanics and simple machines as pulleys, pulley blocks, levers and inclined plane.

Steel board additionally required, e.g.:

41621 Steel board with stand (see page 141)



Steel board not included in delivery

Included in delivery:

Experiment description

Experiment description/Manual

Demonstration kit
Mechanics for the steel board



► Detailed instructions for 15 experiments:

- Mass and weight force
- Hooke's law
- Force and counterforce
- Composition/Decomposition of forces
- Inclined plane
- Location of centre of gravity
- 1st class lever
- 2nd class/3rd class levers
- Torque
- Beam scale
- Fixed/Moveable pulley
- Fixed and moveable pulley
- Block and tackle

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

- | | |
|-----------------------------------|---|
| Pulley, pulley block, roller kit | Dynamometer dial type, 2 N and 5 N |
| Magnets with bosshead | Helical spring |
| Inclined plane with magnetic foil | Rule with magnetic foil and adjustable pointers |
| Lever with support and pointer | Set slotted masses with mass holder |
| Scale, pair of scale pans | Axles on a rod, thread |
| Level, torque disc | |



43085

Materials for demonstration

Dynamics with CorEx Log Qt

The demonstration kit contains apparatus and resources for investigating the fundamental laws of motion and oscillation.

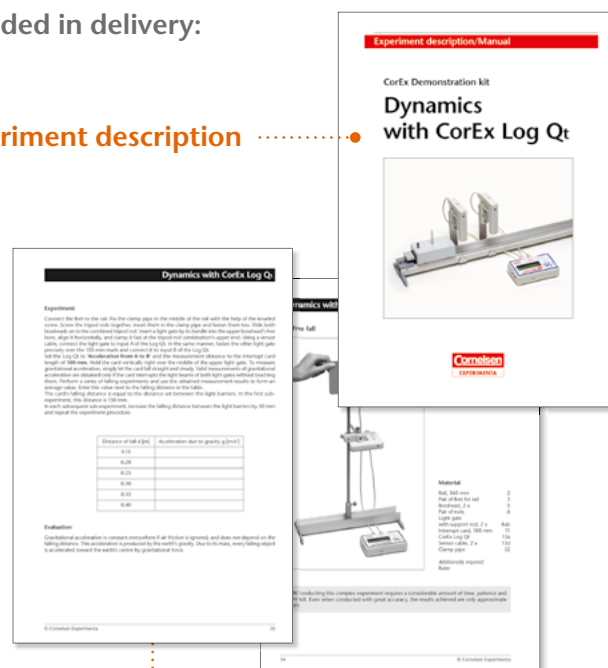
A modern timer with memory function is used for this.

Teachers can carry out measurements in a conventional manner without the need for a power supply, and then the saved measurement results can be analysed using a PC at a later date. In addition, the timer can be used as an interface, allowing any measurement to be displayed, processed and saved on a PC or notebook computer.

The measurements are recorded by means of accurate and reliable light barriers. The precisely manufactured carriage with its own propulsion is characterised by the extremely high precision of its movement.

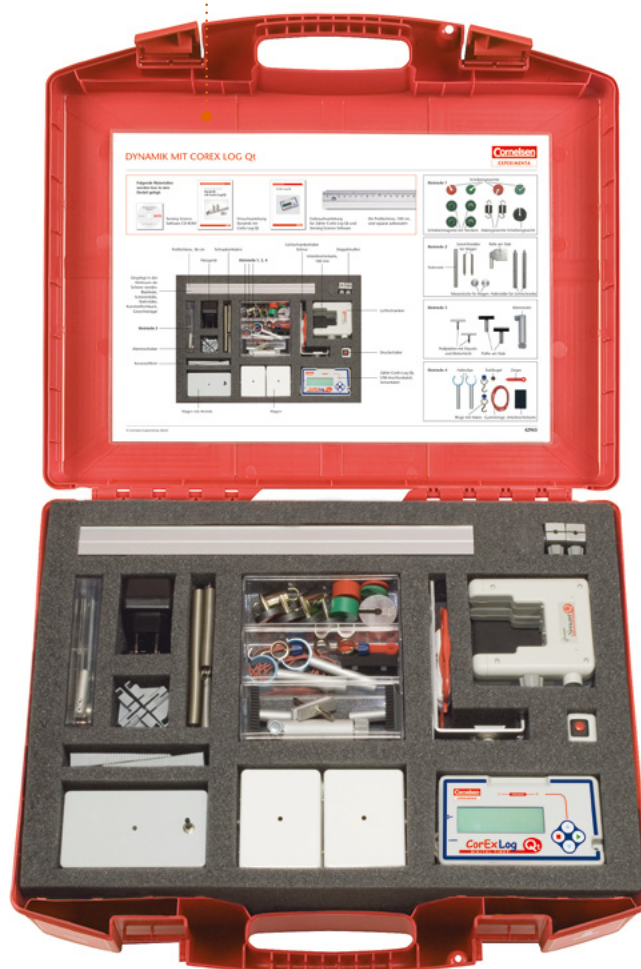
Included in delivery:

Experiment description



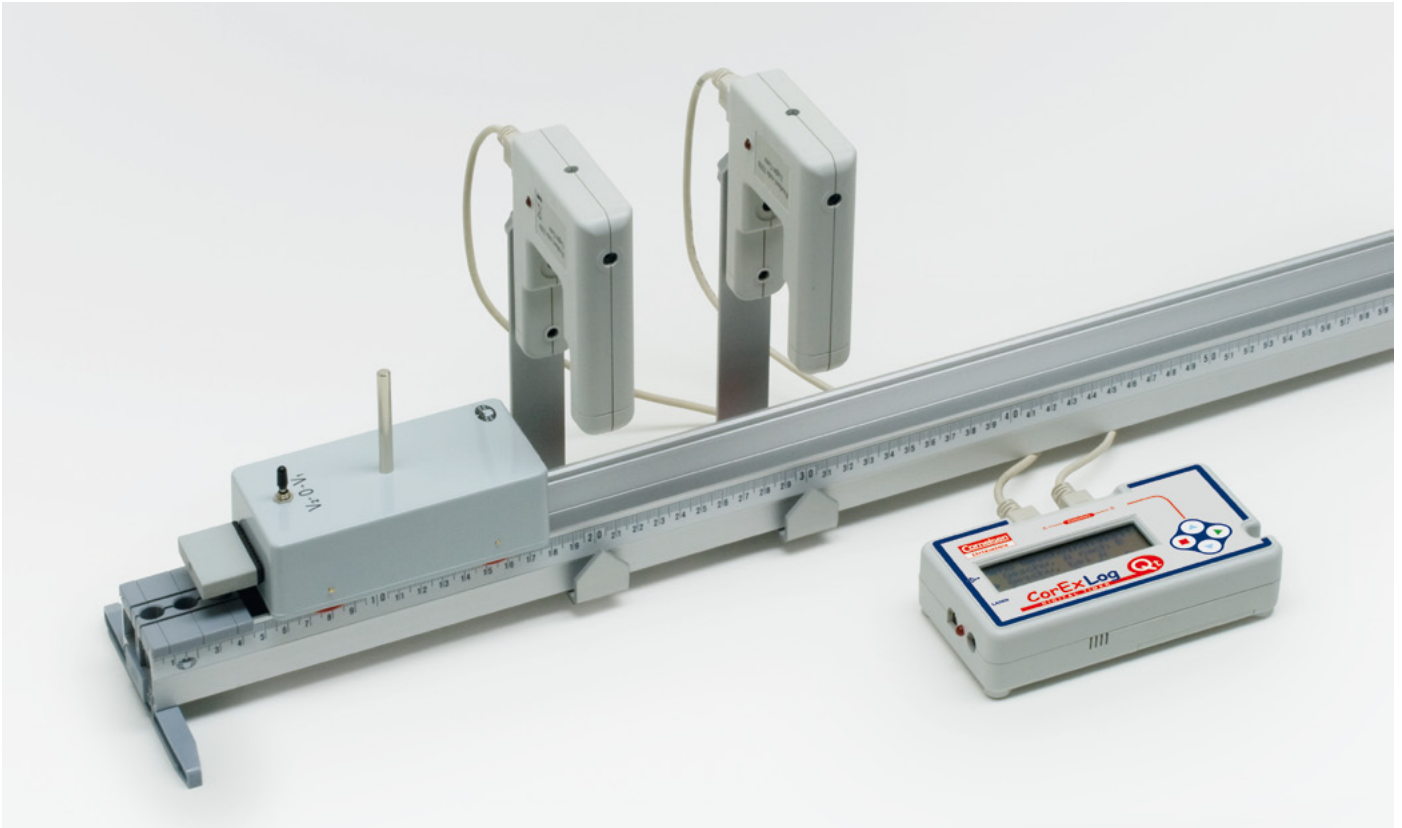
► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

CorEx Log Qt Digital Timer with USB-cable, two Sensor cables, CorEx Sensing Science Software, power supply, manual for CorEx Log Qt and software	Rail (360 cm) with riders and stand material
Plastic hose	Buffers
Set of masses	Carriage with driving unit
Cord	2 carriages
Helical springs	Wedges
Leaf spring	Light gates
Precision pulley	Spoked pulley
Rail, 100 cm	Push button/ reaction switch



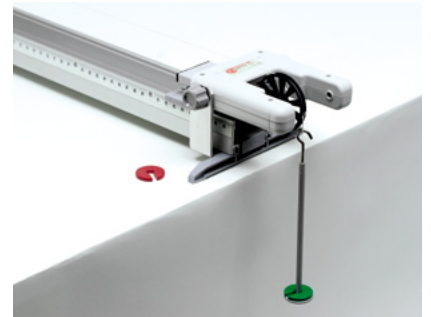
42985

Materials for demonstration



► Detailed instructions for 30 experiments:

- Uniform linear motion (3 experiments)
- Velocity (3 experiments)
- Instantaneous velocity (2 experiments)
- Acceleration (6 experiments)
- Trajectory from a horizontal launch
- Trajectory from an angled launch
- Free fall
- Central elastic collision
- Central inelastic collision
- Elastic collision at a wall
- Action and reaction
- Spring oscillation
- Pendulum oscillation (3 experiments)
- Leaf spring oscillation
- Coupling of spring oscillators
- Damped oscillations (2 experiments)
- Forced oscillations



Centripetal forces

For demonstration and measurement of the force necessary to keep a body moving in a circle of a certain radius depending on its speed of rotation and its mass.

The centripetal force apparatus consists of a rail with a scale, along which a measurement carriage connected to a spring dynamometer can move. The overall weight of the carriage can be altered by adding or removing weights.

A pointer indicates the radius of the circle in which the carriage is moving. A counterweight at the opposite end of the rail ensures that the rotation of the whole set remains stable.

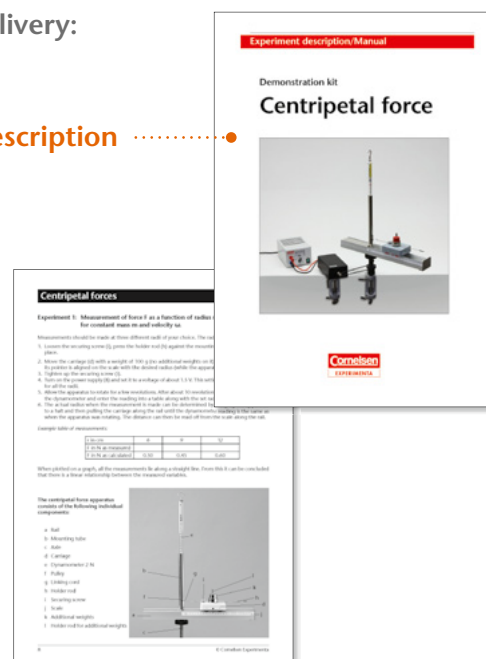
The rail is mounted on a rotating bearing and is connected to a supplied drive motor via a drive belt.

Strong table clamps secure both pieces of equipment to a table.

An adjustable mains supply makes it possible to set the desired speed of rotation precisely.

Included in delivery:

Experiment description



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Centripetal Forces Apparatus	Drive belt, 2x
Bearing	Clamp, 2x
Electric motor on rod	Experiment leads, 2x
Masses	Power supply

43550

Materials for demonstration



► Survey of experiments:

- Measurement of centripetal force dependant on radius
- Measurement of centripetal force dependant on angular velocity
- Measurement of centripetal force dependant on mass

Flight and flying

The kit contains apparatus and resources for demonstrating the fundamental processes and relationships which make flying possible due to static or dynamic lift and by reaction engines.

Using a hot-air balloon as an example, it is possible to impressively yet simply explain and illustrate that particular form of flight.

The response of differently shaped bodies in the presence of a flow of air is investigated using various experiment set-ups, and thereby a more detailed understanding of the pressure and air resistance arising can be gained.

A model rocket can be used to demonstrate how rockets fly even without the presence of an atmosphere.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

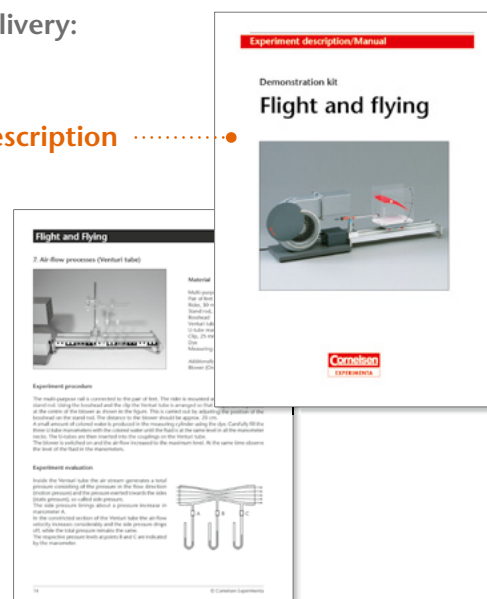
Rail with levelling feet, riders and stand material	Dyer
Pitot tube	Set of air resistance bodies with carriage
Venturi tube	
Impeller with support	Dynamometer
Thread comb	Model of a rocket
Lifting power model with air foil and balance	Solar balloon
Air foil model with pressure measuring test probe	Hot air balloon with heating source
Inclined tube manometer (kit)	Balloon with valve

Also required is an air stream generator to create the air flow, e.g.:

29010 Air stream generator (see page 141)

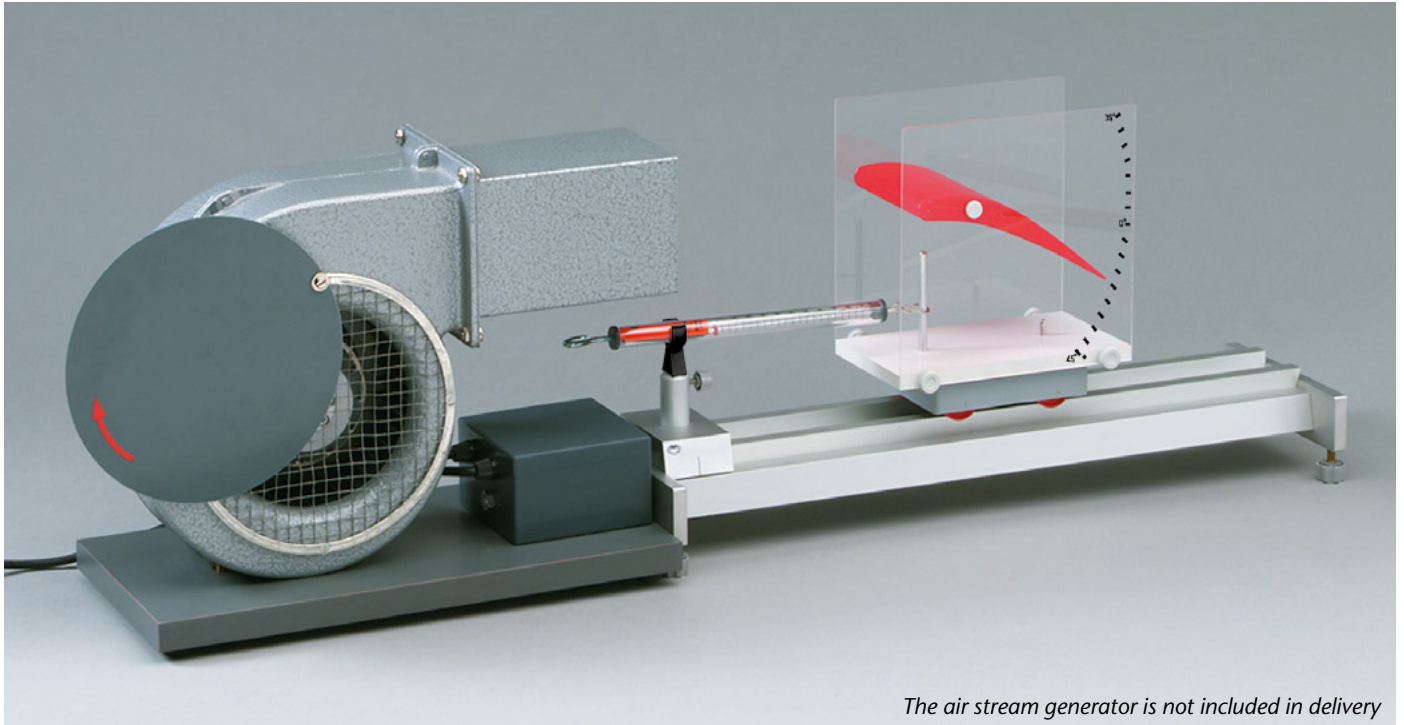
Included in delivery:

Experiment description



29008

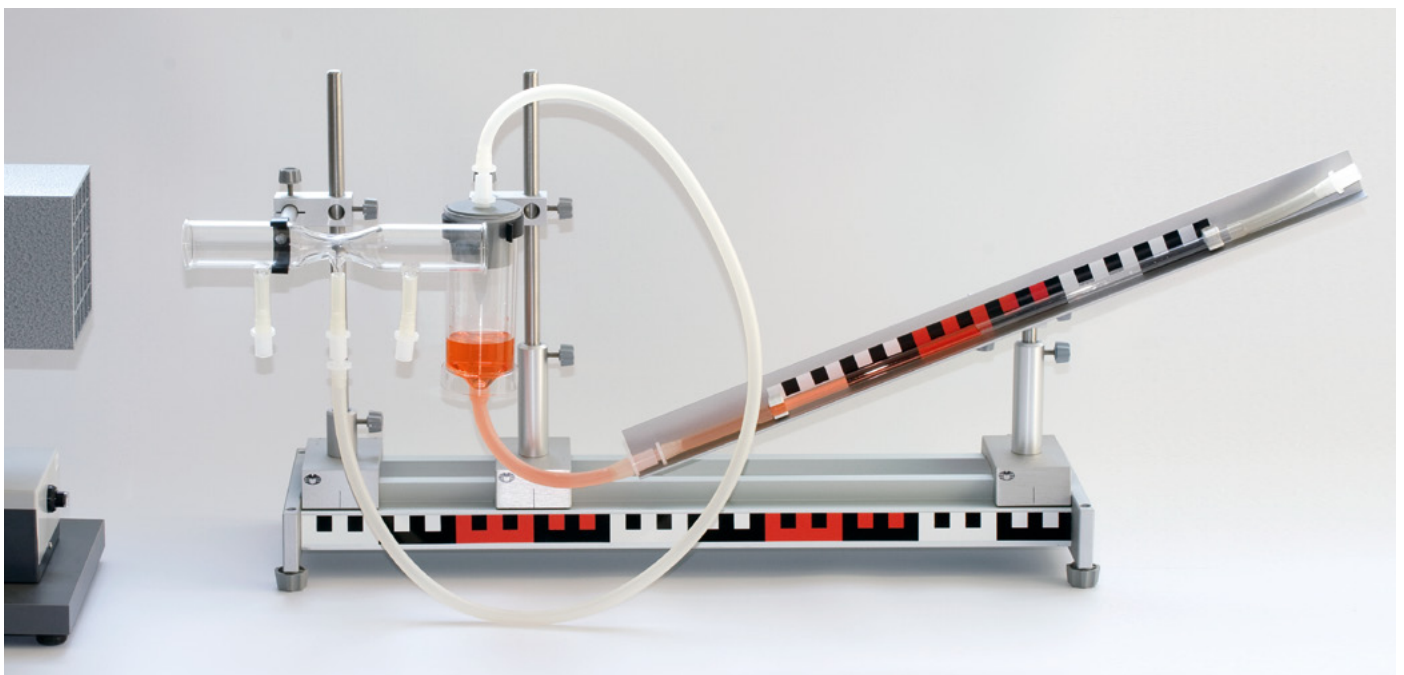
Materials for demonstration



The air stream generator is not included in delivery

► Detailed instructions for 25 experiments:

- Static lifting power
 - hot air balloon
 - solar balloon
- Forces exerted by air stream
- Dynamic lifting power
- Air-flow velocity
- Air-flow processes (Venturi tube)
- Principle of the inclined tube manometer
- Measuring the flow velocity
- Principle of the Pitot tube
- Pressure differences at the air foil
- Pressure distribution along the surface of the air foil
- Measuring the dynamic lift
- Air-stream distribution around the air foil
- Air resistance and shapes of bodies
- Measuring the air-stream resistance
- Flow processes at obstacles
- Eddy formation behind a disc
- Pull of an impeller
- Principle of an autogiro
- Mechanism of a rotary wing
- Reaction principle
- Functional model of a rocket



Wind energy

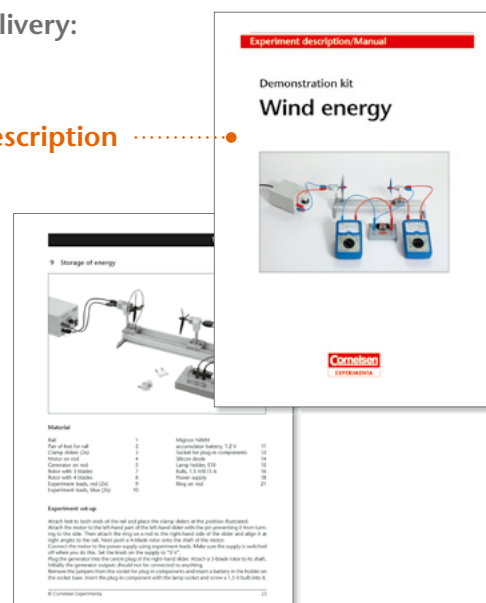
This kit contains apparatus for carrying out fundamental experiments on the use of wind energy.

Use of wind energy has now become well established as a well known means of converting energy. The kinetic energy of wind is being used more and more often as an alternative source of energy by converting it into mechanical energy and then into electrical energy.

This kit allows to investigate the possibilities and limitations of a simple wind generator. The effects of various factors such as the type of rotor, the wind speed, the wind direction and others can be compared and evaluated. In order to create the requisite flow of air, a simple fan is used.

Included in delivery:

Experiment description



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Rail with feet and clamp sliders	Bulbs, 1.5 V
Rotors with 2, 3 and 4 blades	Bridge plugs
Generator and motor as wind source	LED
Connecting cables	Variable resistor
NiMH Rechargeable battery AA	Diode
Base for plug-in elements and accumulator	Mains adapter
Lamp holder MES	Trough
	Pump with motor
	Ring on a rod

Meters additionally required, e.g.:

54977 Ammeter for students (see page 138)

or

54978 Voltmeter for students (see page 138)



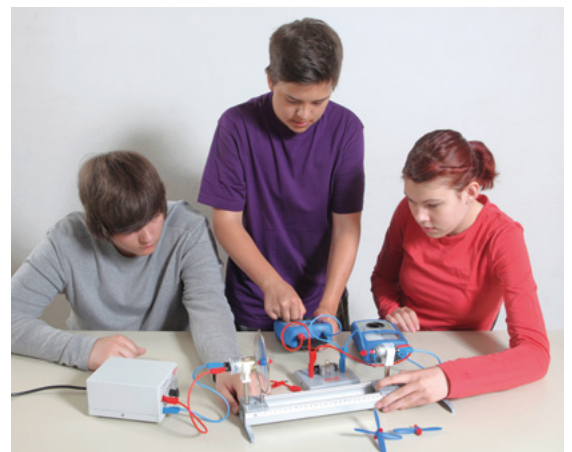
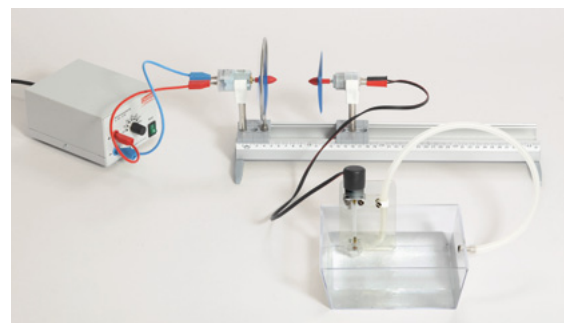
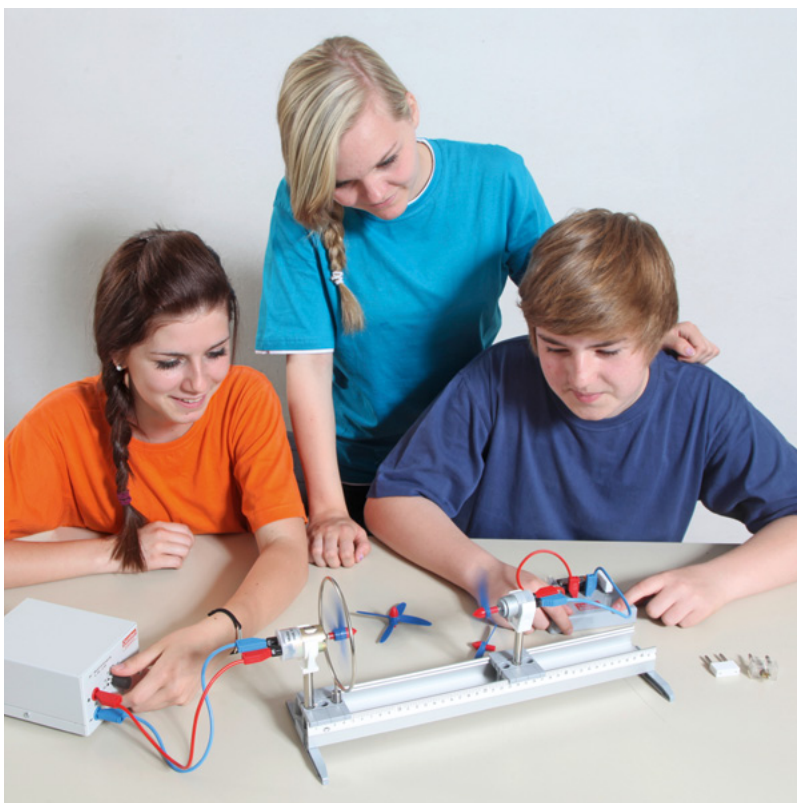
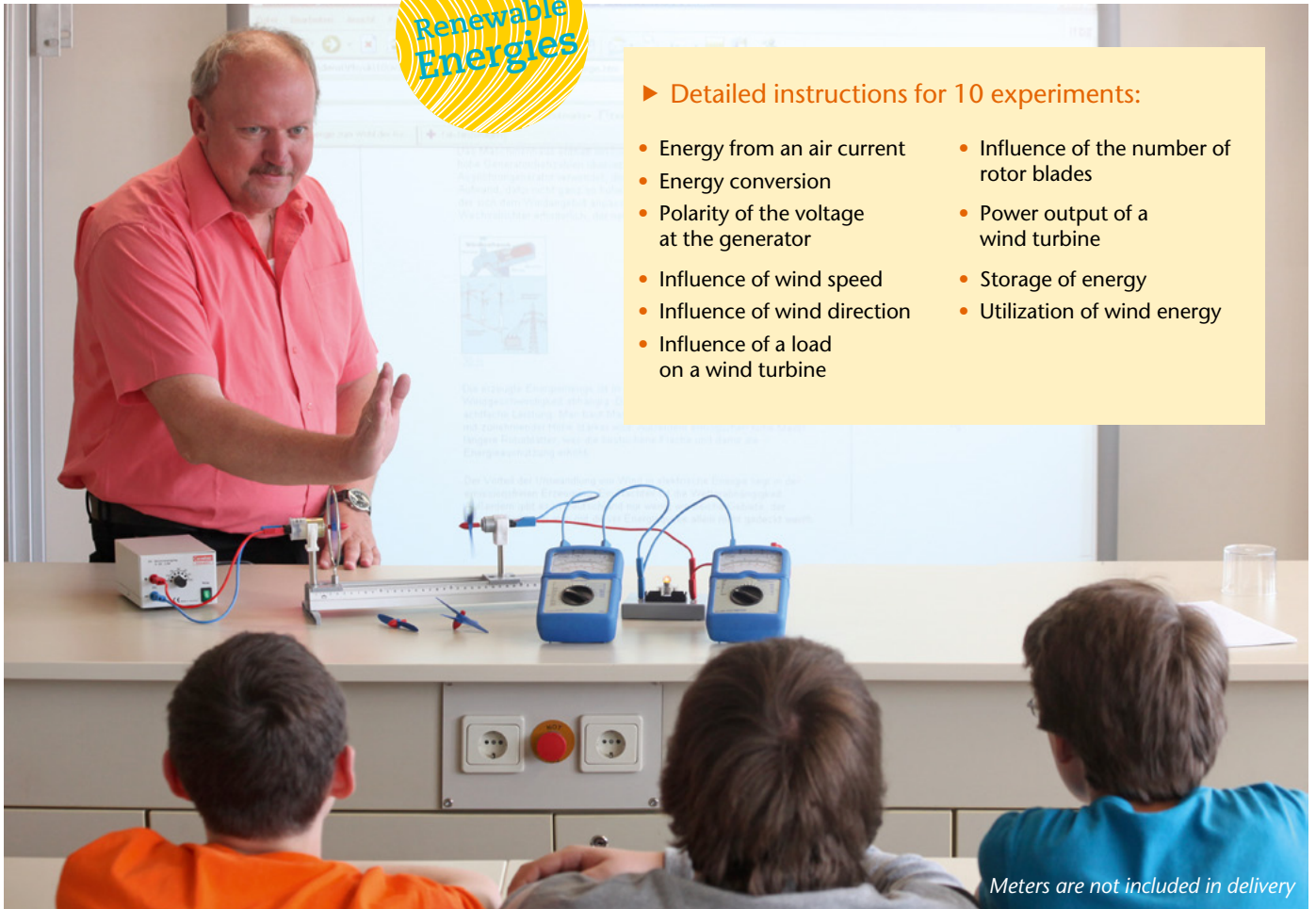
54620

Materials for demonstration

Renewable Energies

► Detailed instructions for 10 experiments:

- Energy from an air current
- Energy conversion
- Polarity of the voltage at the generator
- Influence of wind speed
- Influence of wind direction
- Influence of a load on a wind turbine
- Influence of the number of rotor blades
- Power output of a wind turbine
- Storage of energy
- Utilization of wind energy



Solar thermal energy conversion

For demonstrating the fundamentals and technical applications of solar thermal energy conversion.

This kit contains apparatus for basic experiments on heat absorption, convection and radiation, as well as allowing the assembly of a complete solar collector with thermal siphon recirculation, pump circulation and heat exchanger.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Rail with feet	Heat exchanger vessel with hoses
Tripod stand plate with socket	Digital thermometers
Heat convection tube	Spirit burner
Spirit burner	Reflector lamp
Thermosyphon vessel with hoses	Spirit burner with metal plate
Solar collector	Dyer
Expansion vessel with pump and hose	Stand material
Power supply unit	

Solar collector

The key component of the kit is the solar collector for converting energy radiated by the sun into heat using water to convey the energy. It consists of a special extruded profile frame with threaded holes so that it can be set up vertically or at an angle. It has two removable front panes of glass to prevent convection losses, a blackened collector spiral with six loops and two connectors for rapid release hose couplings. The collector has

interchangeable black and white painted rear covers, expanded polystyrene insulation and a plexiglass pane at the rear, which can also be removed. It also has a built-in thermometer. The collector is used in conjunction with the included reflector projector, which acts as the source of energy. After shining the light on the collector for several minutes, it is possible to measure a distinct rise in temperature.

Included in delivery:

Experiment description

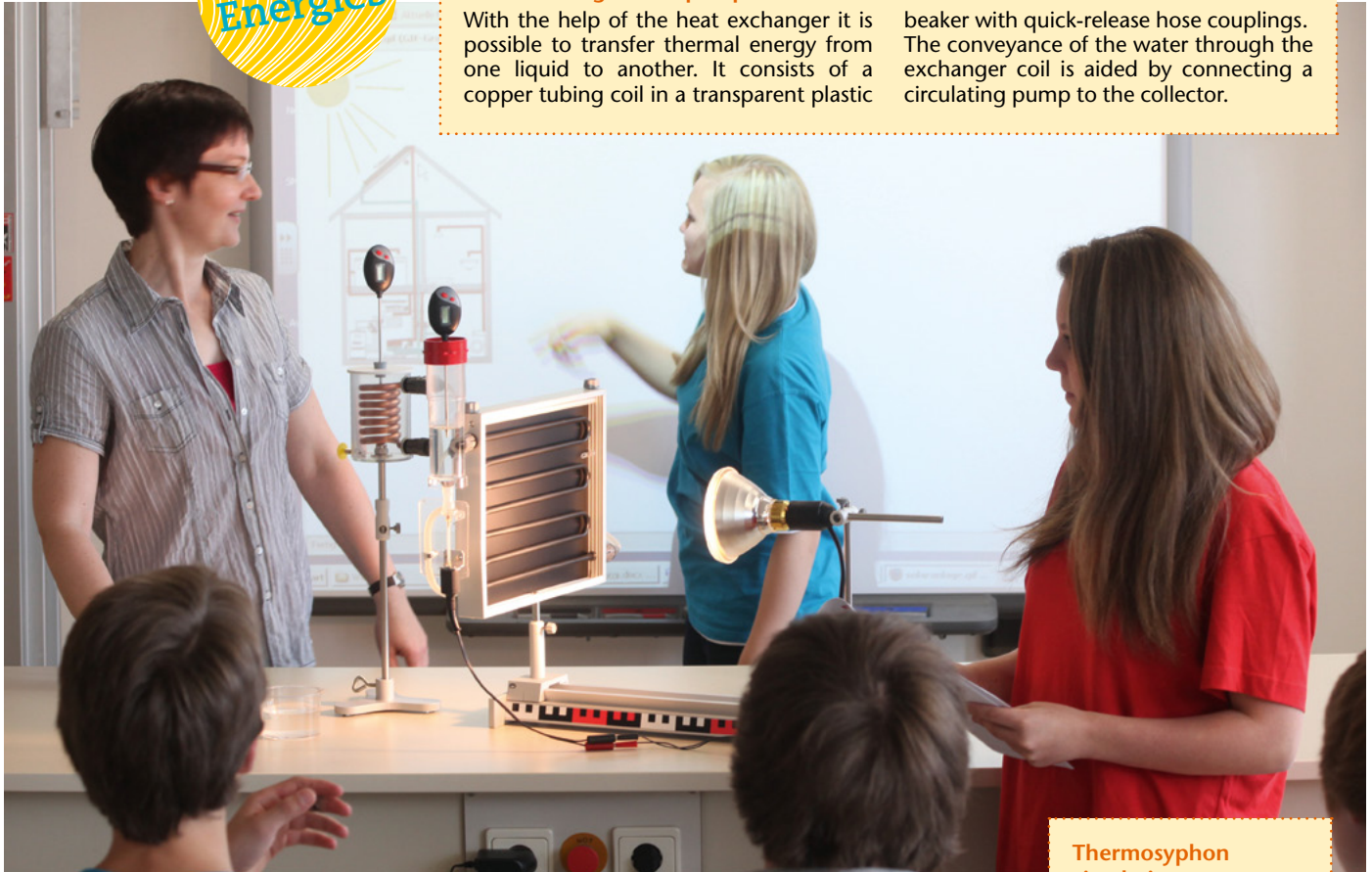


Renewable Energies

Heat exchanger with pump circulation

With the help of the heat exchanger it is possible to transfer thermal energy from one liquid to another. It consists of a copper tubing coil in a transparent plastic

beaker with quick-release hose couplings. The conveyance of the water through the exchanger coil is aided by connecting a circulating pump to the collector.



Thermosyphon circulation

If the elevated tank is connected via the supplied hoses to the solar collector, there will arise a difference in density of the water dependent on the temperature which will cause convection to occur, thus circulating the water.

► Detailed instructions for 6 experiments:

- Heat radiation
- Absorption of heat radiation
- Heat convection
- Principle of the solar collector
- Solar collector with thermosyphon circulation
- Solar collector with pump circulation and heat exchange



Photovoltaics

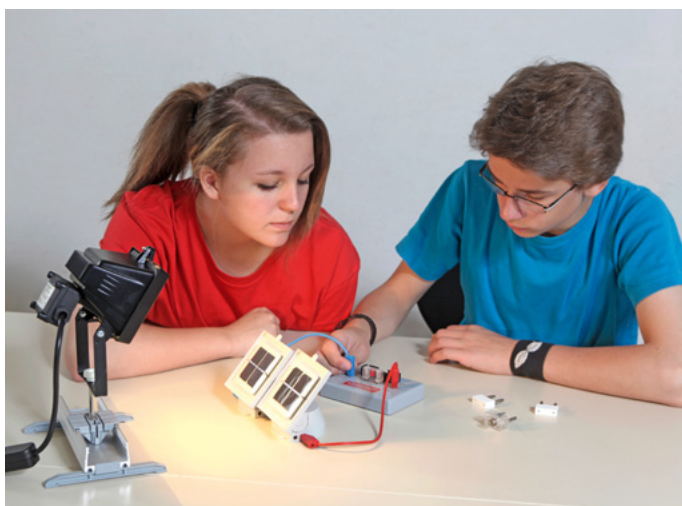
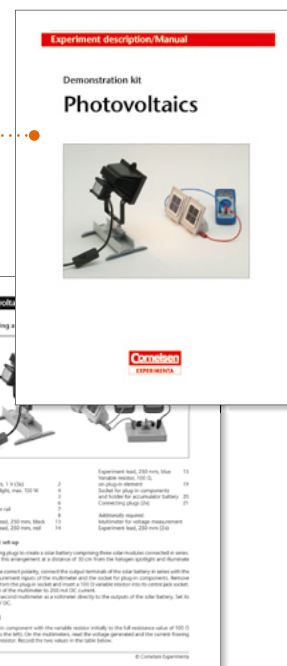
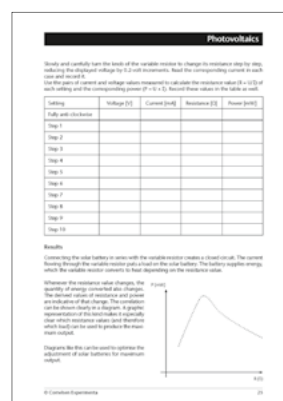
Combining knowledge about the possible uses of renewable energy systems has now become a key component of general education curricula.

As ever, the sun with its virtually inexhaustible resources of energy is at the core of interest in general.

This kit contains all the equipment necessary for carrying out fundamental experiments on the recovery and use of electrical energy produced from sunlight.

Included in delivery:

Experiment description



- In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Solar cell and solar modules	Lamp holder and bulbs
Halogen spotlight	Water electrolysis apparatus with test tubes
NiMH-Accumulator and battery cells	Rail with feet
Experiment leads	Stand material
Connecting plugs	Multimeter
Base for plug-in elements and accumulator	LED
Electric motor with propeller on base	Variable resistor
	Citric acid-1-hydrate



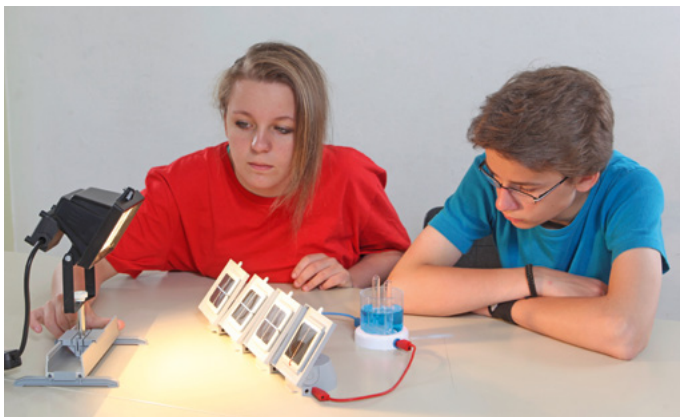
49346

Materials for demonstration

Renewable Energies

► Detailed instructions for 14 experiments:

- Solar cell as a voltage source
- Solar cell as current source
- Internal resistance of the solar cell
- Solar cell as a diode
- Influence of illuminance
- Influence of the illumination angle
- Solar module
- Series connection of solar modules
- Parallel connection of solar modules
- Charging a solar battery
- Conversion of solar energy
 - into light energy
 - into mechanical energy
- Generating hydrogen with the help of solar energy
- Charging an accumulator with solar energy



Solar cell module 1 V

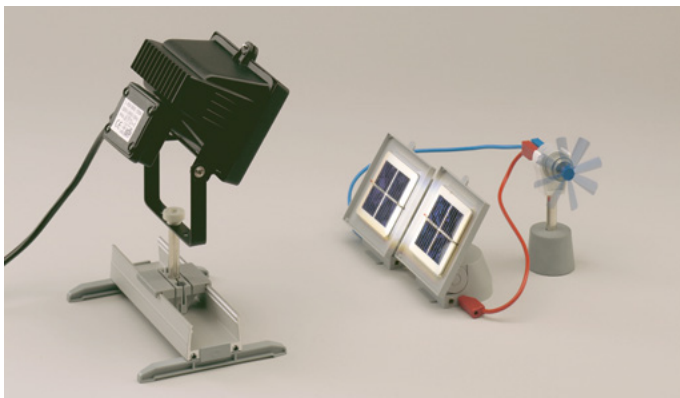
Two solar cells, 0.5 V each, connected in series, mounted on base with hinged panel and 4 mm socket terminals. To increase voltage or current a number of solar cells can be connected in parallel or in series by means of the *Connecting Plugs 54583*.

Voltage: 1 V

Lamp base: GY 6.35

Current: max. 300 mA

Size: 90 x 90 x 100 mm



Hydroelectric power plant

Renewable
Energies



Attractive and easily understood model consisting of an impulse turbine and a 6-V, 3-W generator with a transparent end flap all assembled on a common shaft.

Built on a base board with circuit diagram and two pairs of 4-mm output sockets, one for AC and one for DC, used for connecting loads.

There is a choice of plugging an incandescent lamp or an electric motor with a propeller into the load sockets, each of which is on its own plug-in component.

Suitable hoses of 1 m in length are supplied with the equipment for the inlet and outlet of water.

Required water pressure: min. 1.5 bars

4 bars are needed for the generator to operate at full power.

Size: 240 x 175 x 200 mm

44631

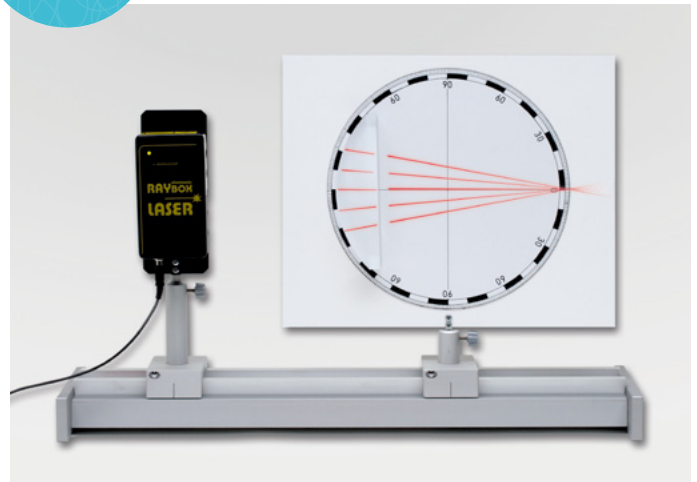
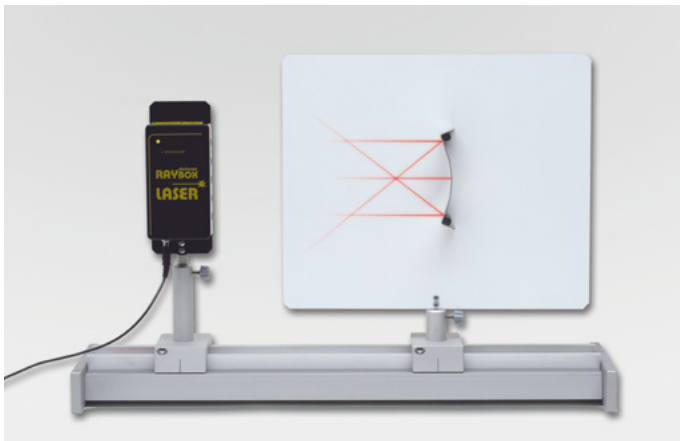
Materials for demonstration

Demo

Geometric optics with laser

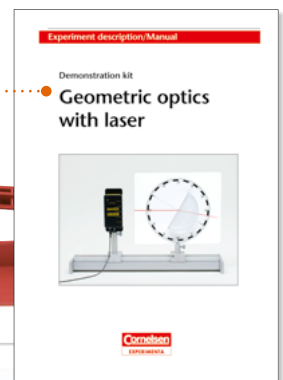
The kit contains elements for the demonstration of the laws of the geometrical optics as the beam gradients through converging and diverging lenses, reflection and refraction.

All the model bodies are made of transparent plexiglass with an attached magnetic foil and are 140 mm long, 15 mm thick.



Included in delivery:

Experiment description



► Detailed instructions for 15 experiments:

- Reflection of light
- Law of reflection
- Angle mirror
- Reflection
 - on the concave mirror
 - on the convex mirror
- Refraction (2 experiments)
- Refraction at a parallel-sided block
- Refraction
 - in water
 - at the prism
 - at converging lenses
 - at diverging lenses
- Lens combinations
- Model of the eye's function/ Correction of myopia

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

<i>Optical model bodies:</i>	Laser Ray Box
Semi-cylinder	Screen
Lens plane-convex	Rail with feet and riders
Lens plane-concave	Optical disc
Prism, rectangular	Plane mirrors
Trapezium-shaped	Concave-convex mirror
Hollow rectangle (cuvette)	



47604

Materials for demonstration

Geometric optics for the steel board

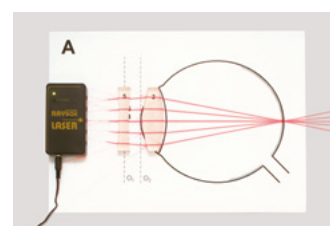
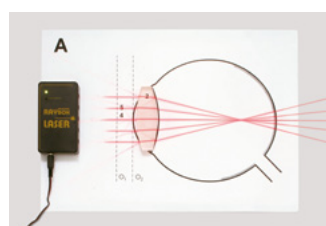
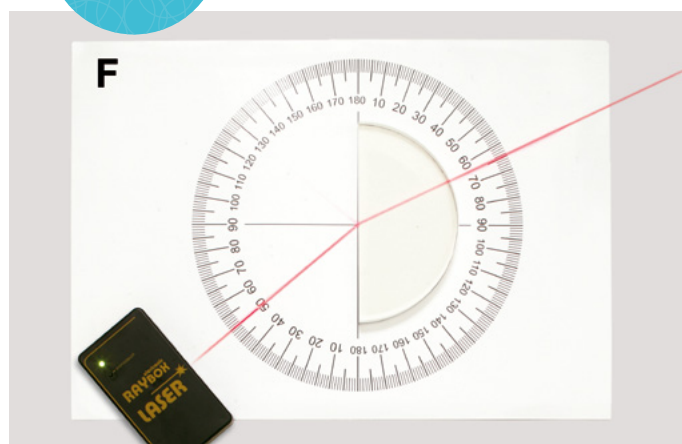
These model bodies can be used on a steel board in conjunction with *Laser Ray Box 47128* to demonstrate the following laws of ray optics:

- Path of rays through convex or concave lenses
- Path of rays through a prism
- Reflection from plane and curved mirrors
- Refraction of light
- Refractive index

In addition, it is possible to demonstrate the path of rays in normally sighted, short sighted and long sighted eyes, as well as how sight defects can be corrected using lenses. The outlines of the eye are depicted on a pre-prepared adhesive foil sheet. The functioning of optical instruments such as cameras or telescopes can also be shown using adhesive sheets and the model bodies. Total internal reflection inside a glass fibre cable can also be demonstrated.

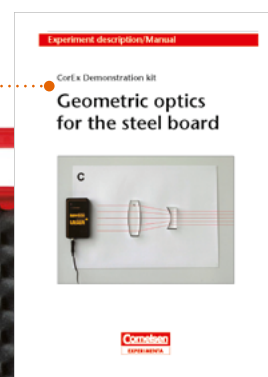
The bottoms of the model bodies and adhesive sheets are coated with magnetic foil so that they can stick to any steel board.

The *Laser Ray Box 47128* can be stored in the case, although it is not included in the kit.



Included in delivery:

Experiment description



Laser additionally required, e.g.:

47128 Laser Ray Box, magnetic adhering (see page 140)

- In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Optical model bodies:

Plane parallel plate
Lens plane-convex
Prism, rectangular
Semi-cylinders small and large
Optical fibre
Plane mirror
Concave mirror
Convex mirror

Example sheets:

– Model of the human eye
– Photo camera
– Galileo telescope
– Kepler telescope
– Refraction and reflection demonstration sheet
5 different lenses for setting up the optical models

47080

Materials for demonstration

Demo

Optics for the steel board

For investigating the path of rays through lenses, prisms and mirror models attached to a steel board.

All the model bodies are made of transparent plexiglass with an attached magnetic foil and are 140 mm long, 15 mm thick.

► Detailed instructions for 22 experiments:

- Linear propagation of light
- Narrow light beams
- Shadows
- Reflection of light
- Law of reflection
- Double mirror
- Reflection at concave and at convex mirrors
- Refraction of light (3 experiments)
- Refraction of light in water
- Refraction of light
 - at a prism
 - at a converging lens
 - at a diverging lens
- Parallel light rays
- Lens combinations
- Human eye model/correction of short-sightedness
- Dispersion of light
- Additive colour mixture
- Subtractive colour mixture



Power supply additionally required, e.g.:

55217 Power supply unit 12 V (see page 137)

Steel board additionally required, e.g.:

41621 Steel board with stand (see page 141)

► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Optical lamp 12 V/20 W with condenser lens, 1/3 slit diaphragm, two dummy diaphragms

Optical model bodies::
Cuvette; semi circle; trapezium-shaped; lenses plane-convex and plane-concave; prism, rectangular

Set of 4 diaphragms
Shadow body

Mirrors: plane, concave/convex

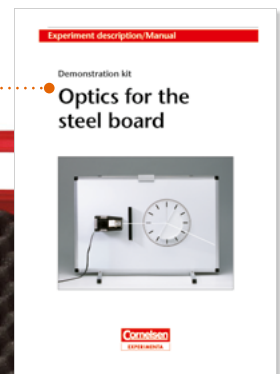
Optical disc on magnetic foil
Inclined screen
Colour filters, red, green, blue, yellow, cyan, magenta

Steel board not included in delivery



Included in delivery:

Experiment description



47095

Materials for demonstration

Optical bench – Basic collection

For demonstrating fundamental laws of light. The kit contains all the individual components and equipment needed for investigating the propagation of light, reflection of light, refraction of light and dispersion of white light into its component colours.

The design and function of the human eye along with the most commonly used optical instruments are also illustrated and investigated in experiments.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Diaphragms	Prism holder
Set primary colours filters	Rail with feet and riders
Optical lamp	Plane mirror
Cuvette	Convex-concave mirror
Lenses in frame	Screen on rod
Diaphragm- and slide holder	Plane parallel plate
Screen, ground glass	Model semicircle
Shadow ball on rod	Prism
Screen- and mirror holder	

Optical light using halogen lamp, 12 V/50 W

Particularly bright light source for universal use in experiments on an optical bench and for projection purposes.

Includes built-in reflective mirror, aspherical condenser, movable and rotatable adjustment mechanism for aligning the light in lateral and axial planes, 4-mm sockets plus fork-type mounting on rod for setting it up at an angle.

Illumination span for halogen lamp: approx. 2000



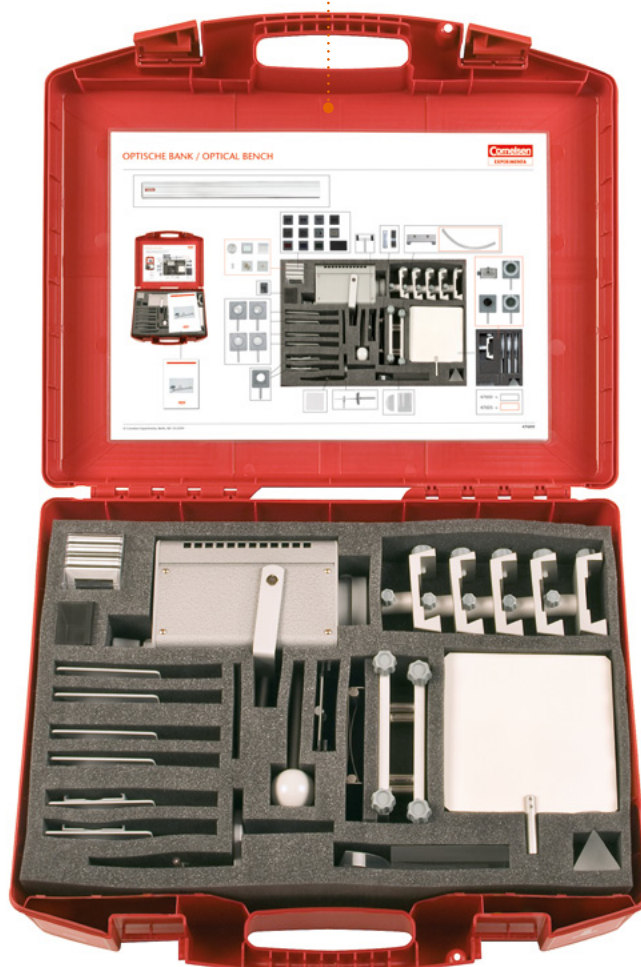
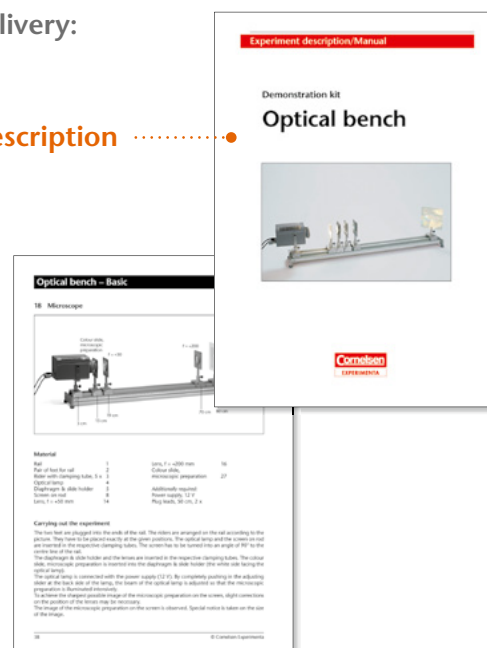
Power: 50 W
Focal length of condenser: +38.5 mm
Dia. of condenser: 50 mm
Lamp socket: GY 6.35
Casing: 240 x 110 x 100 mm
Rod: 10 mm dia.

Power supply additionally required, e.g.:

55224 Transformer, 6 and 12 V/5 A AC (see page 136)

Included in delivery:

Experiment description



47600

Materials for demonstration



Also recommended:

Demonstration kit 'Optical bench – Supplementary collection'



The kit contains all materials to demonstrate the wave nature of the light. The kit 47605 is required to carry out the experiments, which are described in the manual delivered with the basic collection.

Materials can be stored in the case of the basic collection.

The kit contains:

Slit, adjustable
Polariser and analyser in frame
Calcspars-crystal
Slide with cross
Slide with mica probe
Slides with grating,
300 lines/mm; 80 lines/mm
Rider with tube, glass pan
Tubing

47605

► Detailed instructions for 27 experiments:

*Survey of experiments
for the Basic collection*

- Propagation of light
- Formation of shadow
- Pin hole camera
- Reflection at a plane mirror
- Reflection at a curved mirror
- Refraction of light
- Refraction of light in water
- Converging lens
- Diverging lens

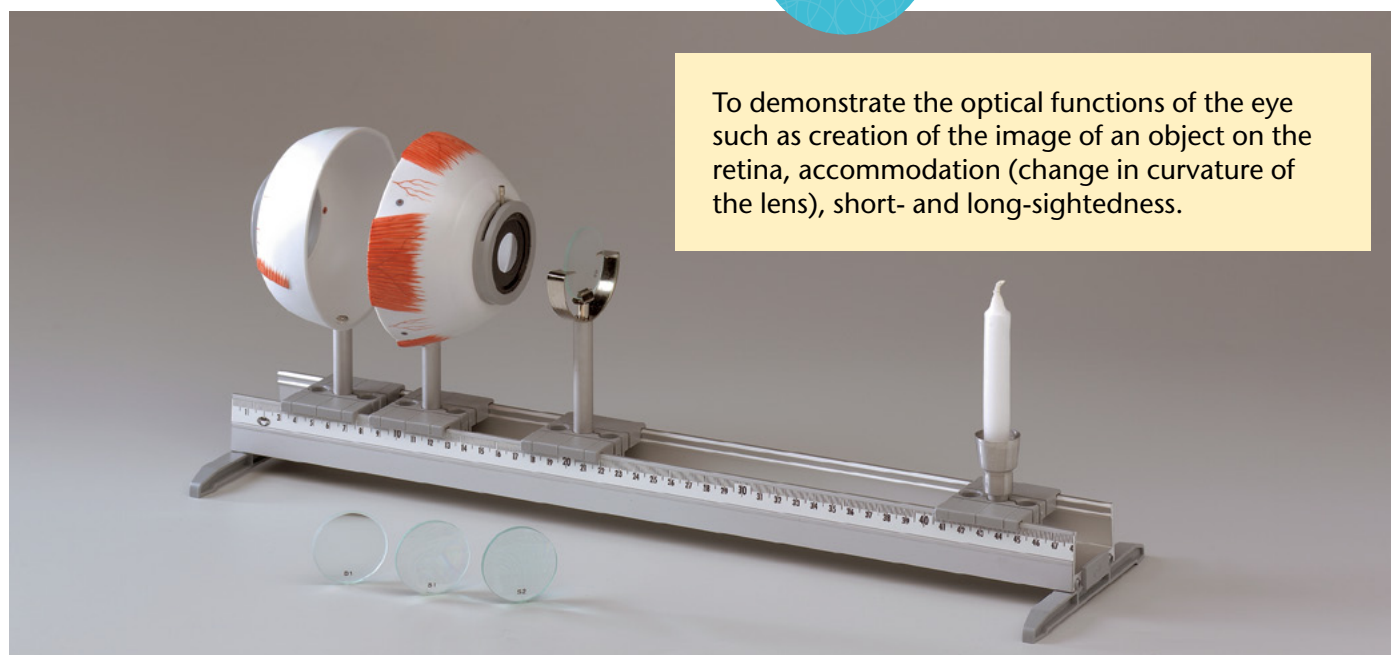
- Focal length of converging lenses
- Human eye model
- Human eye
 - short-sightedness
 - long-sightedness
- Magnifying glass
- Astronomical telescope
- Terrestrial telescope
- Slide projector
- Microscope
- Dispersion of light
- Absorption of spectral colours

The manual also describes seven experiments, which can be made with the materials of the Supplementary collection

- Diffraction at a slit – interference
- Diffraction at a grating
- Polarisation
- Polarisation by birefringence
- Stress birefringence
- Chromatic polarisation
- Turning of the polarisation plane



Functional human eye model



Included in delivery:

Experiment description

► Detailed instructions for 8 experiments:

- Projection of an image on the retina
- Function of the iris diaphragm
- Accommodation of the eye
- The normal sighted eye
- Short-sightedness
- Long-sightedness
- Demonstration of presbyopia (age-related long-sightedness)
- The yellow spot and the blind spot of the eye

► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Hemisphere representing half of the eye with an adjustable iris diaphragm

Lens holder and two convex lenses on rod ($f = 65$ and 80 mm),

Hemisphere with retina (ground screen), on rod

Lens holder on rod, with one each convex and concave correcting lens

Candle holder on rod with candle

Rail, 48 cm long, with feet and clamp riders



47030

Materials for demonstration

Demo

Electrostatics

The kit allows to carry out a series of interesting, partly historical, experiments on electrostatics.

Most parts are equipped with a 4 mm plug to mount them easily exchangeable on an insulated stand. For connections to the charge source plug leads or the included metal chains can be used.



High Power Wimshurst Machine not included in delivery

Included in delivery:

Experiment description



► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Rail with feet and riders	Case with point electrode
Insulated stand with terminal socket	Electric whirl
Sphere with plug	Tissue paper umbrella
Moving sphere	Lighting board
Pith cylinder pendulum	Carillon
Pieces of pith in box	Friction rod with 4 mm socket
Case with sphere electrode	Pair of metal chains

► Detailed instructions for 8 experiments:

- Forces between charged bodies
- Tuft electroscope
- Point discharge
- Electric dance
- Electrostatic filter
- Electrostatic carillon
- Ball spinning around
- Flash board



Recommended for the production of high electrostatic charge:

50315 High Power Wimshurst Machine (see page 110)

or

50300 High Power Van de Graaff Generator (see page 111)

50331

Materials for demonstration

High Power Wimshurst Machine

Demo



For the continuous production of high electrostatic charges. Mounted on plastic covered wooden base, with crank and belt drive, high insulating perspex discs with metal sectors, two large Leiden jars and spark gap. Including dust protection cover. CE labelled.

Charge: approx. 120 kV
Spark length: approx. 100 mm at low humidity
Disc diameter: 310 mm
Dimensions: 380 x 180 x 430 mm
Mass: 3.4 kg

Also recommended:

50331 Demonstration kit 'Electrostatics'



50315

High Power Van de Graaff Generator

Demo



To produce high electric charges for electrostatic experiments. Large, nickel-coated stainless steel sphere with 4-mm sockets for plugging in equipment, belt guide in transparent plexiglass tube, all set up on a plastic base with an earth socket. Can be used manually or in conjunction with a motor. Also features halogen lamp for drying belt, connection box with on-off switches for motor and lamp. Power supplied by a CE certified power supply.

Supplied in ready-built form.

Includes the following accessories:

Stainless steel sphere, nickel-coated, 100 mm diameter on rod, 300 x 12 mm diam., with earth lead
Bunch of threads with 4-mm plug pin
Pointed wheel with needle-point base
Dust-protection cover
Power supply with connecting leads

Electric charge: depending on the room humidity 150 to 200 kV
Spark length: max. 12 cm
Short circuit current: approx. 6 μ A
Sphere diameter: 270 mm
Operating voltage (mains supply unit): 230 V AC
Dimensions: 720 x 325 x 225 mm
Mass: approx. 4 kg

Replacement belt:

50301 Replacement belt for Van de Graaff generator 50300

Also recommended:

50331 Demonstration kit 'Electrostatics'

50300

DynaMot

To carry out teachers' experiments with the hand driven generator DynaMot and the experimental notes by Dr. H. Muckenfuß.

Hand driven generator as power supply and alive teaching support for the formation of concepts in electricity.

DynaMot can be used as a DC-generator as well as a DC-motor and it is able to replace batteries or power supplies in the basic electricity teaching.

As the students can generate the power for most of the experiments themselves the concepts and theories about the electric circuit are closely connected with personal experiences gathered when generating the electric energy with the generator.

Included in delivery:

Teacher's manual

- With instruction manual for equipment and experiment instructions.

Experiment description/Manual

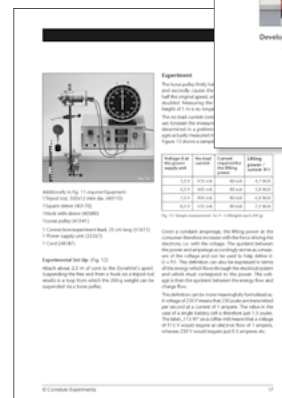
Demonstration kit DynaMot

Manually operated generator as power source for student's and demonstration experiments



Development and documentation by Heinz Muckenfuß

Cornelsen EXPERIMENTA



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Generator DynaMot (2x)	Cables
Mechanic transmission	Masses with hook
Set of cables and belt	Hook with bosshead
Table clamps	Pulley with hook
Stand rods	Cord
Bossheads	

Stopwatch additionally required, e.g.:

41810 Stopwatch for demonstration (see page 139)

Galvanometer additionally required, e.g.:

54889 Digital-Multimeter (see page 139)

Recommended power supply:

55267 Power supply unit 24 V/10 A (see page 137)



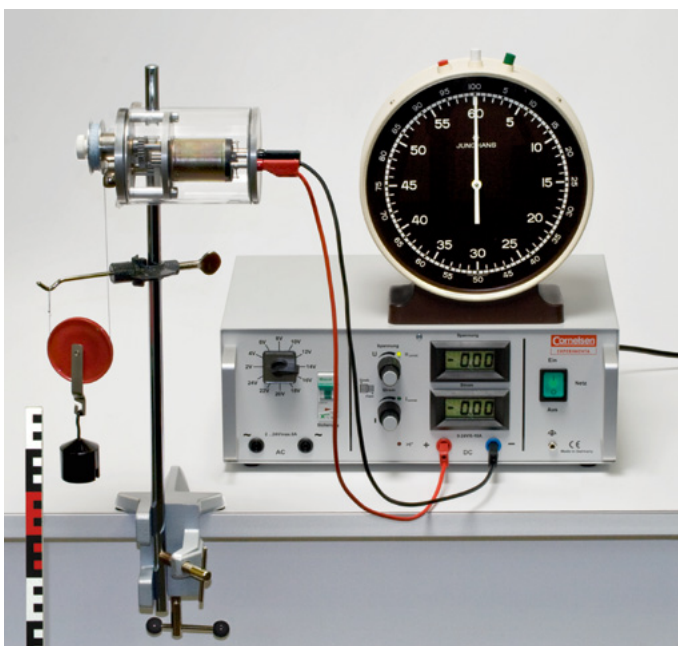
54852

Materials for demonstration



► Survey of experiments:

- Energetic basic ideas, energy current, load carrier, current, current concept, current measuring, mechanic parameter for the energy conversion
- Increasing the power of the energy current with the load carrier current ($P \sim I$), parallel circuit of consumers
- Energy current and electron current at the electric motor
- Ideas for the voltage concept ($P \sim U$), series circuit
- Experiments to determine the voltage definition



Additionally required:

Accessory kit 'DynaMot for carrying out students experiments'



The kit consists of a lamp holder with 4 sockets MES, a lamp holder SES, set of bulbs for DynaMot experiments. All parts can be stored in the box of the *Demonstration kit 'DynaMot'*.

54845

Physics Students kits

Age
13–16

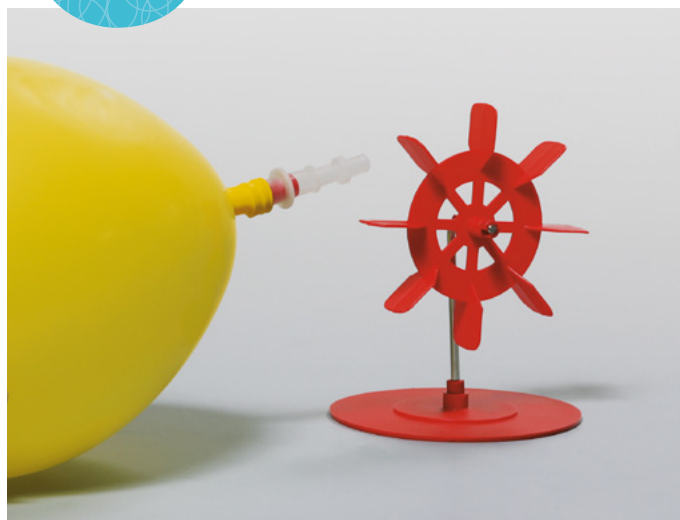
Fundamental physics

The equipment in this kit makes it possible to conduct 96 fundamental experiments on the topics of *mechanics, energy, heat, acoustics, optics* and *electricity*. The key focus is on understanding the effects of physical laws and the precise measurement of physical quantities.

The selection of individual components has been made under the consideration that they can be used in as many functions as possible.

The experiments can be set up with the help of the clear experiment instructions in such a way that they are guaranteed to function properly.

No additional materials or equipment are necessary. The equipment in the kit can also be used outside a laboratory.



Included in delivery:

Experiment description

Fundamental physics



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Amongst others:

Rail, lever, balance beam,
scale pans, set of weights
Dynamometer
Pulleys
Carriage
Paddle wheel
Glass materials
Suction flask
Syringes
Sound box, tuning fork

Lenses, mirrors, prism,
diaphragms, slide
Optical lamp
Projection box
Optical model bodies
Lever switch
Lamp holders and bulbs
Experiment leads
Magnets, coil with core

16005

Materials for 1 work group or demonstration

Distillation

Age
13–18

All usual preparative distillation processes can be conducted safely with this kit. The students can easily recognise the efficiency of water cooling and the possibility to separate fluids because of their different boiling temperatures.

The SVS system is based exclusively on screw connectors consisting of screw cap, silicone gasket and PTFE cuff. This makes the use of the elements of the apparatus much easier for students and it will provide safe and leak proof connections between the components.



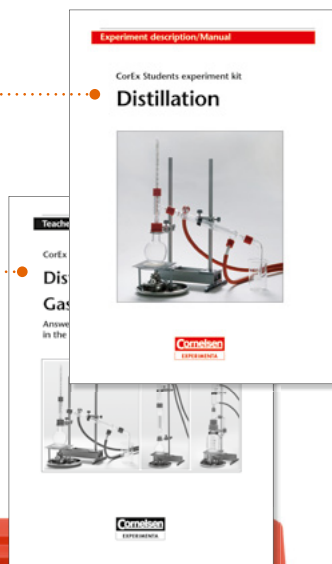
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



- In a plastic tray (312 x 427 x 150 mm) with foam insert and lid:

Still head	Stand rod, 330 mm (2x)
Receiver adapter	Tripod, bosshead (2x), retaining ring, holding clip
Condenser Liebig, 150 mm	Ceramic wire gauze
Thermometer, -10 to +110 °C	Spirit burner
Round flask, 100 ml	Heat resistant pad
Beaker, 100 ml	Beaker, 100 ml
Rail with feet and clamp riders (2x)	Rubber hoses



89756

Materials for 1 work group

Extraction

With the Extraction Kit students can isolate less soluble materials. The special construction of the Soxhlet-extractor ensures that a solvent cycle transports pure solvent to the extraction thimble and thus less soluble compounds are extracted and are enriched in the solution.

The SVS system is based exclusively on screw connectors consisting of screw cap, silicone gasket and PTFE cuff. This makes the use of the elements of the apparatus much easier for students and it will provide safe and leak proof connections between the components.

► In a plastic tray (312 x 427 x 150 mm) with foam insert and lid:

Soxhlet extractor	Tripod, bosshead (2x), retaining ring, holding clip
Dimroth condenser, 210 mm	
Extraction thimble (5x)	Ceramic wire gauze
Round flask, 100 ml	Spirit burner
Rail with feet and clamp riders (2x)	Heat resistant pad
Stand rod, 330 mm (2x)	Rubber hoses



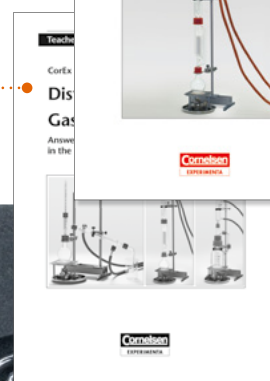
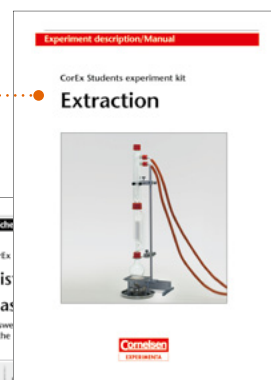
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



89876

Materials for 1 work group

Age
13–18

Gas generator

With the Gas generator Kit small quantities of most of the standard laboratory gases can be generated.

The SVS system is based exclusively on screw connectors consisting of screw cap, silicone gasket and PTFE cuff. This makes the use of the elements of the apparatus much easier for students and it will provide safe and leak proof connections between the components.

If the set up is done correctly the gases in the apparatus are only in contact with the materials glass and Teflon (PTFE). The generation of gas can be interrupted easily at any time. In addition a simple apparatus for steam distillation or a simple extraction apparatus can be built from the components contained in the kit.

- In a plastic tray (312 x 427 x 150 mm) with foam insert and lid:

Universal gas generator bottle
One-way valve
Filter tube with frit
Pressure relief valve
Liebig condenser
Extraction pipe connection
Elbow connectors for extraction and for steam distillation

Dropping funnel
Rail, feet, clamp riders (2x)
Stand rod, 330 mm (2x)
Tripod, bosshead (2x), retaining ring, holding clip
Ceramic wire gauze
Spirit burner
Heat resistant pad
Beaker, 100 ml
Rubber hoses



Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



89886

Materials for 1 work group

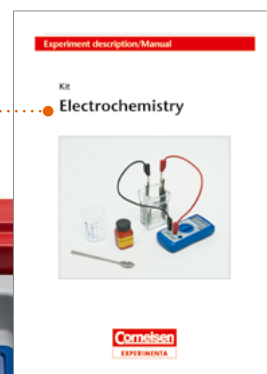
Electrochemistry

The kit contains all necessary materials and agents to carry out basic experiments of electrochemistry.



Included in delivery:

Experiment description



► Detailed instructions for 5 experiments:

- Conductivity of liquids
- Electrolysis
- Electroplating
- Electrochemical element
- Voltage series

► In a plastic tray (312 x 427 x 75 mm) with insert and lid:

Glass trough with stems	Light emitting diode
Carbon electrodes	Common salt
Zinc electrode	Mini Digital multimeter
Copper electrode	Experiment leads
Iron electrode,	Crocodile clips
Citric acid	Square battery, 4.5 V
Copper-II-sulfate	Spoon, stainless steel
Litmus paper	Beaker, polypropylene



51901

Materials for 1 work group or demonstration

Age
13–18

Molecule construction boxes

With the components contained in the molecule construction boxes molecular models can be assembled representing practically all the important compounds of chemistry that are dealt with in secondary schools. The positions of the atomic nuclei and the bonds between the atoms are shown particularly clearly by these structural (rod-and sphere) models. The molecular models are assembled simply by linking up the models of the atoms using the connecting rods. The rods are flexible, so that they can also be used to show multiple bonds.

The colour coding of the different atoms follows international conventions.

- Box 'Molecules 1' contains atomic models for aliphatic compounds.
- Box 'Molecules 2' is to be used in conjunction with basic box 'Molecules 1' only, to build up organic compounds.

Kits

Kit 'Molecules 1' contains materials for 10 work groups

- 10 Boxes 'Molecules 1'
- Teacher's manual 'Molecules'

Size of kit: 540 x 450 x 150 mm

31764 Kit 'Molecules 1'



Kit 'Molecules 2' contains materials for 10 work groups

- 10 Boxes 'Molecules 2'
- Teacher's manual 'Molecules'

Size of kit: 540 x 450 x 150 mm

42880 Kit 'Molecules 2'

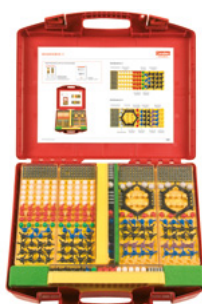


Kit 'Molecules 3' contains materials for 5 work groups

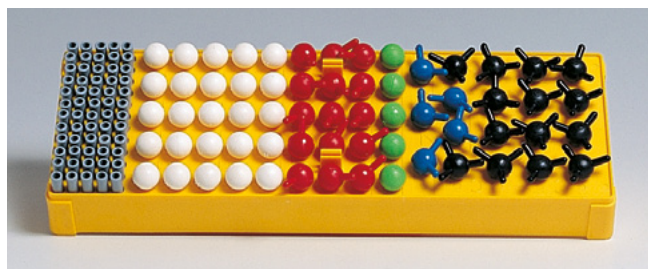
- 5 Boxes 'Molecules 1'
- 5 Boxes 'Molecules 2'
- Teacher's manual 'Molecules'

Size of kit: 540 x 450 x 150 mm

36685 Kit 'Molecules 3'



Box 'Molecules 1'



Contains atomic models for aliphatic compounds.

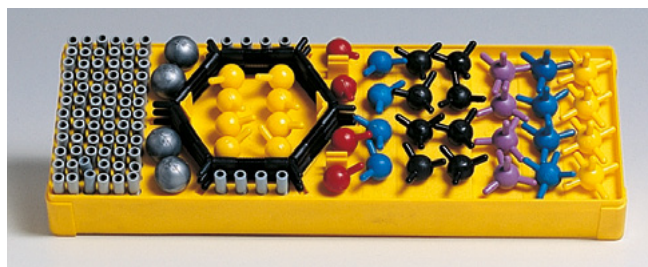
Contents:

- 25 Hydrogen atoms, white, monovalent
- 5 Chlorine atoms, green, monovalent
- 15 Oxygen atoms, red, bivalent
- 5 Nitrogen atoms, blue, trivalent
- 14 Carbon atoms, black, quadrivalent
- 60 Flexible connecting pieces, grey

Size of box: 315 x 115 x 53 mm

18474

Box 'Molecules 2'



To be used in conjunction with basic box 'Molecules 1' only, to build up organic compounds.

Many organic chemical compounds can be constructed using the individual parts from both boxes. The models of benzene rings can be used to create aromatic hydrocarbons. The universal building blocks can be used to complete the organic compounds.

Contents:

- 4 Sulphur atoms, yellow, hexavalent
- 8 Sulphur atoms, yellow, bivalent
- 4 Phosphor atoms, violet, pentavalent
- 4 Nitrogen atoms, blue, pentavalent
- 4 Nitrogen atoms, blue, trivalent
- 8 Carbon atoms, black, quadrivalent
- 4 Oxygen atoms, red, bivalent
- 4 Universal building blocks, grey, monovalent
- 80 Flexible connecting pieces, grey
- 3 Models of benzene ring, decomposable, black

Size of box: 315 x 115 x 53 mm

31810

Biology

Students can carry out a number of tasks using the equipment from this kit.

A very important basis for a profound and successful biological lesson is the carrying out of real experiments with materials specially designed for this purpose.

Important learning aims:

- Observing with a magnifying glass
- Collecting and observing small animals and plants or leaves
- Observing, dissecting and preparing plant parts and animals
- Preparing microscopic slides

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Three-lens magnifiers,
magnification 3x, 6x, 10x

Pooters

Dissecting needles with
protector

Pairs of tweezers

Pairs of scissors

Knives

Microtomes

Test tubes, plastic

Stands for three test tubes

Brush for the test tubes

Double dishes, plastic

Droppers

Microscopic slides

Cover glasses

Flower and leaf press

Cord

Rapid scale

Microtome

The microtome is a very safe and easy to handle instrument for sectioning biological material.

With the knife a suitable piece of botanical material or dead animal is cut. This piece of material is passed through one of the openings of the microtome. It may be held by the tweezers.

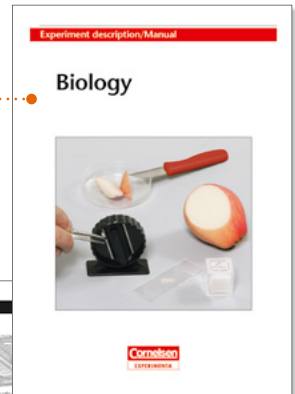
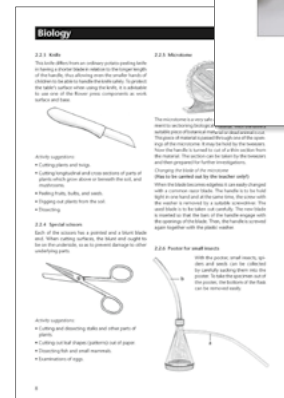
Now the handle is turned to cut of a thin section from the material. The section can be taken by the tweezers and then prepared for further investigations.



Included in delivery:

Teacher's manual

- With instructions for equipment and experiments for preparing lessons and carrying out the experiments themselves.





Pooter

With the pooter, small insects, spiders and seeds can be collected by carefully sucking them into the pooter. To take the specimen out of the pooter, the bottom of the flask can be removed easily.



Germination-Units

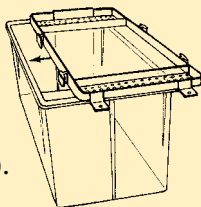
This kit makes it possible to carry out fundamental botanical and zoological experiments for various age ranges. By examining and observing the students get acquainted with following phenomena:

Topic **Botany**

- Germination of seeds
- Growth of plant roots stems and leaves.
- Reaction of plants to light and contact stimuli
- Winding and climbing of plants
- Development of plants from the flower to the fruit
- Importance of growth factors for plants such as soil, light, warmth, air, water, water pollution
- Phototropism of leaves and stems
- Geotropism of sprouts and roots
- Swelling force of seeds
- Transpiration of plants
- Assimilation of plants

Topic **Zoology**

With the transparent air permeable lid the multi-purpose container is well suited for use as small aquarium or terrarium for a short term captivity and observation of small animals (small fishes, beetles, worms). By observing small animals students become acquainted with their habits (movements, breathing, eating and behaviour).



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Germination sets comprising of:

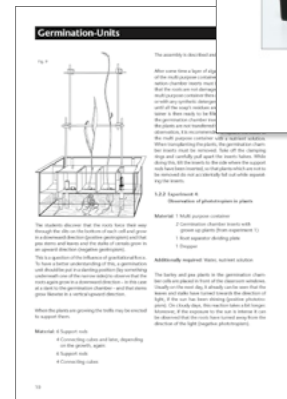
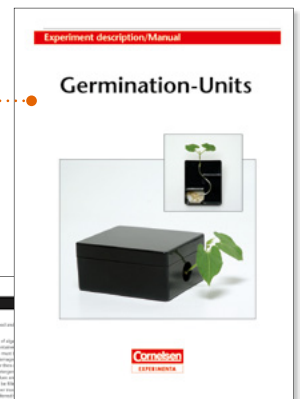
Multi-purpose container with lid, germination chamber insets, cell lids, support rods, connecting cubes

Special absorbent cardboard
Droppers
Dark room germination boxes
Germination dishes
Cotton wad

Included in delivery:

Teacher's manual

- With instructions for equipment and experiments for preparing lessons and carrying out the experiments themselves.



Multi-purpose container

The multi-purpose container is suitable for making comparisons between germination methods of various plants, for observing the development of plant shoots with roots, stalks, leaves and flowers.

The way the plants twist and coil and seek out light can all be impressively demonstrated as well as the way they react to being touched.

The multi-purpose container is also suitable for keeping small animals and insects inside and observing over long periods when the germination trays are removed.



Flower and leaf press

The multi-purpose container has two covers which can also be used for pressing flowers and leaves.



Germination sets

With the germination sets, the students can study germination of various seeds, watch and compare.

Dark room germination box

With the dark room germination box, the growth of a plant towards the light can be shown in an impressive way.



Soil types and plant growth

For the experimental investigation of nature, composition and texture of soil and the resulting impact on the growth of plants.

The experiments and materials were selected in close cooperation with the association **information.medien.agrar e.V.**

The kit is designed for the use in science classes of general education schools and for the use on school farms.

The kit contains all equipment necessary for the experiments described. Two groups of up to five students can conduct the experiments. Only different soil samples, water and seeds according to the season have to be supplied.

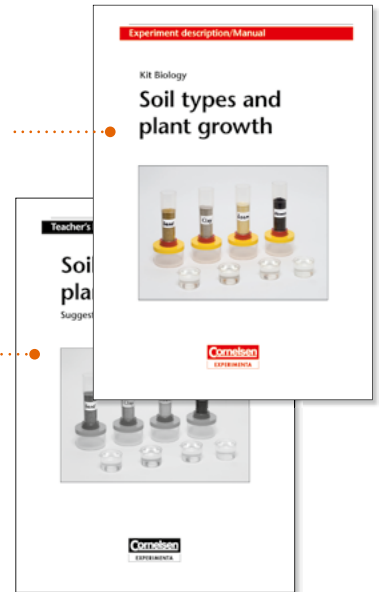
Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



In cooperation with:

information.
medien.agrar e.V.



► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Plastic beaker, graduated	Watch glasses
Scales	Filter paper
Test tube stands	Universal indicator paper
Test tubes	Petri dishes
Heat resistant pad	Magnifiers
Glass bottles, iron crucible	Spirit burner
Germination dishes	Graduated cylinder
Sieve insert, filter tubes, connectors, filter bowl, ceramic wire gauze	Dissecting needles
Crucible tongs	Rubber stopper
	Pipettes
	Metal spoon



85001

Materials for 2 work groups



► Detailed instructions for 11 experiments:

Soil types

- Investigating soil types
- Determining various soil types
- Determining the humus content of soil samples
- Determining the pH-value of soil samples

- Determining the lime content of soil samples
- Investigating soil samples
 - for a presence of living organisms
 - for a presence of seeds
- Determining the water retention capacity of different soil types

Plant growth

- Observing seed germination
- Investigating germination conditions for plant seeds
- Monitoring the development of plant seedlings in different soil types



Agricultural crops

For the experimental investigation of characteristics and properties of important agricultural crops found in many regions of the world.

The experiments and materials were selected in close cooperation with the association **information.medien.agrar e.V.**

The kit is designed for the use in science classes of general education schools and for the use on school farms.

The kit contains all equipment necessary for the experiments described. Two groups of up to five students can conduct the experiments.

Only alcohol, water and parts of plants to be studied – according to the season – have to be supplied locally

Included in delivery:

Experiment description

- with student worksheets

Teacher's booklet

- with suggested solutions



In cooperation with:

information.
medien.agrar e.V.

ima

- In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Stereoscope	Spirit burner
Magnifier	Metal plates
Slides	Garlic press
Cover glasses	Droppers
Dissecting needles	Rubber stopper
Tweezers	Filter paper
Metal spoons, knives	Vegetable oil, glucose, iodine solution, starch
Mortar with pestle	Gloves
Plastic cups	Hemp
Double dishes	
Watch glasses	
Test tubes, holder, test tube stand	



85002

Materials for 2 work groups



► Detailed instructions for 14 experiments:

Grain

- Investigation of a grain ear
- Distinction of cereals by their ears
- Investigation of a cereal grain
- Distinguish the corn by their grain
- Evidence of starch in cereal grains
- Evidence of water in cereal grains
- Grinding of grain into grist and flour

Oilseeds

- Detection of fat in crops

Potatoes

- Investigation of a potato tuber
- Evidence of starch in potato tubers
- Proof of memory cells in potato tubers

Beets

- Investigation of a turnip
- Detection of sugar in sugar beets

Plant fibres

- Studies on the tensile strength of vegetable fibres

Climate – Environment

The CorEx Log Q5+ data logger and the matching collection of sensors makes it possible to study the current themes of climate and the environment in a way that covers several scientific disciplines and geography in comprehensive fashion.

The extensive instructions with tips for teachers and 28 student worksheets describe 19 experiments for teaching units which can all be carried within the space of one lesson but also features experiments which can be carried out over longer periods involving several hours and even days or years.

Experiments using the measurement box are very well suited to bundling with weekly project work.

The set is also ideally suited for participation in various measurements pertaining to the world-wide GLOBE® project.

Included in delivery:

Teacher's manual

- With 28 student worksheets and detailed information for teachers: learning objectives, lists of equipment, tips on setting up and conducting experiments.



Sensing Science software

- For demonstrative depiction and evaluation of data.

► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Data logger
CorEx Log Q5+

Power supply

USB cable

Sensor cables, 2 x

Sensing Science software

Sensors:

Temperature, 2 x

pH Adapter, 1 x

pH Electrode, 1 x

Carbon dioxide, 1 x

Ultraviolet, 1 x

Additionally required:

PC or notebook



74070

Materials for 1 work group

Carbon dioxide gas sensor



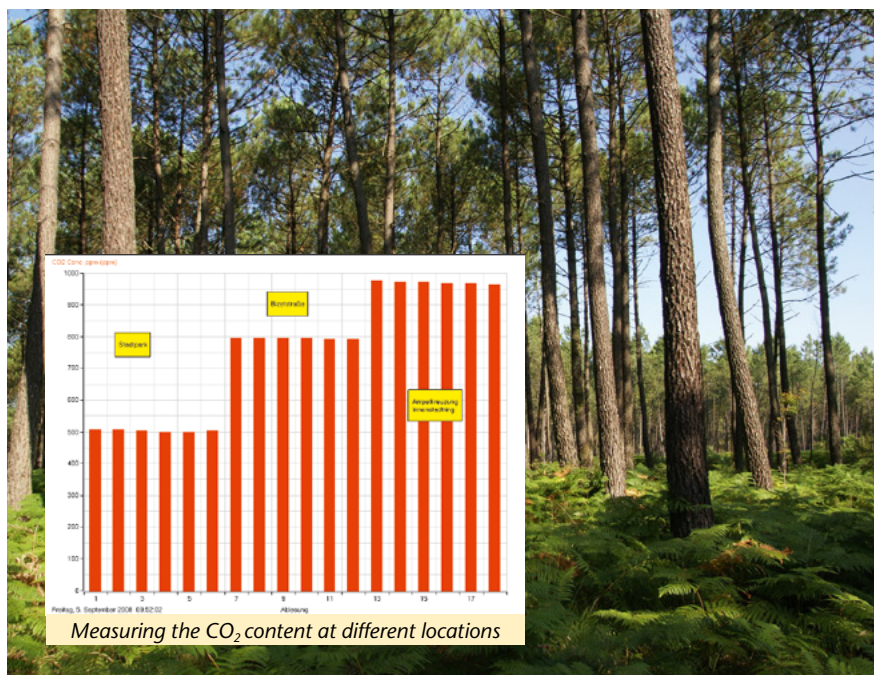
The carbon dioxide sensor measures the content of carbon dioxide in air, for example. The various measuring ranges make it possible to measure carbon dioxide content in small creatures or during the germination of plant seeds as well. The sensor measures carbon dioxide content using infra-red light.

Measuring range:

0 to 50,000 parts per million (ppm)

Precision: 0 to 20,000 ppm: 100 ppm or 10% of the measured value

20,000 to 50,000 ppm: 250 ppm or 20% of the measured value



► Student worksheets for the following investigations:

Climate

- The absolute atmospheric pressure
- Atmospheric pressure changes
- Barometric height measurement
- Temperature measurements
- Relationship between temperature and light intensity as a function of the season
- Relative air humidity: Relationship between relative air humidity and temperature
- Relative air humidity: Daily variations, short series of measurements
- Reverse weather forecasting – weather observation
- The greenhouse effect
- Conversion of CO₂ by plants
- Warming of land and water masses
- Sunshine duration
- The pH value (also recommended for the GLOBE® Project)

Environmental conditions and influences

- Variation in the CO₂ content of the atmosphere over one or more school years; over 24 hours
- The CO₂ content at different locations
- The CO₂ content in the classroom
- CO₂ emissions from cars
- Exposure to noise in everyday life
- UV light measurement: Dependence of radiation intensity on the weather and local conditions
- Measuring the UV protection – of sunglasses – of different materials
- The sun protection factor of sun lotion

pH Electrode

For pH measurements in general.

Filling: Ag/AgCl gel electrolyte

pH Adapter

The pH electrodes can be connected to the pH adapter. The adapter is pre-calibrated for 25 °C but the calibration can be changed for other temperatures or if the electrodes are not working as effectively.

Measuring range: 0 to 14 pH, precision 0.1 pH

Ultraviolet sensor

The sensor is sensitive to both UVA light and harmful UVB wavelengths of the spectrum.

Applications include investigating the effectiveness of various types of sun cream or sunglasses, how much UV light can penetrate textiles or measurement of UV radiation from incandescent bulbs. Outdoors it is possible to measure sunlight and the effects of clouds.

Measuring range: 250 to 360 nm



Climate – Environment (Classroom set)

The classroom set allows four groups to carry out exciting and discerning experiments on the topics of climate, weather and the environment.

Four Q5+ data loggers are each equipped with five built-in sensors, so that most experiments can be carried out simultaneously.

The extensive instructions with tips for teachers and 30 student worksheets describe 20 experiments for teaching units which can all be carried within the space of one lesson but also features experiments which can be carried out over longer periods involving several hours and even days or years.

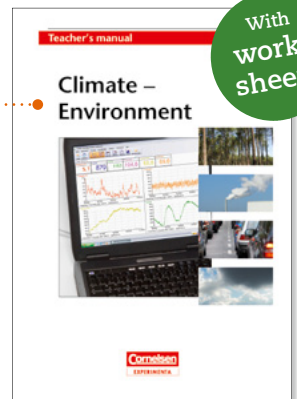
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The set is also ideally suited for participation in various measurements pertaining to the world-wide GLOBE® project.

Included in delivery:

Teacher's manual

- With 30 student worksheets and detailed information for teachers: learning objectives, lists of equipment, tips on setting up and conducting experiments.



Sensing Science software

- For demonstrative depiction and evaluation of data.

► In a case with foam insert for transport and storage (540 x 450 x 150 mm):

Data logger
CorEx Log Q5+, 4 x

Power supply, 4 x

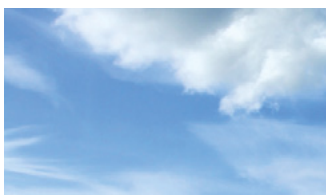
USB cable, 4 x

Sensor cables, 4 x

Sensing Science software,
school licence

Sensors:
Temperature, 8 x
pH Adapter, 1 x
pH Electrode, 1 x
Carbon dioxide, 1 x
Ultraviolet, 1 x
Rainfall, 1 x
Count/Tachometer-
Adapter, 1x

Additionally required:
PC or notebook



74074

Materials for 4 work groups

Carbon dioxide gas sensor



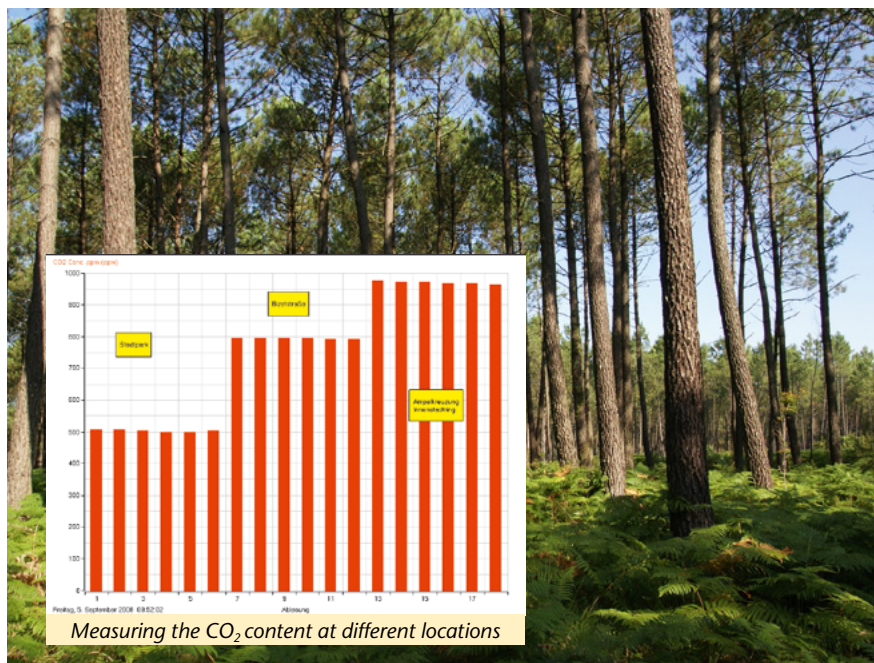
The carbon dioxide sensor measures the content of carbon dioxide in air, for example. The various measuring ranges make it possible to measure carbon dioxide content in small creatures or during the germination of plant seeds as well. The sensor measures carbon dioxide content using infra-red light.

Measuring range:

0 to 50,000 parts per million (ppm)

Precision: 0 to 20,000 ppm: 100 ppm or 10% of the measured value

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► Student worksheets for following investigations:

Climate

- The absolute atmospheric pressure
- Atmospheric pressure changes
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- Temperature measurements
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- Reverse weather forecasting – weather observation
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- Warming of land and water masses
- Sunshine duration
- The pH value (also recommended for the GLOBE® Project)
- Rain measurement

Environmental conditions and influences

- Variation in the CO₂ content of the atmosphere over one or more school years; over 24 hours
- The CO₂ content at different locations
- The CO₂ content in the classroom
- CO₂ emissions from cars
- Exposure to noise in everyday life

- UV light measurement: Dependence of radiation intensity on the weather and local conditions
- Measuring the UV protection – of sunglasses – of different materials
- The sun protection factor of sun lotion

Rainfall sensor

The rainfall sensor measures precipitation in millimetres in conjunction with the universal counter adapter.

The sensor can be used for measurements in the field as well as for stationary weather stations: e.g. using the anemometer sensor and a CorEx Log Q5+.



Measurements with sensors

Many professional careers involve carrying out measurements. Using sensors to display what is happening during the course of the experiments brings a new dimension to lessons. Children can quickly detect and investigate changes in physical quantities such as temperature, light or sound. Rapid acquisition of measurement data is motivating and allows new ideas to be tried out quickly.

Scientific investigations are based on hypotheses, planning, experiments and analysis. With the help of this kit, children can become familiar with working techniques which would be difficult to carry out without scientific knowledge.

The objective is to make it possible for children to interpret measured data, to read a graph and to identify patterns and trends in a set of measurements.

It is equally important to recognise data that has not been measured properly or which diverges from previous experience.

► In a case with foam insert for transport and storage (440 x 330 x 100 mm):

Data logger CorEx Log Q3+ with power supply and USB cable	Rubber bands
Temperature sensors, 2 x	Batteries, zinc-carbon
Sensing Science software	Batteries, Alkaline
Plastic beaker with lid	Clips
Hand ventilator	Pan pipe
Torch	Buzzer with battery holder
Colour paddle	Set of reflection screens
Curtain fabric	Stand for reflection screen
Cotton fabric, white and black	Tape measure
Fake fur	Sound funnel, cardboard

Included in delivery:

Teacher's manual

- With 19 student worksheets and detailed information for teachers: learning objectives, lists of equipment, tips on setting up and conducting experiments.



Sensing Science software

- For demonstrative depiction and evaluation of data.



Acquisition of measurements by means of datalogger ...



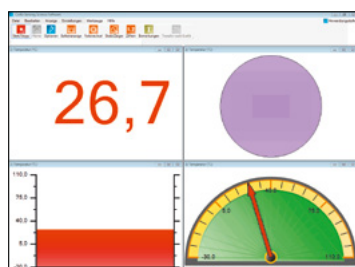
This collection of apparatus was developed with the following aspects in mind

- To encourage children to discover things, research and ask questions.
- To make science for children even more interesting.
- To extend the use of computers to measure, record and check data by means of sensors.

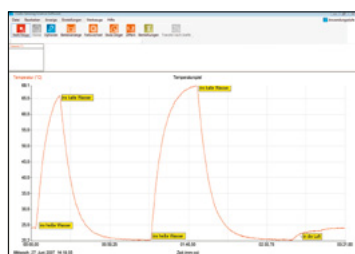


... for display using Sensing Science software

In Digimeter mode there is a choice of four different display formats



Data can be output in the form of a line graph



Acquiring data in Snapshot mode optimises the comparability of data in a set of experiments



The learning objectives are organised in such a way that children can increasingly improve their capabilities in the use of technology:

- Discovery – Learning about sensors
- Comparison – Making various measurements in order to compare them
- Recording – Output of sensor data in the form of a line chart to show changes in the measured values
- Monitoring – Use of multiple sensors simultaneously to monitor an environmental situation, for example
- Research – Use of suitable sensors to test one's own ideas
- Evaluation – Ability to interpret a line chart

► Student worksheets for following investigations:

We investigate light:

- How bright? How dark?
- Curtains, draperies, blinds
- Sun and clouds
- Sunglasses
- Reflexion
- How long will the light last?
- Our classroom

- The temperature game
- Hot drinks
- The wet swimsuit
- To hot!
- Keep warm!

We investigate sound

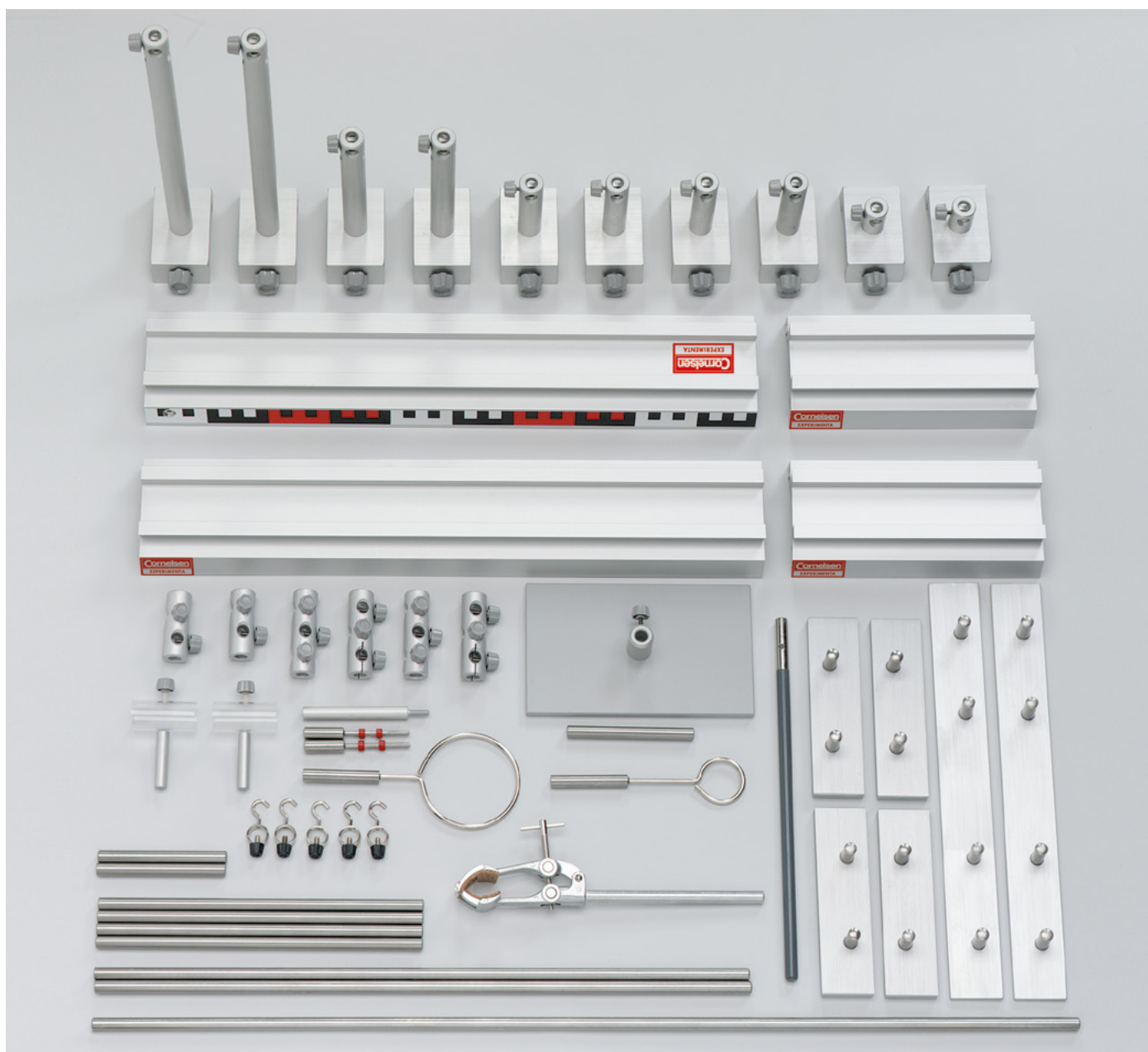
- How noisy? How quiet?
- How near? How far?
- Be quiet!
- Silence is golden
- What happens next?

We investigate temperature:

- How warm? How cold?
- Are your hands warmer than mine?
- How warm is our classroom?

Supporting Equipment

CorEx experiment system, basic set



The basic set contains all the elements needed to set up basic experiments for all areas of natural science. For more advanced experiments it is recommended that you purchase the 'Supplementary set' 77105 or more individual components.

Components:

Rail, 200 mm (2x)	Stand rod, 100 mm (2x)
Rail, 500 mm	Stand rod, 250 mm (4x)
Multipurpose rail, 500 mm	Stand rod, 500 mm (2x)
Rod to incline the multipurpose rails 47001/02	Stand rod, 750 mm
Pair of feet for rail, single	Stand rod, plastic, 300 x 10 mm
Pair of feet for rail, double feet	Axis on rod (2x)
Rider with locking tube, 30 mm (2x)	Rings with hook (5 pcs.)
Rider with locking tube, 75 mm (4x)	Ring on rod, 30 mm
Rider with locking tube, 150 mm (2x)	Ring on rod, 75 mm
Rider with locking tube, 300 mm (2x)	Multipurpose clamp
Bosshead, double (2x)	Dynamometer and tube support (2x)
Bosshead, treble (4x)	Table, small

77100

Supporting Equipment

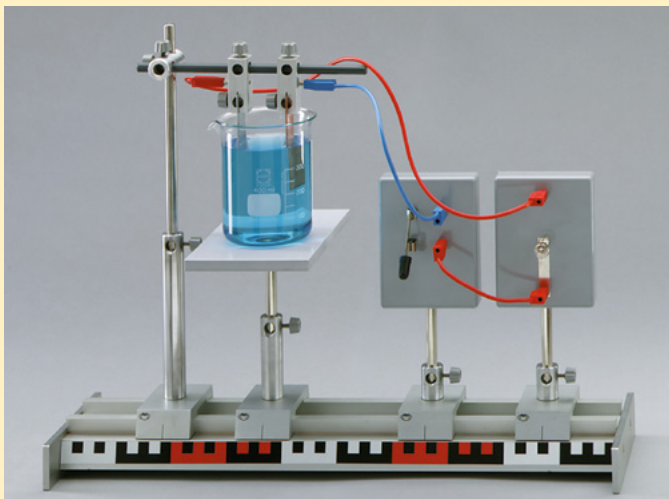
With the elements of the CorEx experiment system it is possible to set up experiments in all areas of natural science quickly and reliably and practically.

The basis of the system is formed by the special extruded aluminium profile rails with various forms of matching sliders.

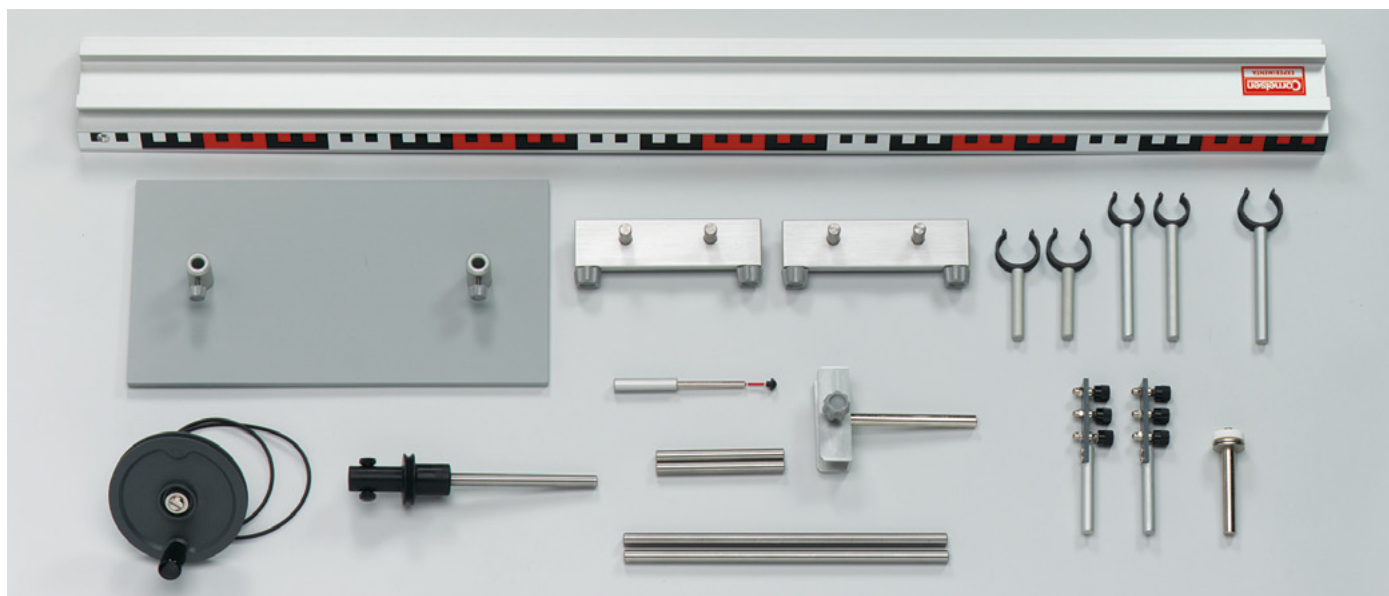
In the basic version, the rails serve as a base with feet attached at either side. The universal profile rails are equipped with two types of scale (block scale/metric scale) and can be set up on an incline so that they

In the basic version, the rails serve as a base with feet attached at either side. The universal profile rails are equipped with two types of scale (block scale/metric scale) and can be set up on an incline so that they

By setting up the rails on pairs of feet it is possible to implement two levels, adjacent or one behind the other quickly and reliably. The round clamps make it possible to attach all add-on components with rods up to 10 mm in diameter in three planes.



CorEx experiment system, supplementary set



Supplementary equipment set for the 'Basic set '77100.

Copmonents:

Rail with scales, 1000 mm

Adjustable feet for rail

Support clip on rod (2x)

Support clip on rod (2x)

Support clip on rod

Crank pulley on rod

Transmission belt, 200 mm ring dia.

Pivot bearing

Insulating support rod (2x)

Table, large

Stand rod, stainless steel, length: 250 mm (2x)

Needle support on rod

Disc support

Plate holder

77105

Supporting Equipment

Power supply unit 12 V/3 A



In ventilated sheet steel case, on/off-switch with control lamp and mains cable. 4 mm coloured safety output socket terminals for DC and AC, fixed voltage selectable in six steps, DC output smoothed but not stabilized, with electronic fuse protection against overheating and short circuit. CE-labelled.

Outputs: 2/4/6/8/10/12 V DC or AC, max. load 3 A
Operating voltage: 230 V/50 Hz AC
Size: 140 x 130 x 210 mm
Mass: 3.5 kg

55222

Power supply unit, 1.5 to 15 V/1.5 A DC



In ventilated sheet steel case with rubber feet, mains connecting cable, coloured, insulated 4 mm safety connecting sockets, on-off switch with built-in control lamp, fused with automatic breaker, activated either thermal or electromagnetic, all outputs galvanic cut from mains. With ground terminal. CE-labelled.

Built-in analogue display for DC.

Output: 1.5 to 15 V DC, adjustable
Ripple: 10 mV
Size: 110 x 80 x 150 mm
Mass: 2 kg

55223

Power supply unit 12 V/5 A



In ventilated sheet steel case, on/off-switch with control lamp and mains cable. 4 mm coloured safety output socket terminals for DC and AC, fixed voltage selectable in six steps, DC output smoothed but not stabilized, with electronic fuse protection against overheating and short circuit. CE-labelled.

Outputs: 2/4/6/8/10/12 V DC or AC, max. load 5 A
Operating voltage: 230 V/50 Hz AC
Size: 140 x 130 x 210 mm
Mass: 4.5 kg

55262

Power supply unit 6 and 12 V/5 A AC



In ventilated steel case, on/off-switch with control lamp and mains cable. 4 mm safety output socket terminals for AC, fixed voltage 6 V and 12 V. With mains fuse protection.

CE labelled.

Outputs: 6/12 V AC, max. load 5 A
Operating voltage: 230 V/50 Hz AC
Size: 150 x 112 x 85 mm
Mass: 2.6 kg

55224

Power supply unit 24 V/10 A

In ventilated sheet steel case with rubber feet, mains connecting cable, coloured, insulated 4 mm safety connecting sockets, on-off switch with built-in control lamp, fused with automatic breaker, activated either thermal or electromagnetic, all outputs galvanic cut from mains. With ground terminal.

Built-in digital displays for DC current and voltage, DC current stabilized and smoothed, ripple frequency less than 2 mV/3mA, electronic and thermal fuse, continuously adjustable current limitation by means of a regulating screw on the front panel. CE-labelled



Outputs:
2 to 24 V AC, 2 V steps
Maximum load AC: 10 A
0 to 24 V DC, voltage and current continuously adjustable
Maximum load DC: 6 A

Operating voltage: 230 V/50 Hz AC
Size: 260 x 140 x 230 mm
Mass: 13.5 kg

55267

Please pay attention to the indications we make for output, power, operating voltage etc. and make sure, that the equipment is applicable.
Other specifications available on request.

Power supply unit 1 to 6 V/2.5 A DC



In ventilated steel case, on/off switch with control lamp and mains cable. 4 mm safety output socket terminals for DC. Thermal overload and short circuit protection.
CE labelled.

Output: 0/1/2/3/4/5/6 V DC, max. load 2.5 A
Operating Voltage: 230 V/50 Hz AC
Size: 110 x 80 x 150 mm
Mass: 1.5 kg

55225

Power supply unit 3 V

Plastic case, with mains plug and 150 cm bifilar connection cable.

Operating voltage:
100–240 V/50–60 Hz
Output: 3 V/1 A DC
Cable with DC power plug
CE labelled



68534

Power supply units, clocked



Plastic case, with mains plug and 150 cm bifilar connection cable.

Operating voltage: 100–240 V/50–60 Hz

	Output voltage	Output voltage, clocked
68533	6 V	1 A DC
55217	12 V	2 A DC

Supporting Equipment

Voltmeter for students

This new Voltmeter with analogue mirror scale, point bearing moving-coil instrument and central range selector switch designed for education guarantees easy and comfortable operation and reading of measured values.

- 4 mm safety jacks
- Water-resistant and dual insulated housing
- Accessories: carrying case, test leads, batteries and operation manual
- Integrated stand



Measuring ranges:

AC: 3 V to 1000 V (6 steps)

DC: 100 mV to 1000 V (8 steps)

Accuracy:

AC: 2 %

DC: 1.5 %

Frequency: 20 to 400 Hz

Fuse: 0.5 A/500 V (6 x 32 mm)

Dimensions: 110 x 170 x 60 mm

Mass: 430 g

54978

Ammeter for students

This new Ammeter with analogue mirror scale, point bearing moving-coil instrument and central range selector switch designed for education guarantees easy and comfortable operation and reading of measured values.

- 4 mm safety jacks
- Water-resistant and dual insulated housing
- Accessories: carrying case, test leads, batteries and operation manual
- Integrated stand



Measuring ranges:

AC: 10 mA to 10 A (7 steps)

DC: 100 μ A to 10 A (11 steps)

Accuracy:

AC: 2 %

DC: 1.5 %

Frequency: 45 to 400 Hz

Fuses: 3 A/500 V; 10 A/500 V (6 x 32 mm)

Dimensions: 110 x 170 x 60 mm

Mass: 450 g

54977

Multimeter for students

This new Multimeter with analogue mirror scale, point bearing moving-coil instrument and central range selector switch designed for education guarantees easy and comfortable operation and reading of measured values.

- 4 mm safety jacks
- Water-resistant and dual insulated housing
- Accessories: carrying case, test leads, batteries and operation manual
- Integrated stand



Measuring ranges:

DC: 2.5 V to 1000 V (7 steps)/50 μ A to 10 A (9 steps)

AC: 10 V to 1000 V (6 steps)/2.5 mA to 10 A (7 steps)

Accuracy:

AC: 2.5 %

DC: 1.5 %

Resistance: 1 Ω to 1 K Ω (4 steps)

Frequency: 20 to 400 Hz

Fuses: 1 A/500 V; 10 A/500 V (6 x 32 mm)

Operating voltage: 3 x 1.5 V AA (UM-3)

Dimensions: 110 x 170 x 60 mm

Mass: 470 g

54980

Galvanometer for students

This new Galvanometer with analogue mirror scale, point bearing moving-coil instrument and central range selector switch designed for education guarantees easy and comfortable operation and reading of measured values.

- 4 mm safety jacks
- Water-resistant and dual insulated housing
- Accessories: carrying case, test leads, batteries and operation manual
- Integrated stand



Measuring ranges:

DC: 30 μ A to 3 mA (2 steps)

DC: 100 mV (1 step)

Accuracy: 1.5 %

Fuse: 0.5 A/500 V (6 x 32 mm)

Dimensions: 110 x 170 x 60 mm

Mass: 420 g

54979

Digital-Multimeter

Portable instrument with rotary switch for the range selection of voltage, current and resistance. All ranges overload protected. With diode- and transistor tester. Solid plastic housing with hinged stand, 4 mm safety sockets, a pair of measuring cable with test prod, fine-wire fuse, K-type temperature sensor and 9 V battery.



Measuring ranges:
DCV: 200/2000 mV/20/200/600 V; $\pm 0,5\%$
ACV: 200/600 V; $\pm 1,2\%$
DCA: 2000 μ A/20/200 mA/10 A; $\pm 1,2\%$
Ohm: 200/2000 Ω /20/200/2000 k Ω ; $\pm 1,0\%$
Temperature: 0 to 1000 $^{\circ}$ C; $\pm 2,5\%$

Safety: IEC-1010-1; CAT II 600 V
Battery: 9 V 6F22
Size: 70 x 128 x 28 mm
Mass: 140 g

54892

Digital-Multimeter

Portable instrument with 27 mm high contrast LCD with back-light. Single 20 positions easy to use rotary switch for function and range selection.

Automatic overrange indication with the „1“ displayed

Automatic polarity indication on DC ranges

Diode testing with 1 mA fixed current

Hold-function



Measuring ranges:

Voltage DC: 200 mV, 2, 20, 200, 600 V, Resolution 0.1 mV; $\pm 0.5\%$

Voltage AC: 200, 600 V; Resolution 0.1 V; $\pm 1.2\%$

Current DC: 2, 20, 200 mA, 10 A; $\pm 1\%$

Resistance: 200 Ω , 2, 20, 200, 2000 k Ω ; $\pm 0.8\%$

Battery test: 1.5 und 9 V; Resolution 10 mV; $\pm 1\%$

Battery: 9 V block 6F22

Display: 3½-digits, 27 mm

Safety: IEC 1010-1; CAT III 600 V

Size: 70 x 150 x 48 mm

Mass: 260 g

54889

Stop clock, demonstration



Colour coded push buttons for START/STOP/RESET, 2 pointers indicating seconds and minutes, 20 hours spring driven movement, in metal case on base and protected dial.

Dial divisions: 0 to 60 minutes and 1/100 minutes

Reading: 1 s

Dial dia.: 210 mm

41810

Supporting Equipment

Laser Ray Box, magnetic adhering



Consisting of five laser diodes optically adjusted mounted one below the other to produce five parallel laser beams to demonstrate beam optic experiments with Optical Models 47080. A magnetic foil on the bottom of the box allows the use on a suitable Steel Board 41621. The box is powered by the included battery holder for two 1.5 V battery cells AA (cells not included) or alternatively by the included AC adapter.

The repeated pressing of the on/off-switch allows to select the following beam variations: 1 beam, 3 beams with a narrow or wide distance and 5 beams.

The laser corresponds to the German Safety Regulations acc. to DIN 58126, part 6 for laser class 2, which are allowed for the use in schools.

Laser diodes:
Power: 1 mW, class II
Wave length: 635 nm

Operating voltage: 3 V/300 mA
Power supply: 2 mignon cells (AA) 1.5 V each or
AC adapter 3 V/300 mA
Size: 60 x 110 x 25 mm

47128

Microscope



This microscope is ideally suited for first scientific observations. Easy handling. Integrated LED-illumination. Lenses made of optical glass.

Magnification: 40x to 400x
Observation tube: monocular eyepiece 45°-inclined
Nosepiece: triple revolving with click stops
Objective: 4x, 10x, 40x
Ocular: 10x
Plain stage: 90 x 90 mm with 2 sample clips and 6 apertures
Power supply: 3 x R6 batteries
Size: 300 x 170 x 120 mm

89905

45,00 € / 53,55 €

Quartz-iodine reflector lamp

To illuminate solar cells as replacement for sunlight. Solid metal case with reflector, retainer bracket and rod for the assembly with stand material. Including quartz-iodine lamp and connection cable.

Consumption: max. 150 W
Voltage: 230 V/50 Hz
Size: 130 x 100 x 160 mm



47100

Additionally required:

15670 Tripod stand plate with socket and screw

Tripod stand plate with socket and screw



Steel, with rubber feet, plate thickness 10 mm
To fasten stand rods up to 13 mm dia.

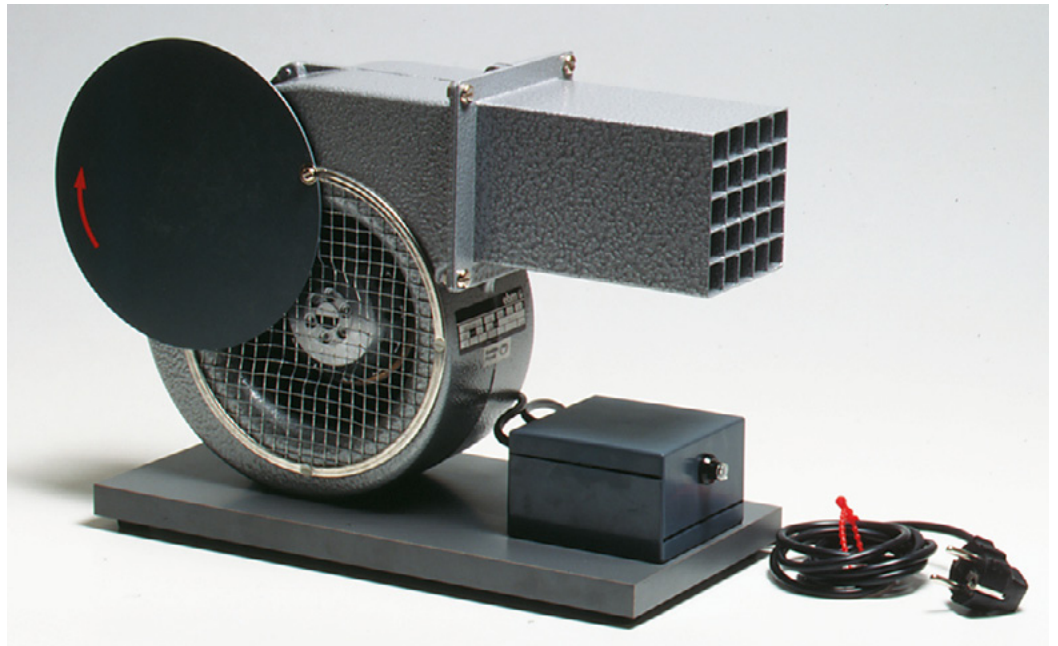
Legs: 80 mm long
Mass: 800 g

15670

Air stream generator

To produce a whirl free, homogenous air flow for aerodynamic experiments. Radial blower in metal case with adjustable suction opening, long air stream rectifier, on wooden base with switch and mains cable, suitable for horizontal and vertical operation.

Max. air speed: 14 m/s
Air outlet opening: 90 x 90 mm
Height of the opening (centre) above the table surface: 230 mm
Operating voltage: 230 V, 50 Hz
Consumption: 65 W
Size: 400 x 200 x 290 mm
Mass: 5.5 kg



29010

Steel board with stand

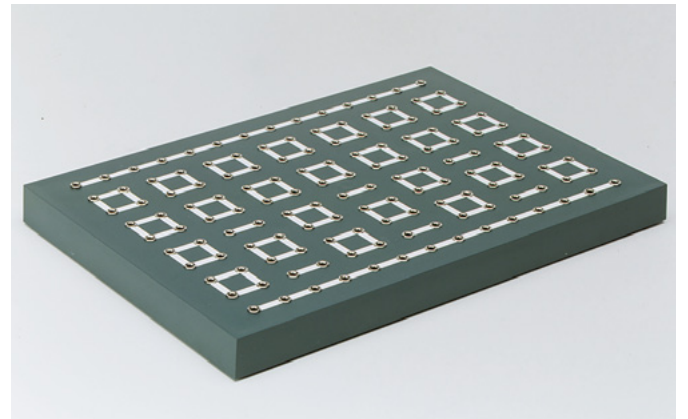


For experiments with magnetic supports and suction cups. Enamelled steel, scratch-proof, white surface, to write upon with chalk, can be wiped off wet or dry, with table stand, can be mounted vertically and horizontally.

Dimensions: 900 x 600 mm

41621

Universal circuit board



A special board of 4 mm socket terminals allows to build up various electric and electronic circuits including potentiometers and transistors by means of 19 mm plug-in elements. Max. 15 V AC/DC

Number of 4 mm sockets: 140
Size: 310 x 220 x 25 mm

20402

Index

8231	24	31756	16	52200	84
8959	26	31764	119	53540	85
11370	34	31772	20	54620	96
11372	34	31780	30	54845	113
15670	140	31790	14	54852	112
16005	114	31799	32	54853	74
16100	42	31802	22	54889	139
16102	42	31810	119	54892	139
16104	43	31900	12	54977	138
16106	43	36680	32	54978	138
16110	44	36685	119	54979	138
16115	44	41621	141	54980	138
16120	45	41810	139	55217	137
16180	45	42880	119	55222	136
16300	38	42985	90	55223	136
16500	86	43000	64	55224	136
18080	120	43080	88	55225	137
18085	122	43085	89	55262	136
18474	119	43108	66	55267	137
20402	141	43550	92	64433	36
20410	80	44631	102	65500	35
22005	48	47030	108	68533	137
22006	50	47080	104	68534	137
22009	52	47095	105	68544	37
22012	54	47100	140	74061	132
22014	56	47128	140	74070	128
22018	58	47525	76	74074	130
22021	60	47550	77	76001	72
22024	62	47600	106	77100	134
23001	82	47604	103	77105	135
23060	83	47605	107	85001	124
23100	78	48500	68	85002	126
29008	94	48550	70	85021	6
29010	141	49345	98	85022	8
31118	47	49346	100	85023	4
31121	46	50300	111	89756	115
31500	40	50301	111	89876	116
31710	18	50315	110	89886	117
31720	10	50331	109	89905	140
31748	28	51901	118		

A

Agricultural crops, kit..... 126
Air, kit..... 18
Air and water, Mini-Kit 42
Air stream generator 141
Anja and Leon experiment,
kits 4, 6, 8

B

Balances and equilibrium, kit..... 30
Basic electrical circuits, kit 84
Biology, kit..... 120
Biology, Mini-Kit 45

C

Centripetal forces, kit..... 92
Circuit board 141
Climate –
Environment, kits..... 128, 130
Cradle globe..... 47

D

Digital-Multimeter 139
Distillation, kit..... 115
Dynamics
with CorEx Log Qt, kit 90
DynaMot, demo 112
DynaMot, students kit..... 74

E

Electrical circuits
for the steel board, kit..... 85
Electrical circuits, kit..... 20
Electrical energy
sources, kit 82
Electricity and
magnetism, kit..... 50
Electricity, kit..... 78
Electricity, Mini-Kit 45
Electrochemistry, kit..... 118
Electronics, kit..... 80
Electrostatics, kit 109
Electrostatics/Magnetism,
Mini-Kit 44
Energy conversion, kits..... 70, 72
Environment –
Climate, kits..... 128, 130
Experiment system, kits..... 134, 135
Exploring the world
of the small, kit..... 54
Extraction, kit..... 116
Eye model..... 108

F

Flight and flying, kit..... 94
Floating and sinking, kit 12
Forces and motion in nature
and technology, kit..... 60
Fuel cell, kit..... 72
Fundamental physics, kit..... 114

G

Gas generator, kit..... 117
Gear and drive models, kit 35
Germination-Units, kit..... 122
General science, kit 40
Generator, Van de Graaff..... 111
Geometric optics, kits 103, 104

H

Heat, kit..... 32, 68
Heat, Mini-Kit 43
Human eye model 108
Hydroelectric power plant..... 102

I

Insulated wide neck vessels 32

L

Laser Ray Box..... 140
Light and shadow, kit..... 28

M

Magnet and compass, kit..... 16
Magnetism/Electrostatics,
Mini-Kit 44
Materials in everyday life, kit 48
Measurement of temperature,
weight and length, kit..... 14
Measurements
with sensors, kit..... 132
Mechanics, kits 64, 66, 88, 89
Mechanics, Mini-Kit 42
Microscope..... 140
Mixer..... 34
Molecule construction boxes 119
Multimeter 139
My body, my health, kit 56

O

Optical bench..... 106, 107
Optics, kits..... 103, 104, 105
Optics, Mini-Kit..... 44
Optics, students kits..... 76, 77

P

Photovoltaics, kit..... 100
Physics, kit 86
Plant growth and soil types, kit ... 124
Plants, animals, habitats, kit 62
Power supplies..... 136, 137
Primary science, kit 38

R

Recycled paper, kit..... 34
Reflector lamp 140

S

Soil types and plant
growth, kit..... 124
Solar cell, kit 83
Solar thermal energy
conversion, kit 98
Sound and tone, kit 10
Sound, Mini-Kit..... 43
Stand material 134, 135
Steel board 141
Stop clock..... 139
Sun, heat and air, kit 52
SVS system, kits 115, 116, 117

T

Tellurium N..... 46
Tripod stand plate..... 140

U

Universal circuit board 141

V

Van de Graaff Generator 111
Vehicles to build
and drive, kit 36, 37

W

Water purification, kit..... 22
Water supply, kit 24
What you feel, what you see,
what you hear, kit..... 58
Wimshurst Machine 110
Wind and weather, kit..... 26
Wind energy, kit..... 96

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