Science Kits

for primary and secondary school levels

Catalogue
2019

Contact

About us

Cornelsen Experimenta® is producer of teaching material for natural sciences – from Kindergarten to secondary school. We are part of the Franz Cornelsen Educational Group which roots go back to Cornelsen Publishing with more than 75 years of experience in the educational market.

Our company is one of the largest and most important providers for educational material in Germany and more than 60 other countries worldwide. Our trade mark is the 'red case' that includes the teaching material for science. We have more than 40 % market share in German elementary schools, secondary schools and Kindergarten and are proud to say that "Every German school has at least one 'red case' with Cornelsen Experimenta® science material." We inspire since with our material, teachers enable students to understand, internalize and discover the magic of natural science.

Cornelsen Experimenta® is a manufacturing company located in Berlin with approximately 40 employees, partnerships with external authors, cooperation with universities and more than 250 deliverers worldwide. Our product portfolio contains at least 200 cases in which we assemble 6.000 single parts.

Come and join our community and discover a modern, outstanding company with high-end quality products that make you and our common customer – teachers and students – learn enthusiastically natural science accompanied with experiments from Cornelsen Experimenta®.

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 regulary audited, internally and externally.

Cornelsen Experimenta® has been certified after ISO 9001:2015. It is ensured that the demands of the customers will be realized and fulfilled with high quality.

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.

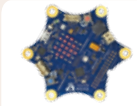
Contents

Secondary school

Physics Students Kits

Physics Demonstration Kits

Supporting Equipment



Digital Learning

Chemistry Students Kits

Biology Students Kits

Primary school

Integrated Natural Science

Storytelling

Vinus explores the world

Primary Natural Science

Kindergarten

Kindergarten kits

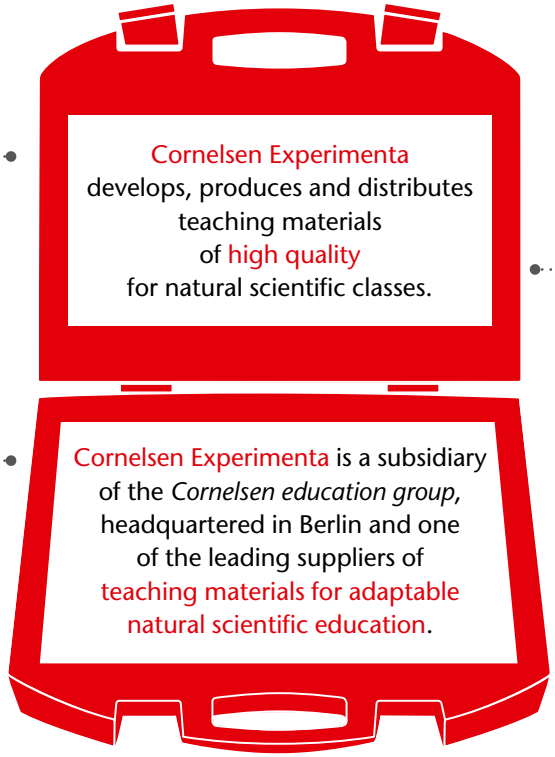
Cornelsen Experimenta® …

… 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.

… offers complete solutions, based on an integrated media system. The components of this system – kits and manuals – match each other.

… uses for the production of their teaching aids only quality raw materials. All raw materials are RoHs compliant. All plastic (or other) materials and colours are free of dangerous components and electrical parts used in combination with our educational materials do comply with all CE and other international safety standards.

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



… 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.

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

… offers a 2 years warranty for all products purchased from us.

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

Pages 158 – 167

Science kits for the Kindergarten

- Fail-safe experiments, easy to reproduce
- Laminated pictorial step-by-step plans
- Robust materials, compactly stowed
- The kits provide fun and thus encourage children's natural spirit of research

The Experiments

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

Pages 94 – 157

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

Pages 4 – 93

Demo

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 labs

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

Digital Learning

Pages 74 – 79

- With coding and robotics for computational thinking
- Calliope mini
- eXperiBot®
- LEGO® Education
- eXperiyser®

Storytelling

Pages 114 – 119

- Combining experimentation with exciting stories
- Enables children to experimental learning or investigative discovery learning – from hypothesis to their own conclusion
- includes teacher's manual with methodical approach

Age 13 – 18

Students kit Mechanics

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

43000	Materials for 1 work group

All stand equipment included!

▶ This kit covers the following basic laws of physics:

- Newton's 1st law
- Hooke's law
- Archimedes law of the lever
- Archimedes principle
- Boyle's law
- Gay-Lussac's law
- Principle of the Heron's engine
- Newton's 2nd and 3rd law
- Golden rule of mechanics

Detailed instructions for 49 experiments:

Mechanics of solids

- Volume / 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
- 1st class lever
- 2nd and 3rd 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

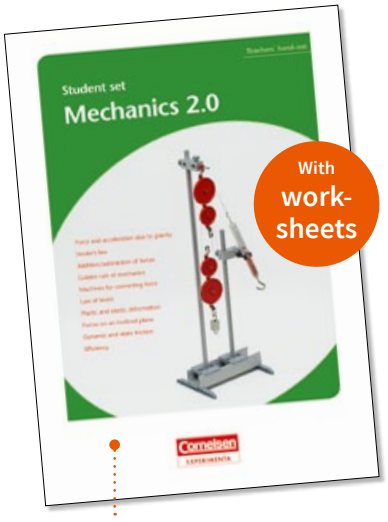
Age 13 – 18

Students kit Mechanics 2.0

Possibility to tie in with mathematics:

- Use of age-appropriate statistics when evaluating
- Testing for proportional correlations
- Introduction of vector summation with overlapping forces. *A geometric analysis is included in the manual.*
- Link to the angular function

Included in delivery:



Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

43010	Materials for 1 work group

▶ This kit covers the following basic laws of physics:

- Newton's 1st law
- Hooke's law
- Archimedes law of the lever
- Golden rule of mechanics

All stand equipment included!

Experiments:

- Spring dynamometers, acceleration due to gravity, weight
- Addition and subtraction of forces
- Hooke's law
- Centre of gravity and equilibrium
- Law of levers – 2nd/1st class levers
- Dynamic and static friction
- Forces on an inclined plane
- Elastic and plastic deformation (Leaf springs, Sand)
- Golden rule of mechanics Pulleys: Fixed pulleys, loose pulleys, Block and tackle
- Measurement of efficiency on an inclined plane

Age 13 – 18

Class set Mechanics 2.0

Possibility to tie in with mathematics:

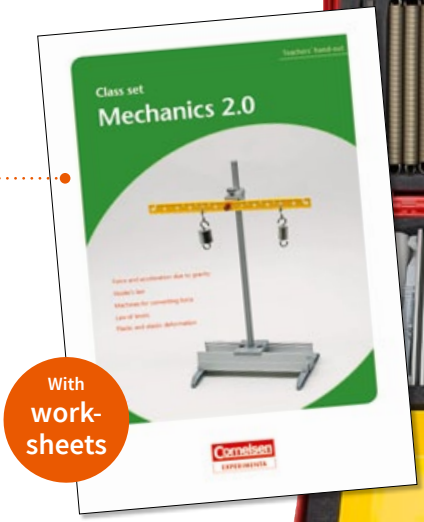
- Use of age-appropriate statistics when evaluating
- Testing for proportional correlations
- Introduction of vector summation with overlapping forces.
  A geometric analysis is included in the manual.

6 groups of students can experiment at the same time

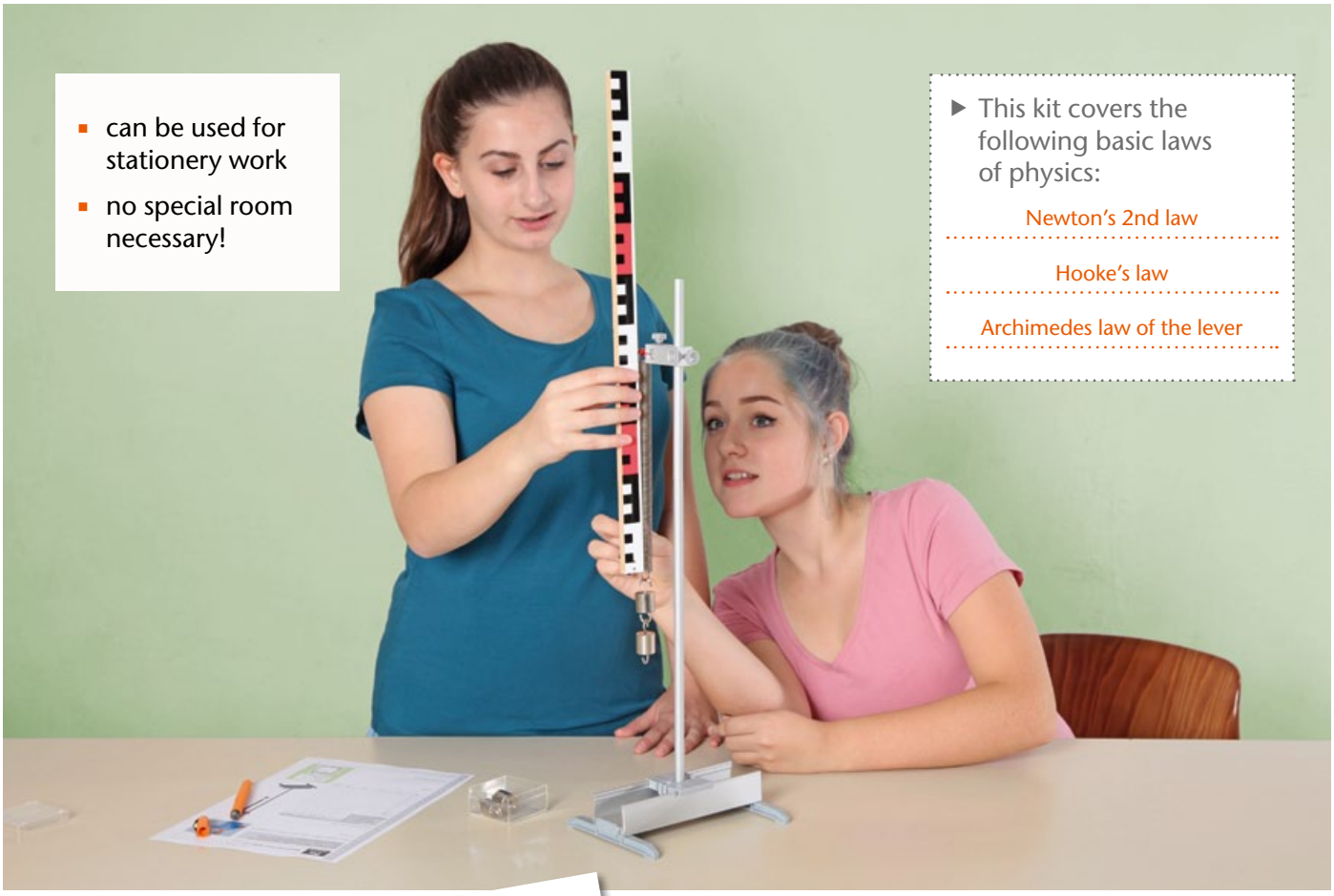
Included in delivery:

Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples



43020	Materials for 6 work groups



- can be used for stationery work
- no special room necessary!

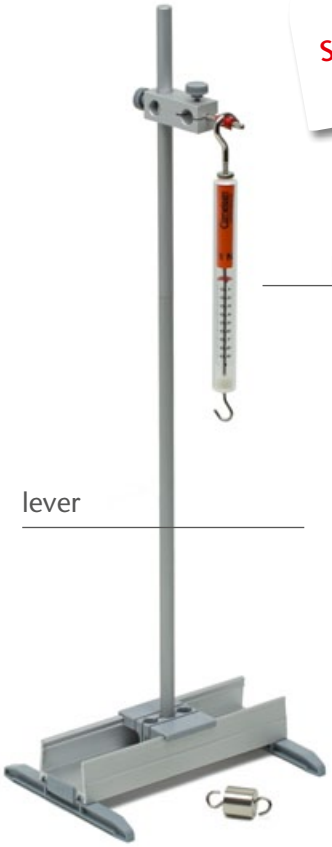
▶ This kit covers the following basic laws of physics:

Newton's 2nd law

Hooke's law

Archimedes law of the lever

All **stand equipment included!**



precise dynamometers

lever

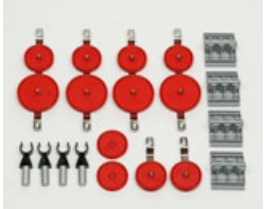
Experiments

- Spring dynamometers, acceleration due to gravity, weight
- Hooke's law
- Centre of gravity and equilibrium
- Law of levers – 2nd/1st class levers
- Elastic and plastic deformation (Leaf springs, Sand)

*Additionally recommended for experiments dealing with the **Golden rule of mechanics**:*

Mechanics 2.0 Additional kit "Pulleys"

With the additional kit the *class set Mechanics 2.0* can be graded up. Experiments on *fixed pulleys*, *loose pulleys* and *block and tackle* can be carried out to explain the **Golden rule of mechanics**.



43022

Age 13 – 18

Students kit Dynamics 2.0

The kit contains equipment and resources required for investigating the basic laws of motion and oscillation. A digital timer is included to support the efficiency of experimenting.

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.

Included in delivery:

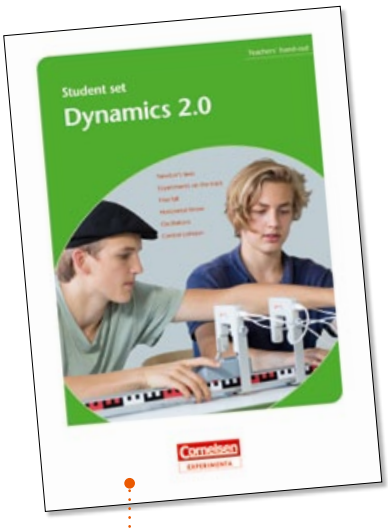
1-m-track

Digital timer V-Log

You can exactly measure
- Time
- Speed
- Acceleration
- Period of oscillation

Required for experiments exploring the uniform linear motion

43302 Self-propelled car



Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

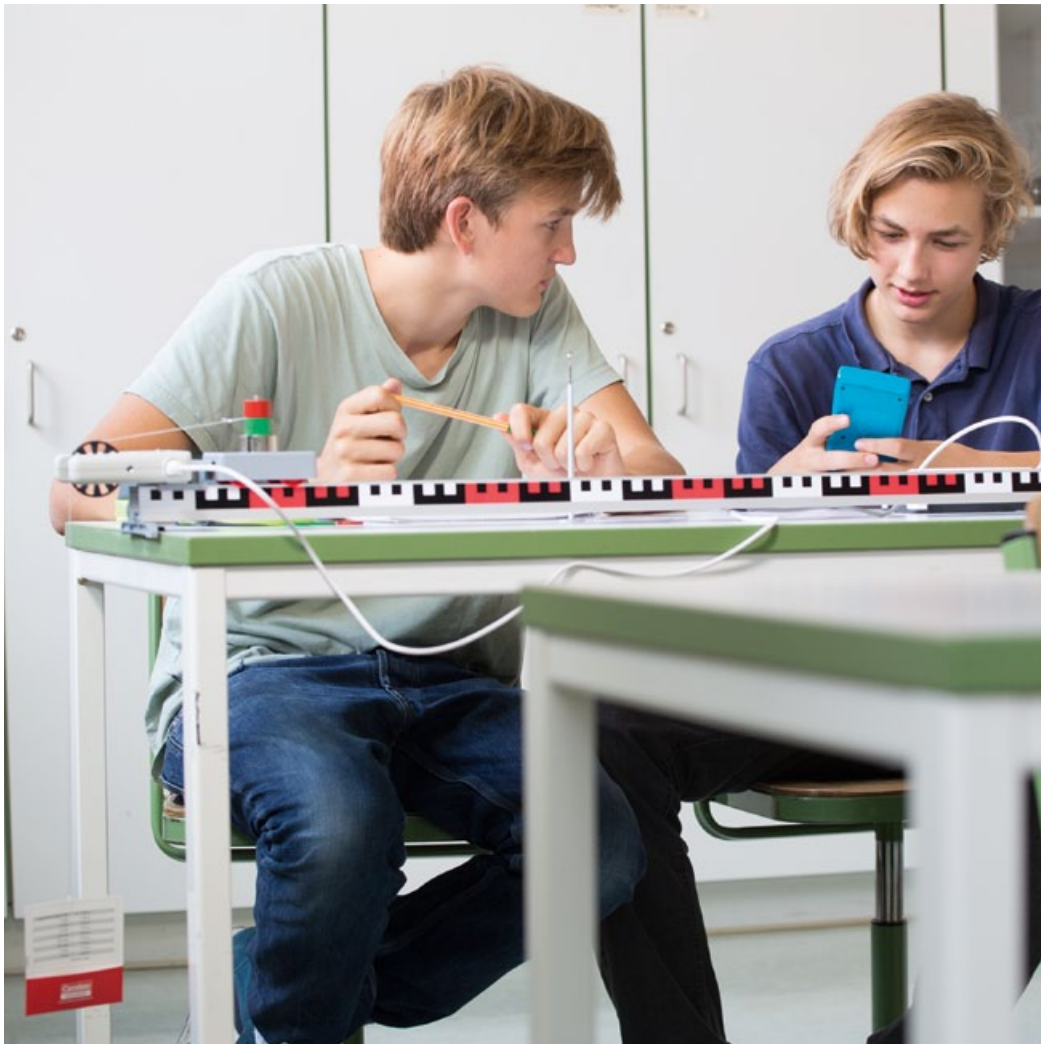
4300988 Materials for 1 work group

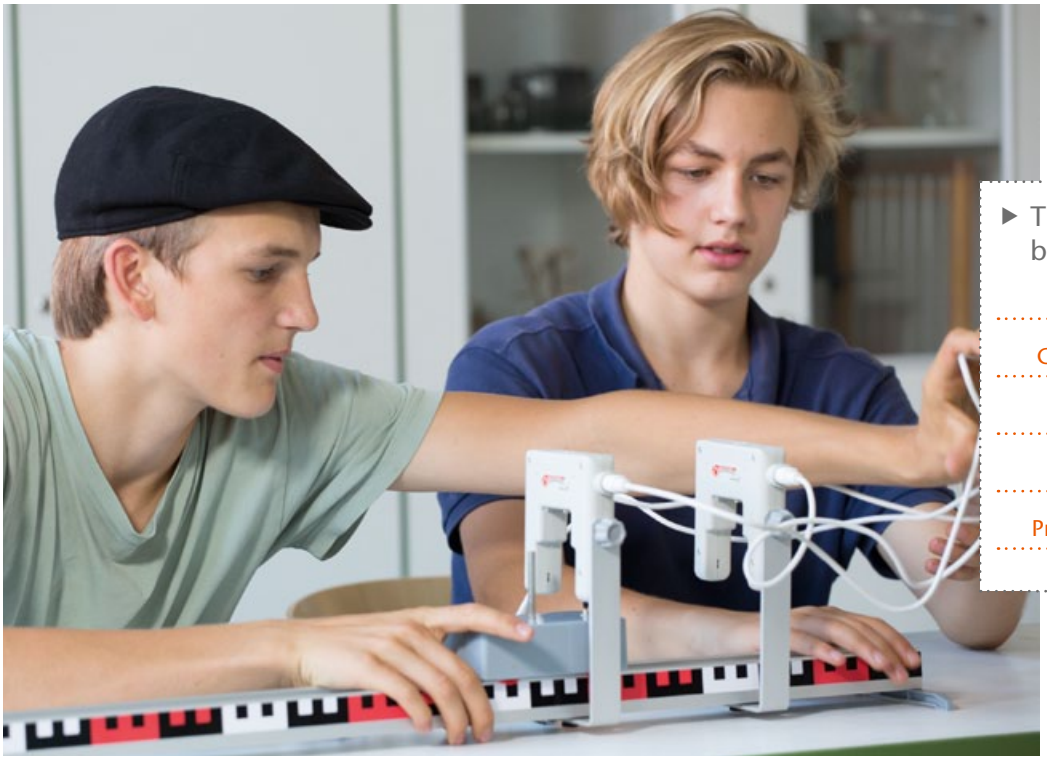
Detailed instructions for 15 experiments:

- Newton's laws (2 experiments)
- Relationship between distance and time for uniformly accelerating motion
- Motion plots
- Free fall:
  - Acceleration due to gravity
  - Height of fall – speed of fall
  - Height of fall – time to fall
- Trajectory of horizontally launched projectiles
- String pendulums
  - Period of oscillation
  - Damping
  - Determination of *g*
- Conservation of momentum
- Elastic and inelastic collisions

Experiment with the self-propelled car *43302* (optional):

- Uniform motion in a straight line





▶ This kit covers the following basic laws of physics:

- Newton's laws
- Galileo's equivalence principle
- Huygens' law of collision
- Galileo's laws of pendulum
- Principle of action and reaction

Age 13 – 18

Students kit 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 of the range of available experiments.

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

68533 Power supply unit 6 V (see page 71)

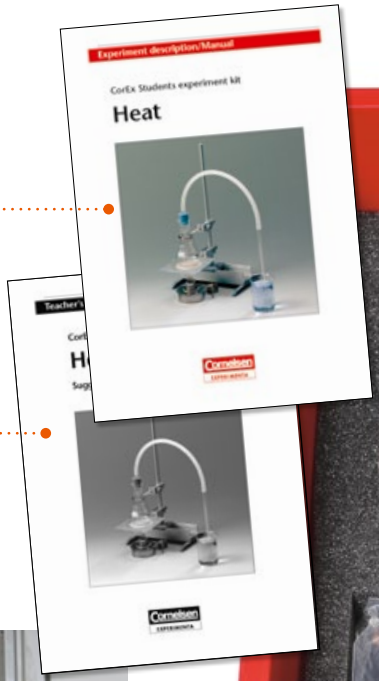
▶ This kit covers the following basic laws of physics:

- Boyle's law
- Gay-Lussac's law
- Fourier's law
- Stefan-Boltzmann law

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions



48500 Materials for 1 work group

All stand equipment included!

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

Age 13 – 18

Students kit Energy conversion

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 en-ergy, 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.

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 71)

Additional meter required, e.g.:

54985 Digital Multimeter with Bargraph (see page 73)

▶ This kit covers the following basic laws of physics:

Mayer's law of conservation of energy

Clausius' 2nd law of thermodynamics

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

48550 Materials for 1 work group

Renewable Energies

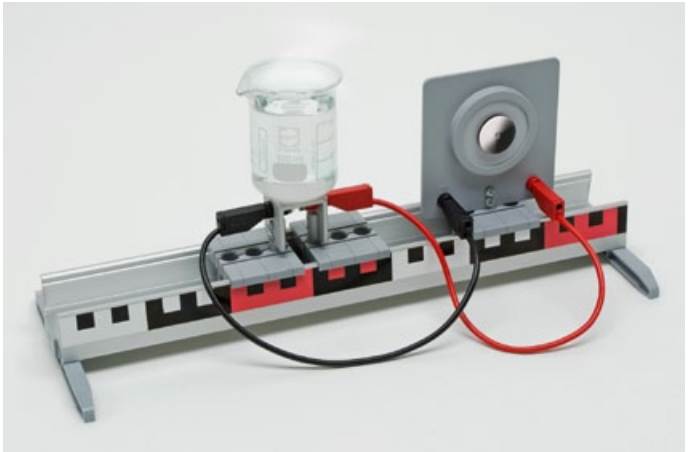
All stand equipment included!

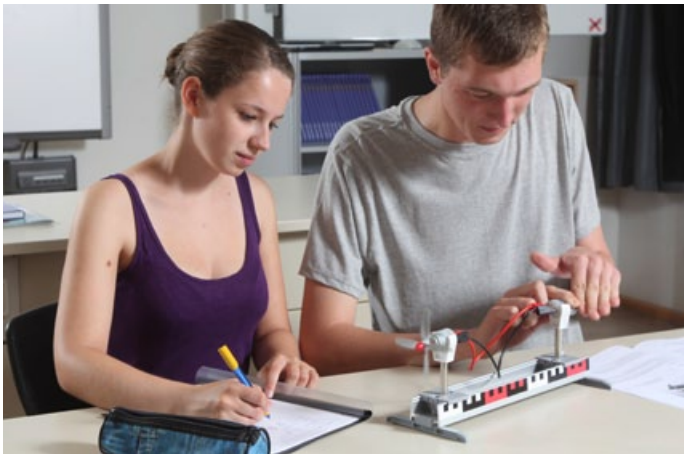
Detailed instructions for 26 experiments:

Experiments with conversion of energy:

- mechanical energy ↔ electrical energy
- electrical energy ↔ mechanical energy
- mechanical energy ↔ thermal energy
- thermal energy ↔ electrical energy
- light energy → electrical energy
- light energy → mechanical energy
- chemical energy ↔ electrical energy
- chemical energy → mechanical energy
- electrical energy ↔ flow energy

- Bernoulli-Effect
- Stages of energy conversion
- Measurement of thermal conduction through conversion
- Measurement of thermal radiation through conversion
- Direct and indirect utilisation of solar energy
- Solar module as energy converter
- Dependence of converted solar energy on the illumination
- Loading of a solar module
- Cooling with sunlight
- Storage of electrical energy through conversion into chemical energy
- Energy conversion and storage





Age 13 – 18

Students kit 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.

Additional meter required, e.g.:

54870	Analogue Multimeter (see page 72)
	or
54985	Digital Multimeter with Bargraph (see page 73)

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

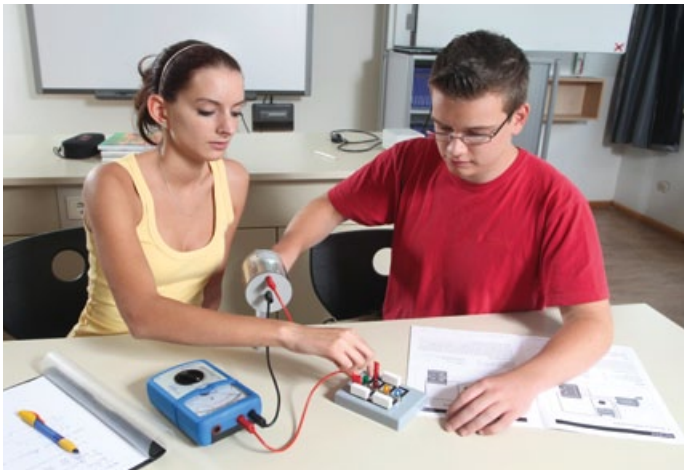
54853	Materials for 1 work group

Hand driven generator as power supply

- to support alive teaching
- to help forming concepts in electricity

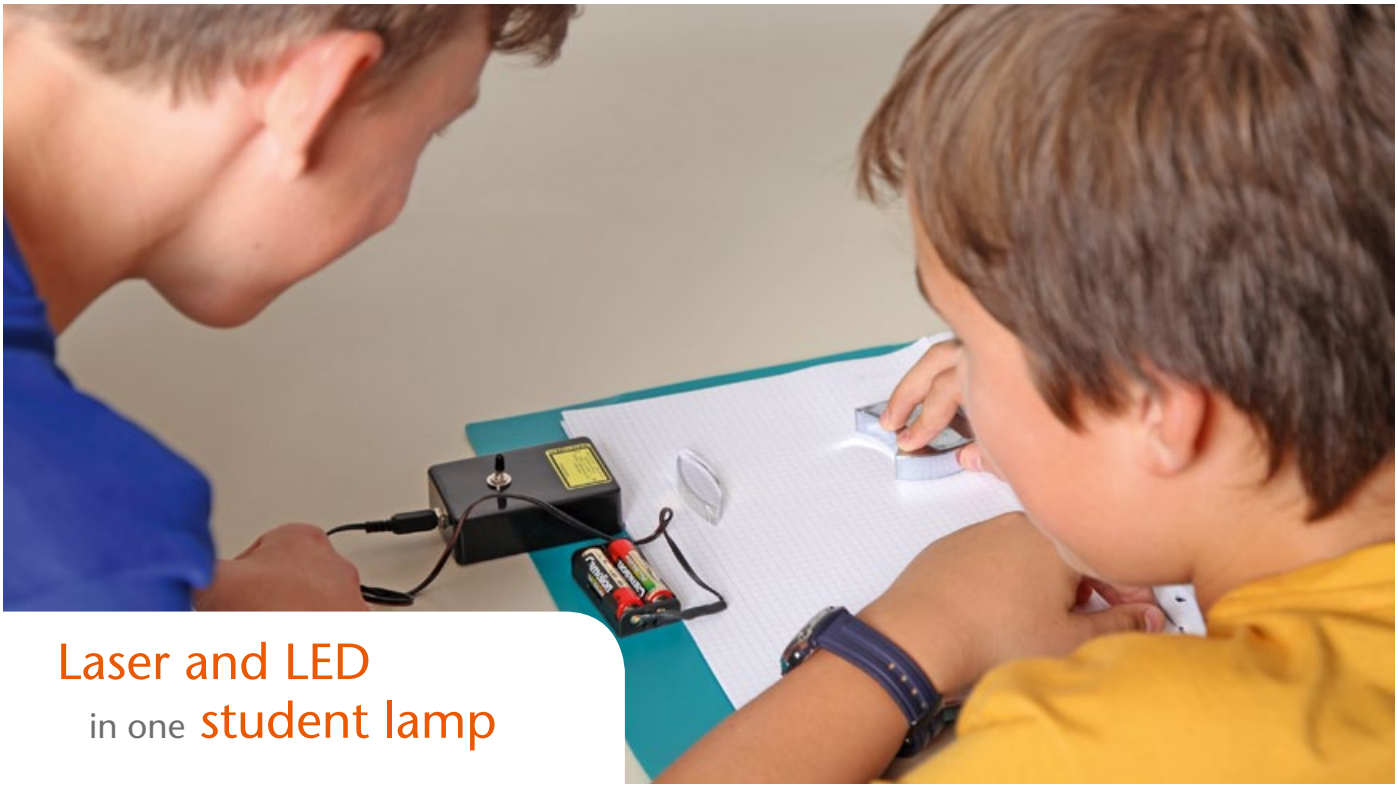
Detailed instructions for 8 experiments:

- 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



Age 13 – 18

Students kit Optics 2.0



Laser and LED in one student lamp

Included in delivery:

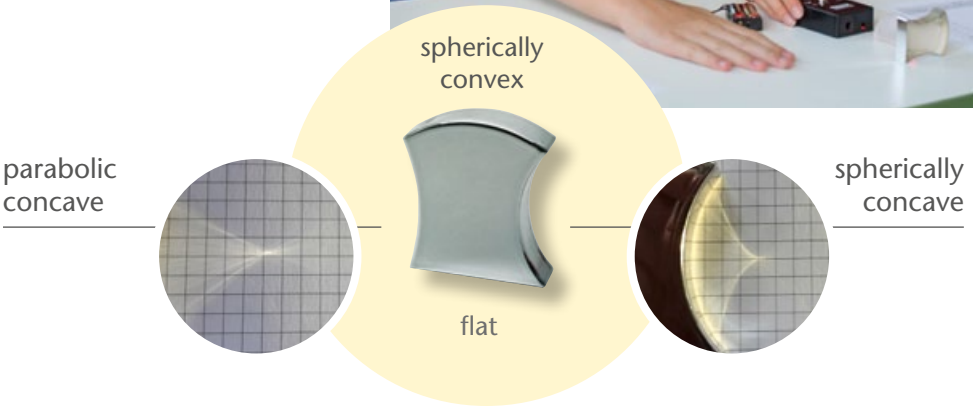
Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

47530	Materials for 1 work group

Universal mirror

- Can produce caustic and focus



▶ This kit covers the following basic laws of physics:

- Newton's corpuscular theory of light
- Galileo's telescope
- Kepler's telescope
- Huygens–Fresnel principle
- Fermat's principle
- Snell's law

Experiments

- Light and shadow
- Law of reflection
- Curved mirrors
- Snell's law of refraction
- Fermat's principle
- Refraction and total internal reflection in water
- Refraction
- Paths of light through lenses
- Focal point of a converging lens
- Formation of images by converging lenses
- Lens equation
- Light and colour
- Optical instruments: Terrestrial telescopes, Astronomical telescopes, Projectors, Optical microscopes

Possibility to tie in with mathematics

$\overline{x}$		
Statistics	Angular function	Proportional correlation

LED that generates less heat

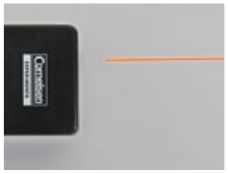
- Very bright, perfect for projections

Student lamp Laser/LED

Laser class 1 **safe for students**
(Certificate available on request)

- Presentation of peripheral rays
- Examining interference and diffraction at different grids
- Discovering polarization with monochromatic light
- Following beam paths directly with the laser

Quick change to optics on a worksheet by switching from LED to Laser

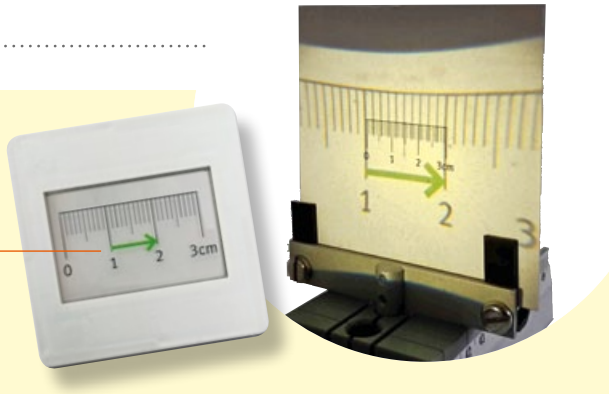


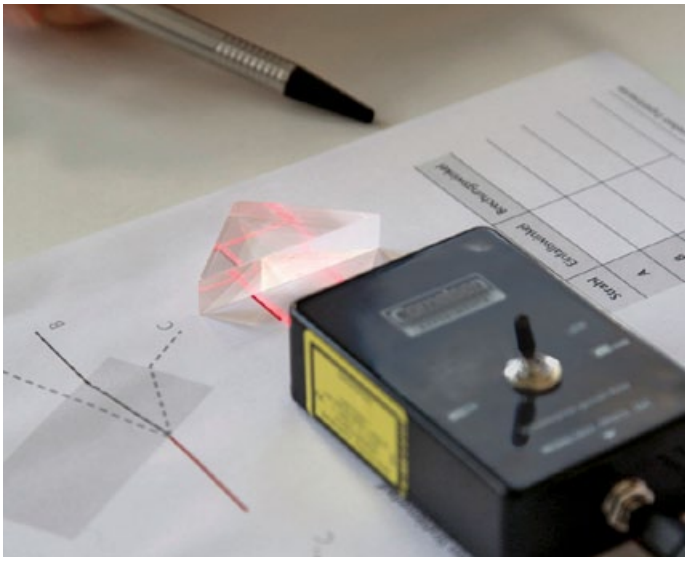
Students kit **Optics 2.0**

Slide *scale* – direct obvservation

and easy determining of the magnifaction

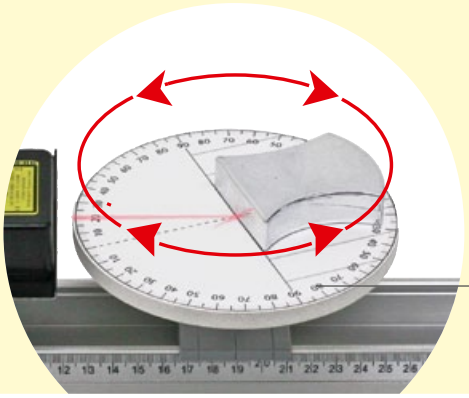
with arrow





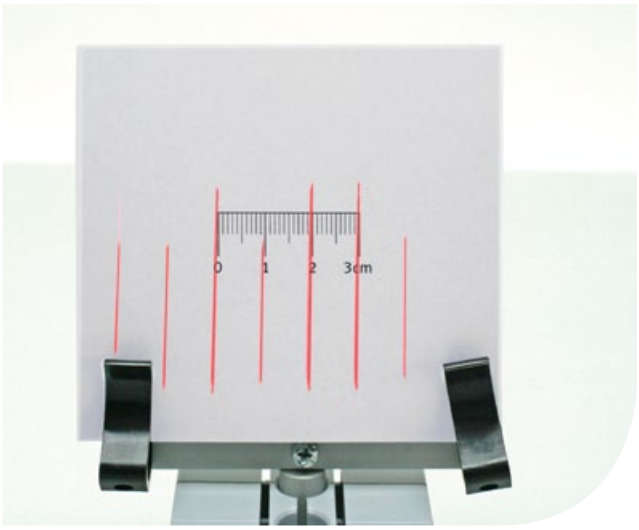
Rotating measuring table

- With angle scale for measuring angle of incidence

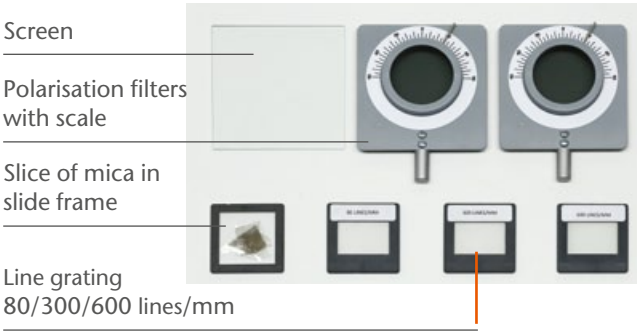


Positioning line and perpendicular to optimize optical paths

Optics 2.0 Additional kit "Wave optics"



- The additional kit contains materials and devices for further seven basic experiments
- The parts of the additional kit can be stored in the box of Optics 2.0.



47540

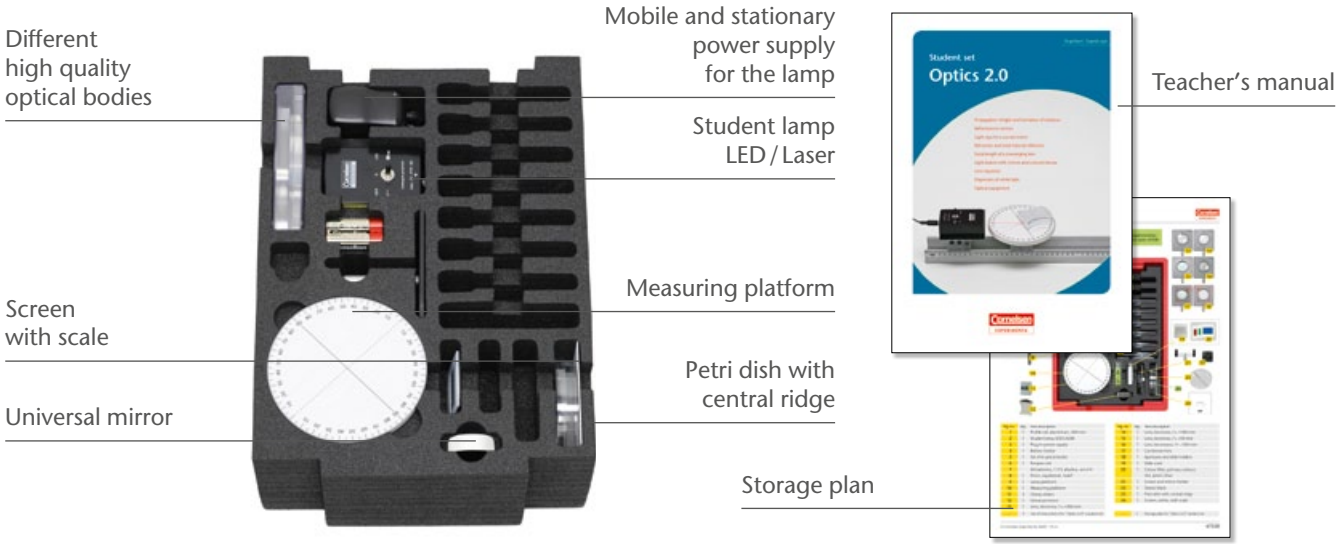
Optics 2.0 Upgrade

Upgrade

You are already working with our **students kit *optics 1*** and want to use the possibilities of the new ***kit optics 2.0***? No problem!

With the upgrade *optics 2.0* you receive all new materials like the student lamp LED/Laser or the universal mirror and the teacher's manual *optics 2.0*. Just remove the missing items from your students kit *optics 1* and put them in the compartments provided in the upgrade.

Included in delivery:



47531	Upgrade Students kit *Optics 2.0*	Materials for 1 work group

Age 13 – 18

Class set Optics 2.0

6 groups of students can experiment at the same time

Included in delivery:

All experiments practicable on worksheets

Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

47545	Materials for 6 work groups

Laser and LED
in one **student lamp**

see page 19

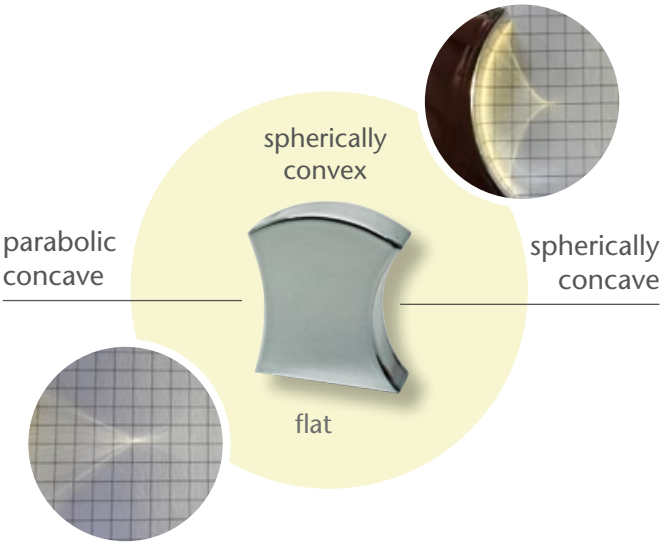
Experiments

- Light and shadow
- Law of reflection
- Curved mirrors
- Snell's law of refraction
- Fermat's principle
- Exercises: Refraction
- Paths of light through lenses
- Focal point of a converging lens
- Light and colour

Possibility to tie in with mathematics		
$\overline{X}$	∿	
Statistics	Angular function	Proportional correlation

Universal mirror

- Can produce caustic and focus



Age 13 – 18

Students kit **Electricity** *complete*

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

To meet the demands of and applications in different types of schools the kit consists of three modules.

The modules you will find on the following pages.

Experiments on current flow and on the electrical basic circuits

- Experiments on the effects of electric current and examinations of selected engineering usage
- The components of the basic unit are stored in a plastic tray.

Electricity – upgrade induction and alternating current

- Continuing experiments on electromagnetism and on electromagnetic induction

The supplement can be stored in the tray of the basic unit electricity 1.

Electricity – upgrade electrostatics, magnetism and electrochemistry

- Examinations to demonstrate the properties of permanent magnets
- Experiments to demonstrate electrical charge and how charges behave
- Experiments to demonstrate the basics of electrochemistry

The components of this supplement are stored in a separate tray.

Included in delivery 23200
Kit *"Electricity"* including circuit board

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

▶ This kit covers the following basic laws of physics:

- Coulomb's law
- Faraday's law of induction
- Ohm's law
- Oersted's law
- Galvanic cell
- Lenz´s law

23200 **Kit *Electricity* including circuit board** Materials for 1 work group

Possibility to tie in with mathematics

$\overline{X}$

Statistics

Experiments 23200:

Electricity – Basics (DC)
- Electrical circuit
- Conductor/ non-conductor
- Conduction in liquids
- Voltage, Amperage
- Electrical resistance
- Ohm's law
- Series connecton
- Parrallel connection
- Dropping resistor
- Voltage divider
- Specific resistance
- Resistance and temperature
- Bridge circuit
- Measuring resistance
- Wattage
- Electrical work

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

Electromagnetism
- Magnetic field/Oerstedt's experiment
- Electromagnet
- Relay
- Automatic interrupter
- Electric motor

Induction and alternating current (AC)
- Induction
- Induction with DC
- Self-induction
- Lenz's law
- Generator
- Alternator
- AC motor
- Transformer
- Impedance of a coil
- Capacitor
- Impedance of a capacitor

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

Magnetism
- Magnetic Action
- Magnetic field
- Forces acting between magnets
- Magnetic induction
- Geomagnetism/ compass

Electrochemistry
- Electrolysis
- Galvanisation
- Electrochemical element
- Electrochemical potential

Additional power supply required, e.g.:

68533	Power supply unit 6 V (see page 71)
	or
55222	Power supply unit, 12 V/3 A (see page 70)

Additional meter required, e.g.:

54985	Digital Multimeter with Bargraph (see page 73)
	or
54892	Mini Digital Multimeter (see page 73)

Age 13 – 18

Students kit **Electricity** *modules*

Experiments 23210:
Kit *Electricity – Basics:*

Electricity – Basics (DC)
- Electrical circuit
- Conductor/non-conductor
- Conduction in liquids
- Voltage, Amperage
- Electrical resistance
- Ohm's law
- Series connecton
- Parrallel connection
- Dropping resistor
- Voltage divider
- Specific resistance
- Resistance and temperature
- Bridge circuit
- Measuring resistance
- Wattage
- Electrical work

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

Electromagnetism
- Magnetic field/Oerstedt's experiment
- Electromagnet
- Relay
- Automatic interrupter
- Electric motor

Included in delivery 23210
Kit *Electricity* – Basics including circuit board

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

Kit *Electricity – Basics* including circuit board

23210

23210 Kit *Electricity – Basics* including circuit board

Additional experiments with 23220
Upgrade Induction and Alternating Current (AC):

Induction and alternating current (AC)
- Induction
- Induction with DC
- Self-induction
- Lenz's law
- Generator
- Alternator
- AC motor
- Transformer
- Impedance of a coil
- Capacitor
- Impedance of a capacitor

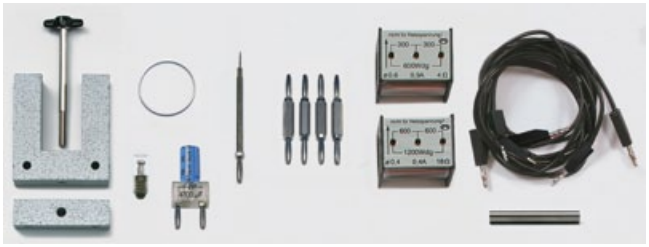
Additional experiments with 23230
Upgrade Electrostatics, Magnetism and Electrochemistry:

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

Magnetism
- Magnetic Action
- Magnetic field
- Forces acting between magnets
- Magnetic induction
- Geomagnetism/compass

Electrochemistry
- Electrolysis
- Galvanisation
- Electrochemical element
- Electrochemical potential

Included in delivery 23220
Kit *Electricity* –
Upgrade *Induction and Alternating Current (AC)*



Kit *Electricity* –
Upgrade Induction and Alternating Current (AC)

23220

The components can be stored in the tray of the kit ***Electricity – basics***.

Included in delivery 23230
Kit *Electricity* –
Upgrade *Electrostatics, Magnetism and Electrochemistry*

Kit *Electricity* –
Upgrade *Electrostatics, Magnetism and Electrochemistry*

23230

23220	**Kit *Electricity* – Upgrade** *Induction and Alternating Current (AC)*
23230	**Kit *Electricity* – Upgrade** *Electrostatics, Magnetism and Electrochemistry*
20402	**Universal circuit board**

Age 13 – 18

Class set Electricity 2.0 *Basic circuits for circuit boards*

6 groups of students
can experiment at the same time

Included in delivery:

Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Worksheets for students
- Complete evaluation of examples

23410	Materials for 6 work groups

Experiments

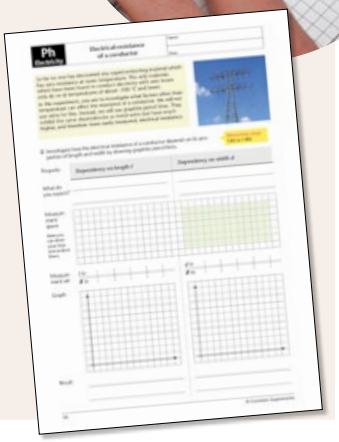
- Electric circuits
- Conductors and insulators
- Series and parallel lamp circuits
- Games with circuits
- Logic circuits
- Practical circuits
- Measurement of electric current
- Measurement of voltage
- Ohm's law
- Electrical resistance of a conductor
- Kirchhoff's laws
- Electrical power

Possibility to tie in with mathematics

$\overline{X}$

Statistics

Proportional correlation



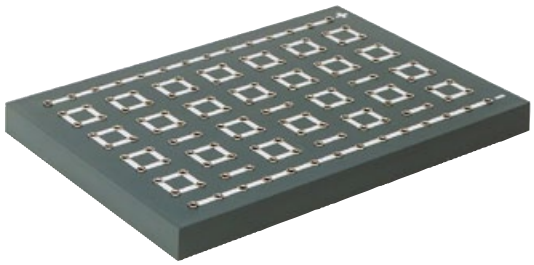
Multimeter not included

Students experiment **Investigation of electrical resistance of a conductor** with the help of graphite pencils

Separate inserts that can be individually removed

Additional circuit board required, e.g.:

20402 Universal circuit board



Additional power supply required, e.g.:

68533 Power supply unit 6 V (see page 71)

or

55222 Power supply unit, 12 V/3 A (see page 70)

Additional meter required, e.g.:

54985 Digital Multimeter with Bargraph (see page 73)

or

54892 Mini Digital Multimeter (see page 73)

Age 13 – 18

Students kit **Electricity** *Basic 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.

Recommended for power supply in place of batteries:

68534 Power supply unit 3 V (see page 71)

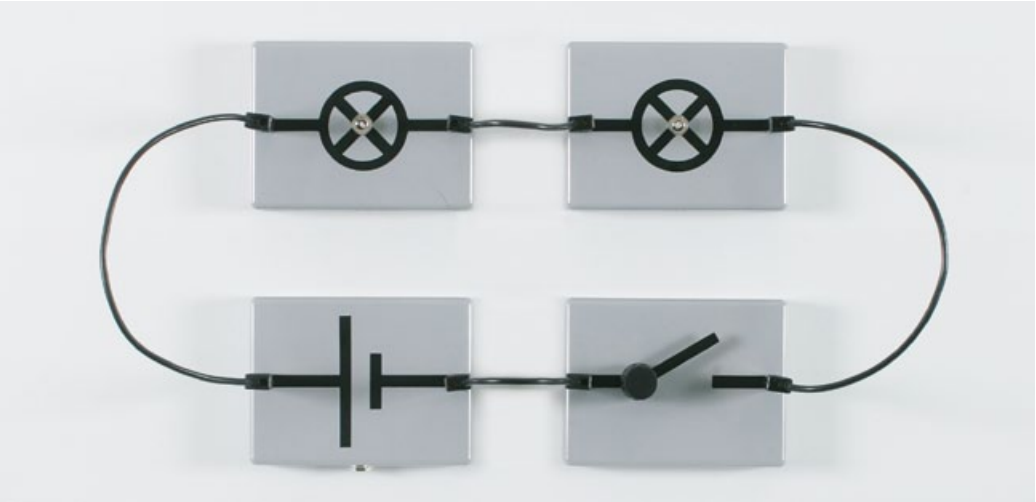
Included in delivery:

Experiment description

53550	Materials for 1 work group

Detailed instructions for 12 experiments:

- Electric circuits
- Conductors and insulators
- Series and parallel lamp circuits
- Games with circuits
- Logic circuits
- Practical circuits
- Measurement of electric current
- Measurement of voltage
- Ohm's law
- Electrical resistance of a conductor
- Kirchhoff's laws
- Electrical power

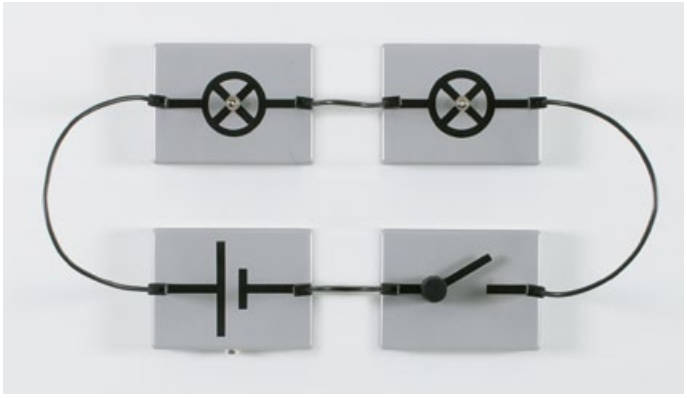


Age 13 – 18

Students kit **Electrical circuits** *for the steel board*

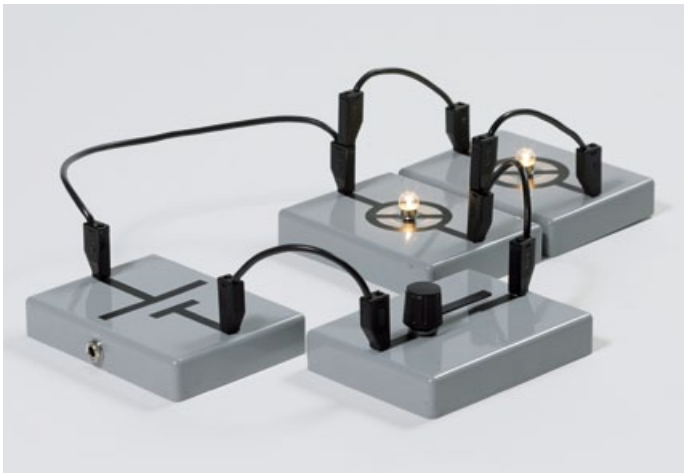
The bases for components are magnetically attachable and the top is printed with the relevant circuit symbol and wiring. They can either be placed horizontally on a bench or attached vertically to a steel board.

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



Recommended for power supply in place of batteries:

68534 Power supply unit 3 V (see page 71)

Additionally required:

41621 Steel board with stand

Included in delivery:

Experiment description

53540 Materials for 1 work group or demonstration

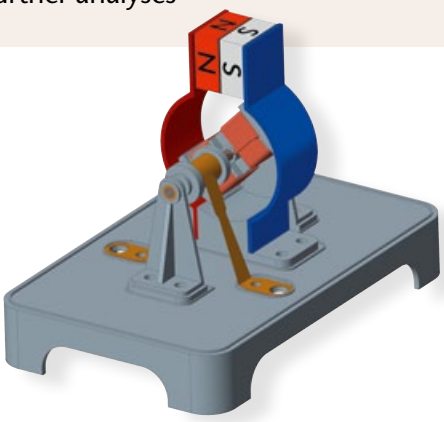
Age 13 – 18

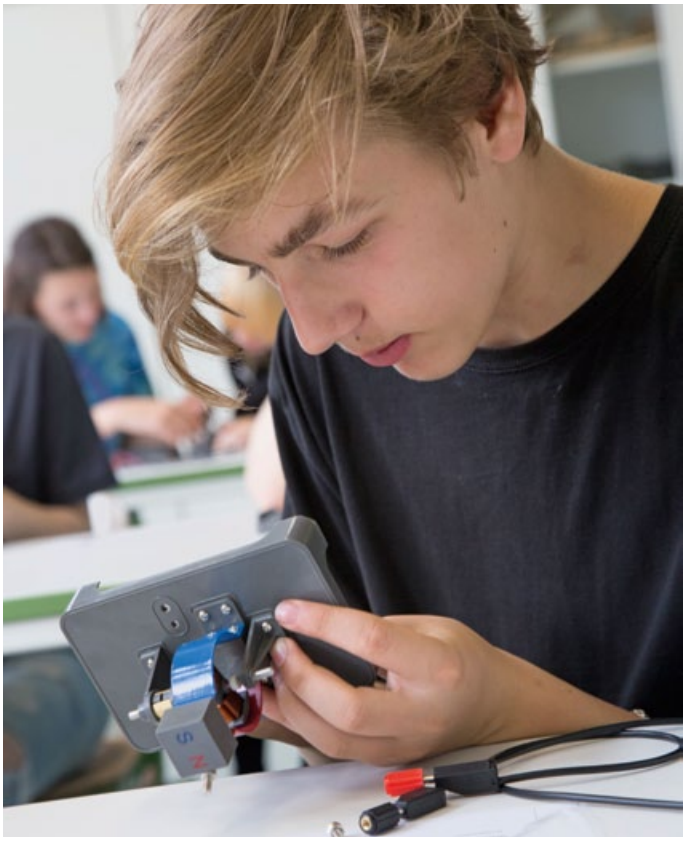
Students kit Electro motor

The electro motor is designed of sturdy material. The commutation of the current is ensured by a commutator (not stripped enameled copper wire). Students can themselves assemble and dissemble the motor.

The product includes worksheets with proposed solutions on the topics:

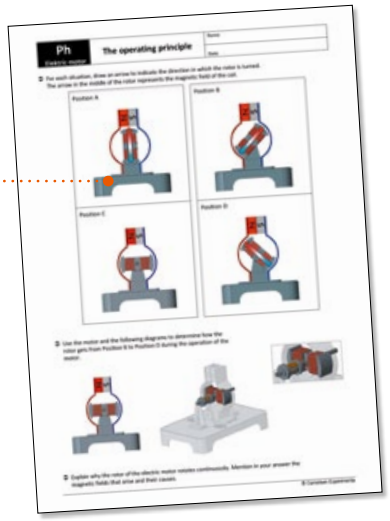
- construction and components
- functioning
- further analyses





Included in delivery:

Student worksheets



54835	Materials for 1 work group

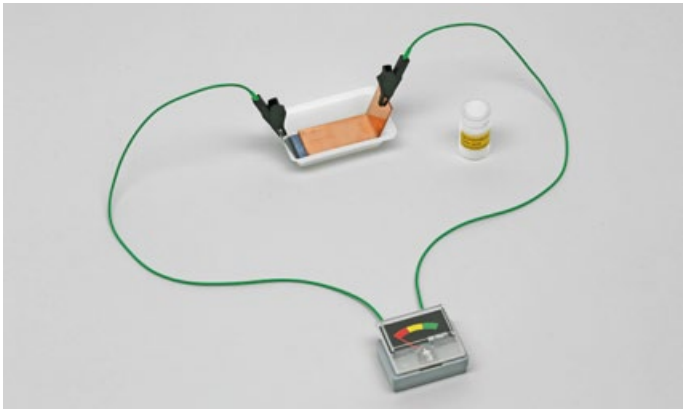
Age 13 – 18

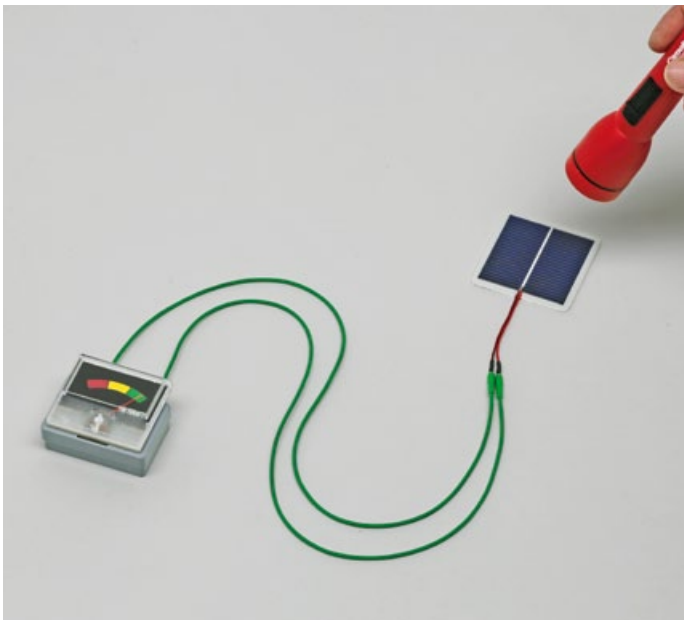
Students kit Electrical energy sources

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 voltage indicator is provided.





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

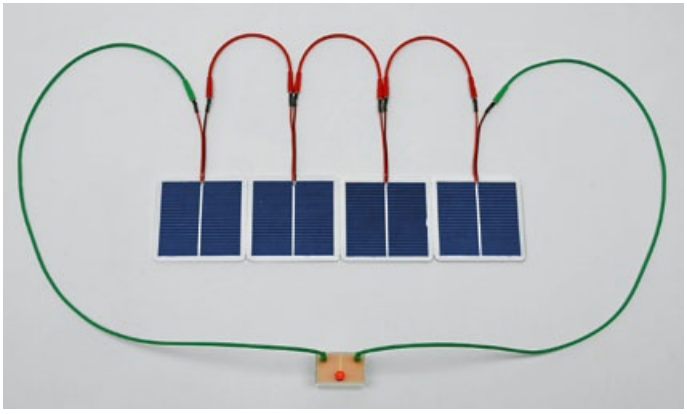
23030 Materials for 1 work group

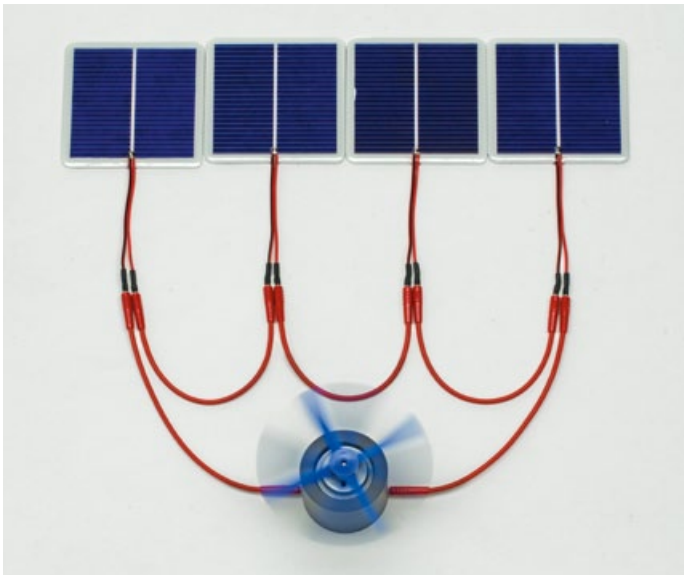
Age 13 – 18

Students kit **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.





The experiments that can be carried out include the following:

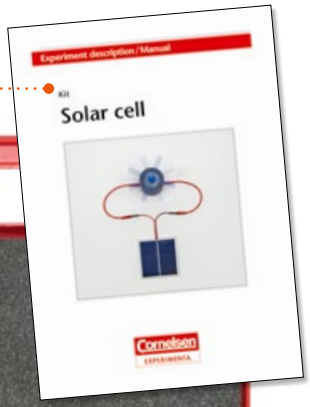
- No-load voltage and short-circuit current
- Series- and parallel connection
- Power characteristic line of a solar generator
- Influence of illuminance and of the illumination angle
- Conversion of solar energy to mechanical energy and to luminous energy
- Solar production of hydrogen

Additionally required:

47100	Reflector lamp
15670	Tripod stand plate with socket and screw

Included in delivery:

Experiment description



23060	Materials for 1 work group

Kits suitable for Cambridge Examinations

The set consists of 6 boxes. The kits include materials required for IGCSE-Examination 2019 – 2021 and are suitable for **practicals** and **revision.**

The products have been developed to support schools and students in practising for and finally taking **Cambridge International Examinations in Physics, Chemistry and Biology**.

Each box is offering all materials needed to prepare for one of the topics.

Manuals are not needed.
The experiments and the execution are part of IGCSE curriculum.

All kits are delivered in a cardboard box

Cambridge 9625099 *Electricity:*

- batteries (6)
- mini digital multimeter (2)
- battery cell holder for 4 cells
- battery cells, 9 V (2)
- lever switches (2)
- switch contacts (2)
- bridges (2)
- bulbs E10 / 20 V (3)
- bulb holders E10 (3)
- plug board with battery holder
- crocodile clips (2)
- plug leads, red (3)
- plug leads, black (3)
- iron wire bare, 100 m
- iron wire bare, 50 m
- copper wire bare, 100 m
- plug-in element base

Cambridge 9625099 – Electricity

Cambridge 9630099 – Mechanics

Cambridge 9630099 *Mechanics:*

- weight holder
- slotted masses, 10 g, red (2)
- slotted masses, 10 g, green (2)
- slotted masses, 50 g, red (3)
- slotted masses, 50 g, green (2)
- spring 200 mm / 2.5 N
- rail, 180 mm, with feet
- stand rod
- clamp with hook
- clamping tube
- pendulum ball, wood
- pendulum ball, steel,
- dynamometer, 200 mN
- dynamometer, 5 N
- light plasticine
- set of 4 supporting wooden blocks

9610099	**Cambridge Examinations *Measurement***
9615099	**Cambridge Examinations *Laboratory material***
9620099	**Cambridge Examinations *Glass ware***

Cambridge 9635099 *Optics*

- lens without rod
- set of ray optics models (6 pcs.)
- prism, equilateral 25 x 25 mm, 3 x 60°
- needles to mark ray tracks
- ray track plate, cork
- mirror, plane
- cross base

Cambridge 9635099 – Optics

Cambridge 9610099 *Measurement:*

- ruler
- tape rule
- probe thermometer, digital
- stopwatch

Cambridge 9610099 – Measurement

Cambridge 9615099 *Laboratory material:*

- dissecting needle
- microtome
- knife, stainless
- scissors, stainless
- foceps, tapered
- permanent marker
- beaker, squat, 100 ml DURAN
- beaker, squat, 250 ml DURAN
- beaker, squat, 250 ml PP
- test tubes, FIOLAX (20)
- boiling tube 150 x 25 mm
- Erlenmeyer flask, 100 ml, DURAN
- syringe
- spatula, micro powder
- spatula, wood (10)
- indicator paper universal ph1–14
- funnel, 75 mm diam.
- filter paper, circulat, (100 pcs.)
- wash bottle, 250 ml, PE
- splashhead
- dropping pipette, glass
- white tile
- plate
- measure, 1000 ml
- triple lens magnifier

Cambridge 9615099 – Laboratory material

Cambridge 9620099 – Glass ware

Cambridge 9620099 *Glass ware:*

- graduated cylinder, glass: 100 ml / 50 ml / 25 ml / 10ml
- glass tube, bent right angled, 50 mm legs
- glass tube, bent right angled, 100 mm legs
- measuring pipette
- pipette filler, bulb type
- petri dish, one way
- stirring rod, glass

9625099	**Cambridge Examinations *Electricity***
9630099	**Cambridge Examinations *Mechanics***
9635099	**Cambridge Examinations *Optics***

Age 13 – 18

Students kit 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

16005	Materials for 1 work group or demonstration

Detailed instructions for 96 experiments for the following topics:

Mechanics of solid bodies
- 17 Experiments

Mechanics of fluids
- 11 Experiments

Mechanics of gases
- 10 Experiments

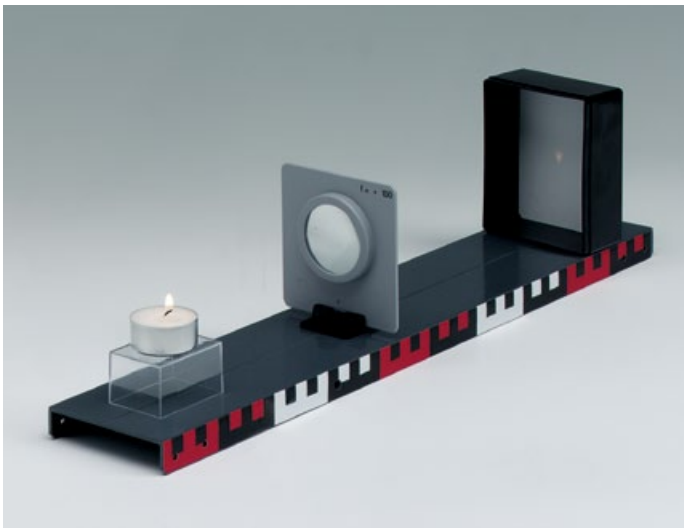
Heat
- 9 Experiments

Sound
- 5 Experiments

Light
- 16 Experiments

Magnetism
- 8 Experiments

Electricity
- 20 Experiments



Demo

Demonstration kit 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.

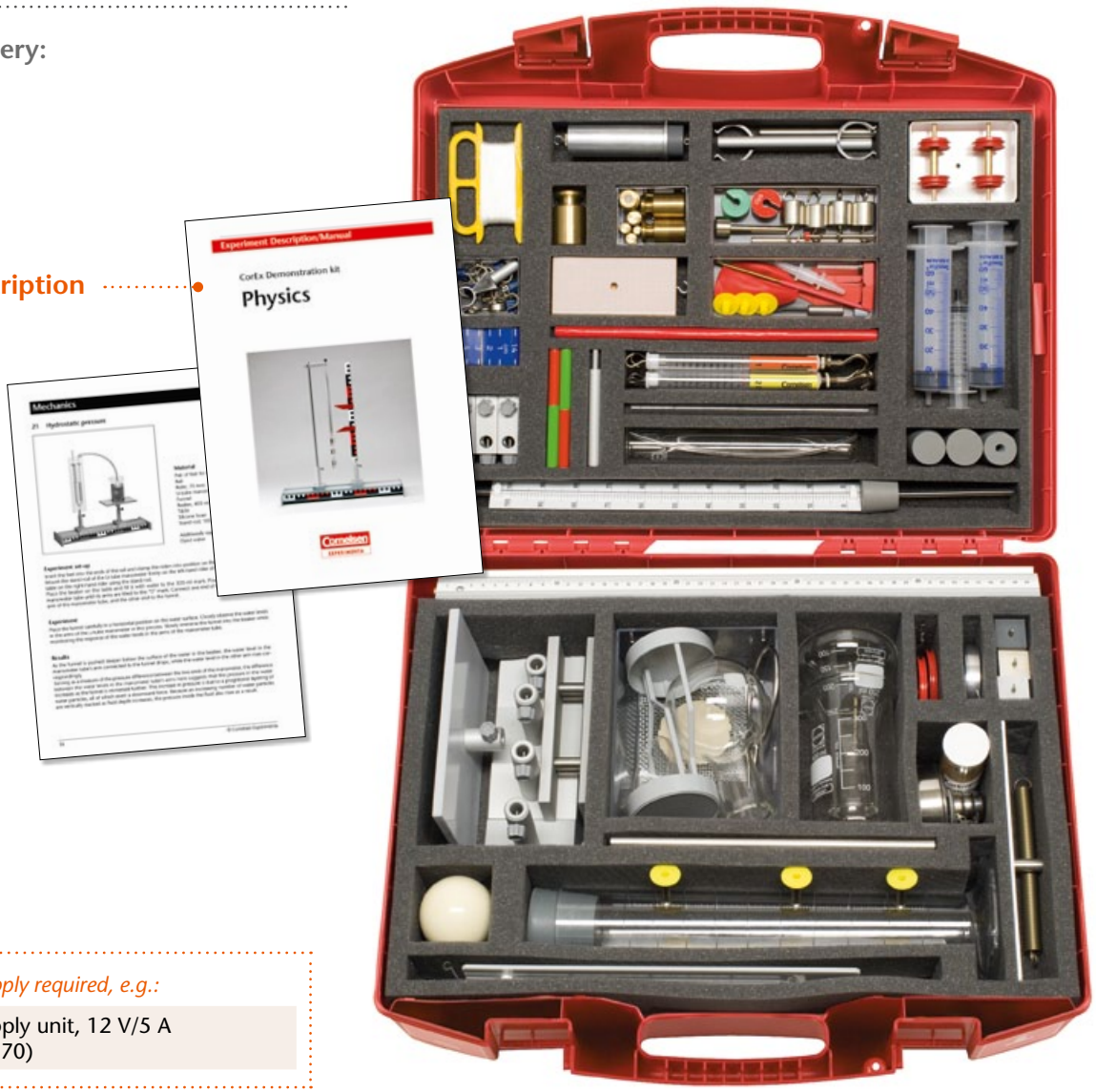
The kit contains all the required materials, which are used to carry out the most important experiments which form the fundamentals of Physics. The stable and universal design of all parts allows a secure experimenting and guarantees a long durability.

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.

Included in delivery:

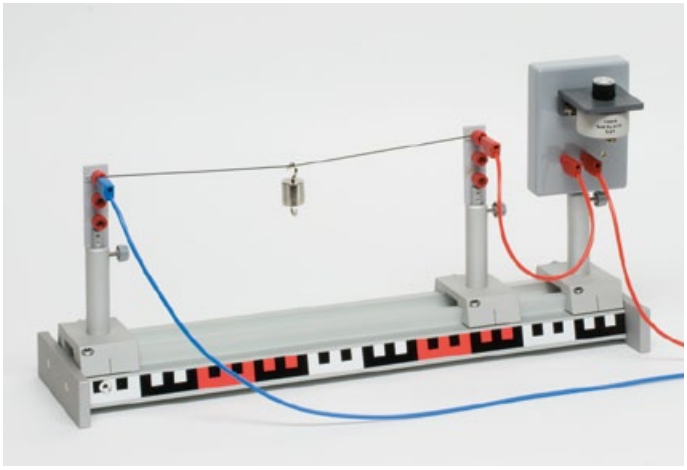
Experiment description

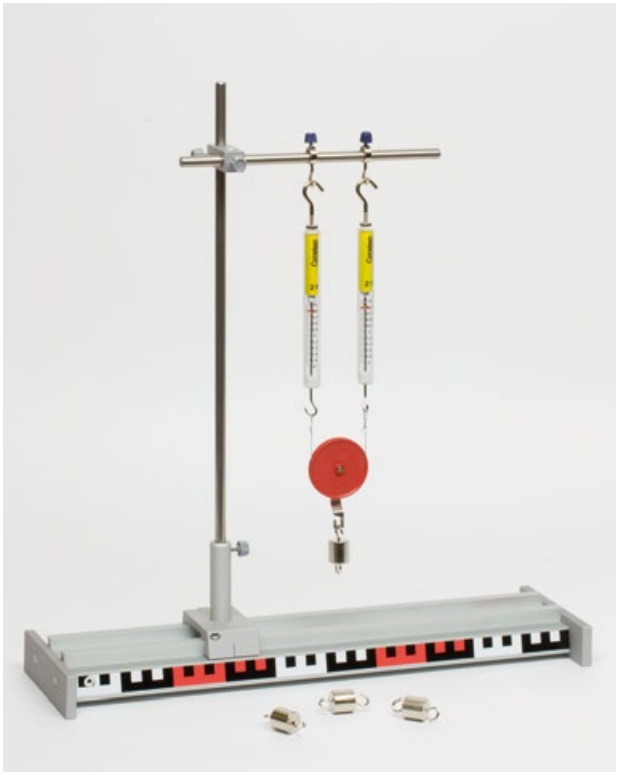


Additional power supply required, e.g.:

55262 Power supply unit, 12 V/5 A
(see page 70)

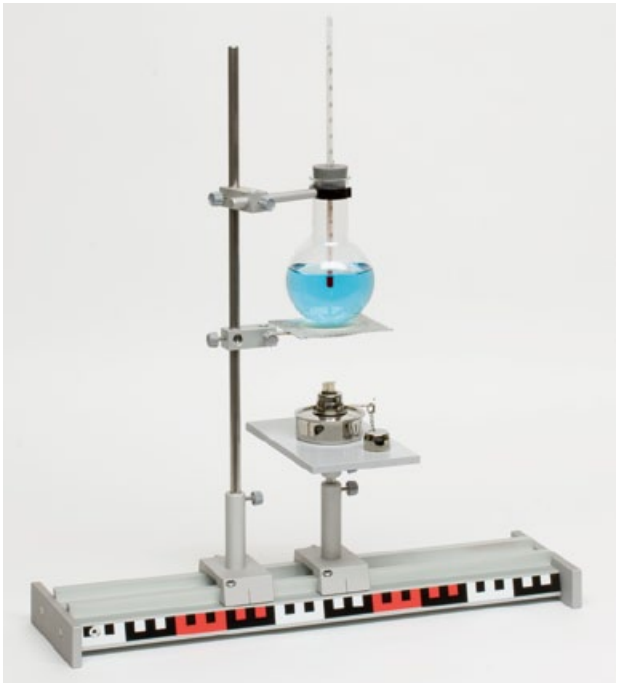
16500 Materials for 1 work group or demonstration





Detailed instructions for 74 experiments:

- Mechanics (31 experiments):
- Heat (7 experiments):
- Optics (8 experiments):
- Electricity (28 experiments):



Demo

Demonstration kit **Mechanics**

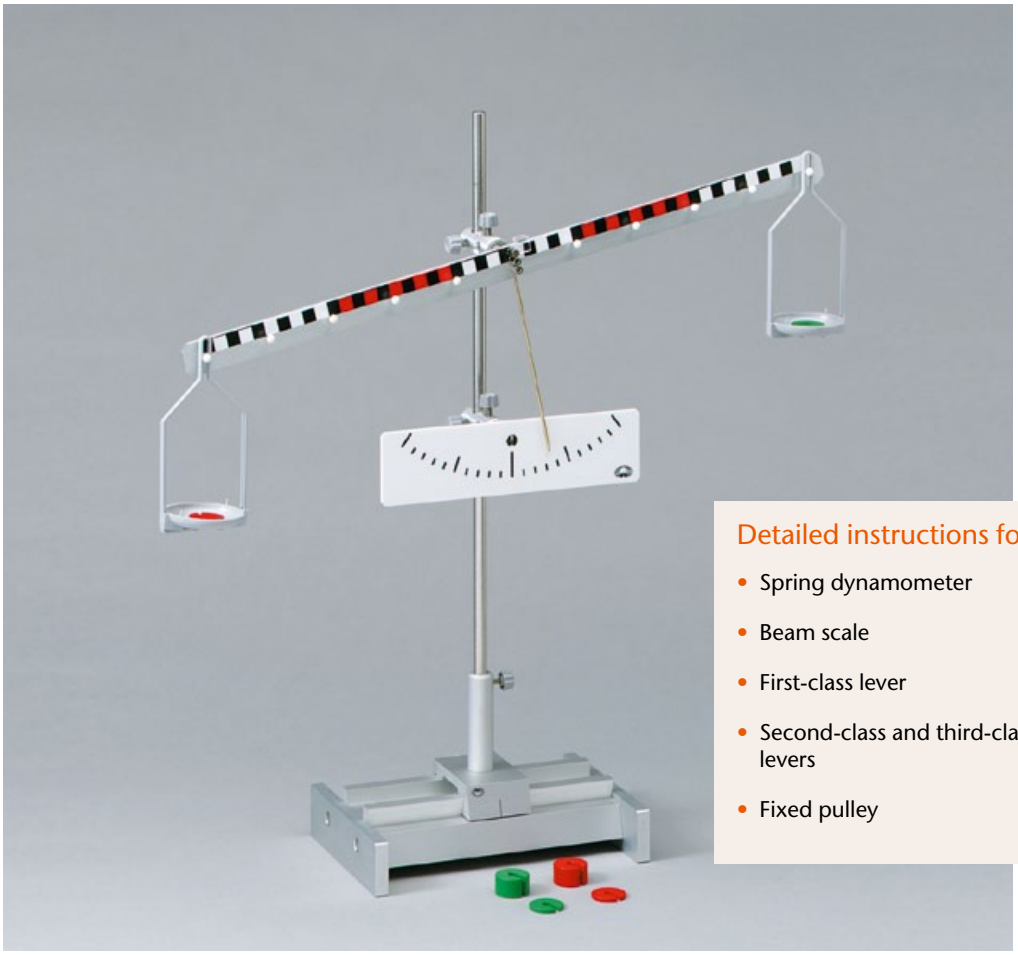
For the demonstration of various laws of mechanics with levers, pulleys, pulley blocks and dynamometers.

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

Included in delivery:

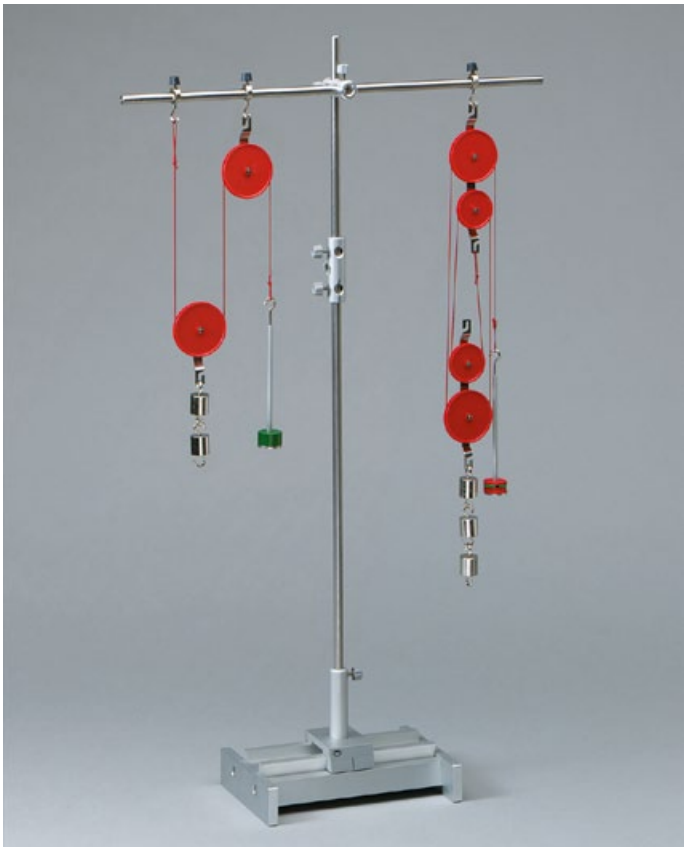
Experiment description

43080	Materials for demonstration



Detailed instructions for 10 experiments:

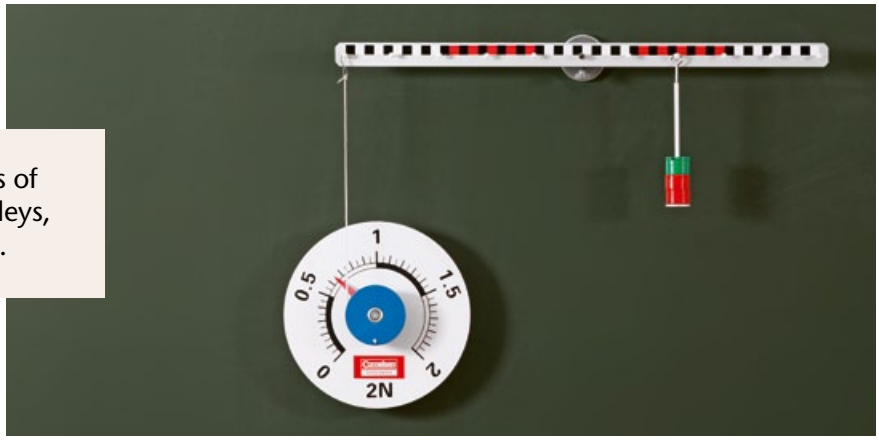
- Spring dynamometer
- Beam scale
- First-class lever
- Second-class and third-class levers
- Fixed pulley
- Moveable pulley
- Fixed and moveable pulley
- Pulley block (2 experiments)
- Multiple diameter pulley



Demo

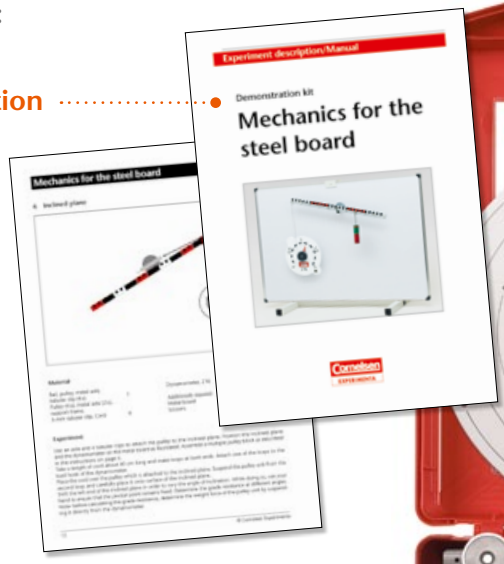
Demonstration kit **Mechanics** *for the steel board*

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



Included in delivery:

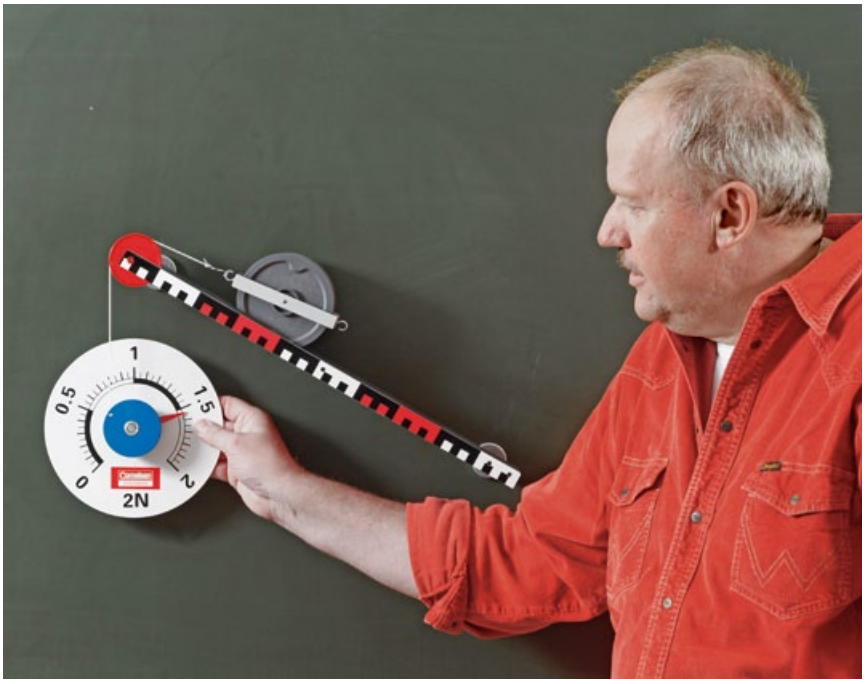
Experiment description



Steel board additionally required, e.g.:

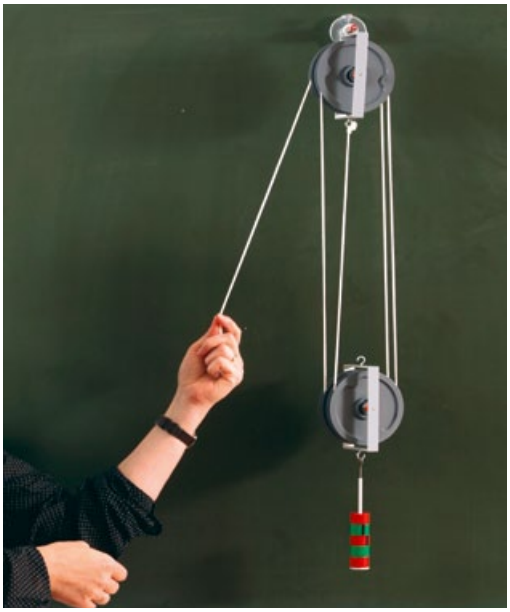
41621 Steel board with stand

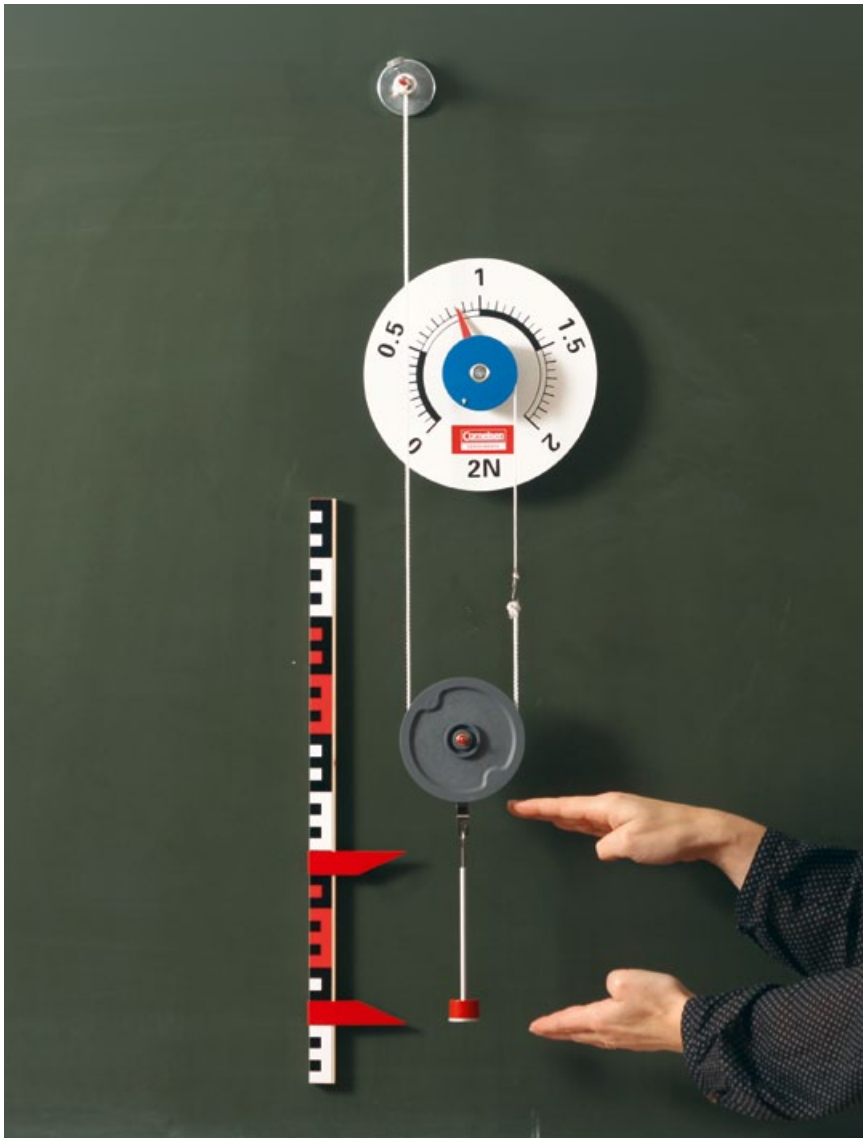
43085 Materials for demonstration



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





Demo

Demonstration kit Dynamics 2.0

The kit contains equipment and resources required for demonstrating the basic laws of motion and oscillation. A digital timer is included to support the efficiency of experimenting.

Measurements can be made 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.

Included in delivery:

Digital timer V-Log

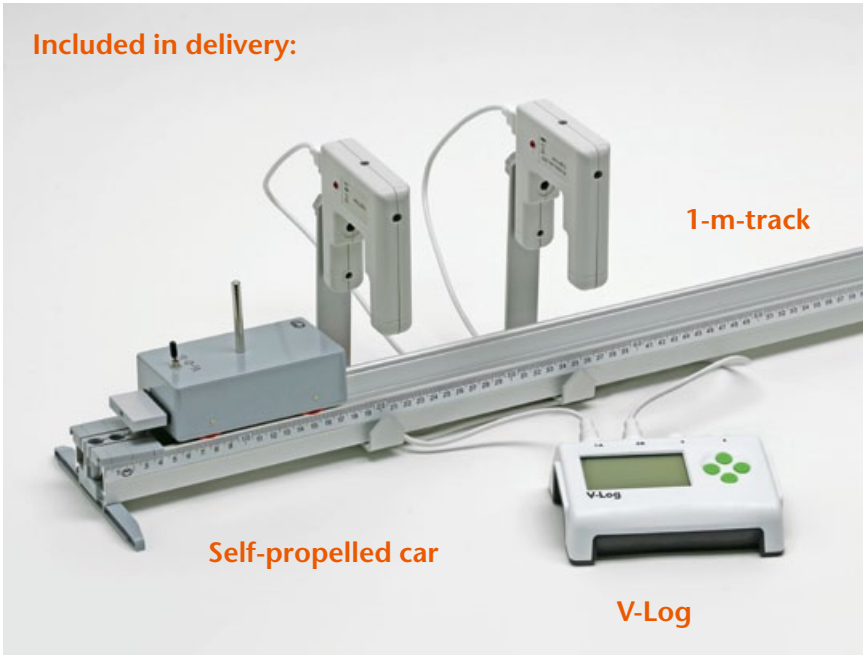
Exact measurement of
- Time
- Speed
- Acceleration
- Period of oscillation

Teacher's manual

- Detailed assembly instructions
- Tips for implementation
- Complete evaluation of examples

4299588 Materials for demonstration

Included in delivery:



Detailed instructions for 15 experiments:

- Uniform motion in a straight line
- Newton's laws (2 experiments)
- Relationship between distance and time for uniformly accelerating motion
- Motion plots
- Free fall:
  – Acceleration due to gravity
  – Height of fall – speed of fall
  – Height of fall – time to fall
- Trajectory of horizontally launched projectiles
- String pendulums
  – Period of oscillation
  – Damping
  – Determination of *g*
- Conservation of momentum
- Elastic and inelastic collisions

Demo

Demonstration kit 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.

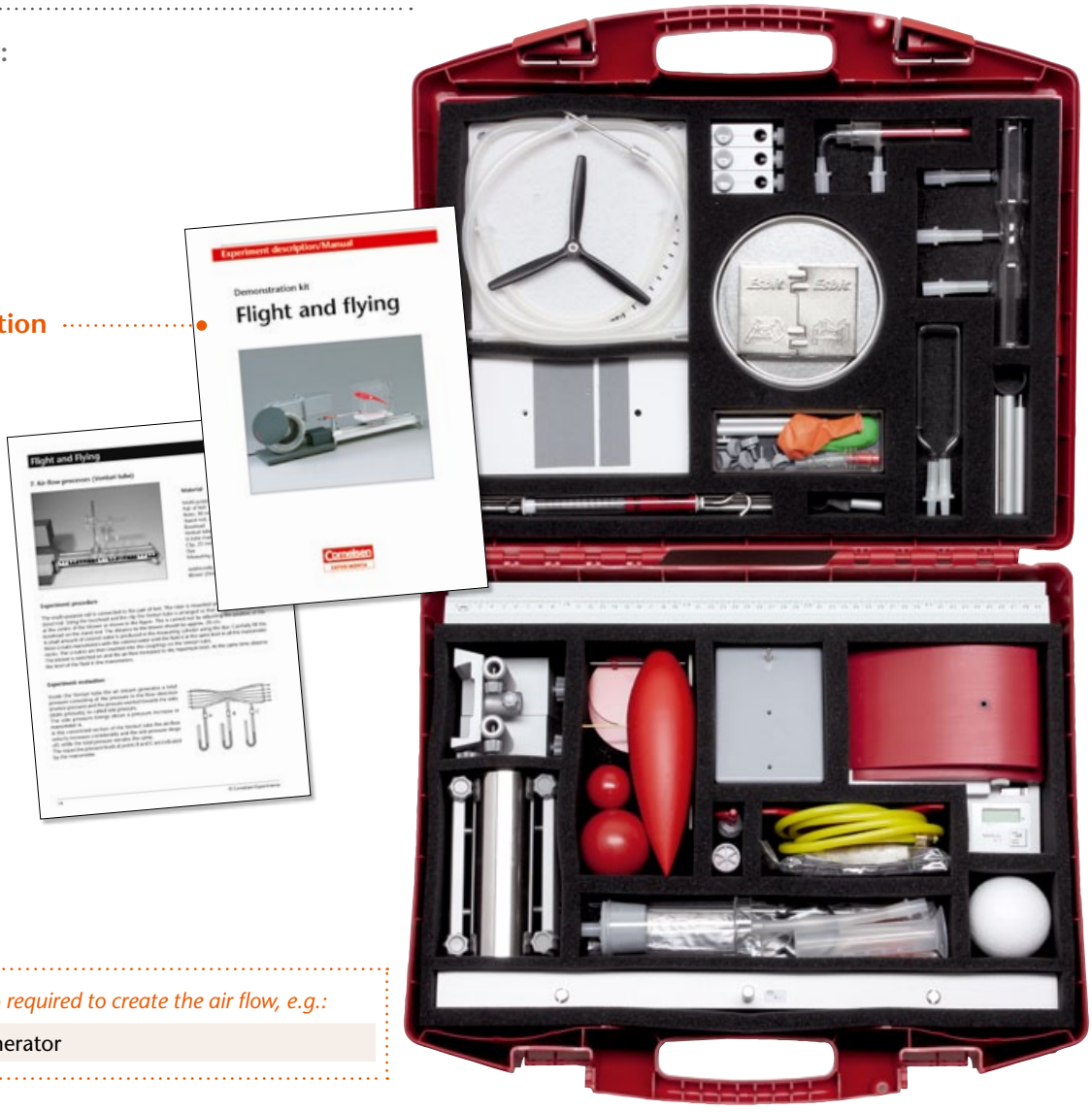
Using a hot-air balloon as an example, it is possible to impressively yet simply explain and illustrate that particular form of flight.

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.

Included in delivery:

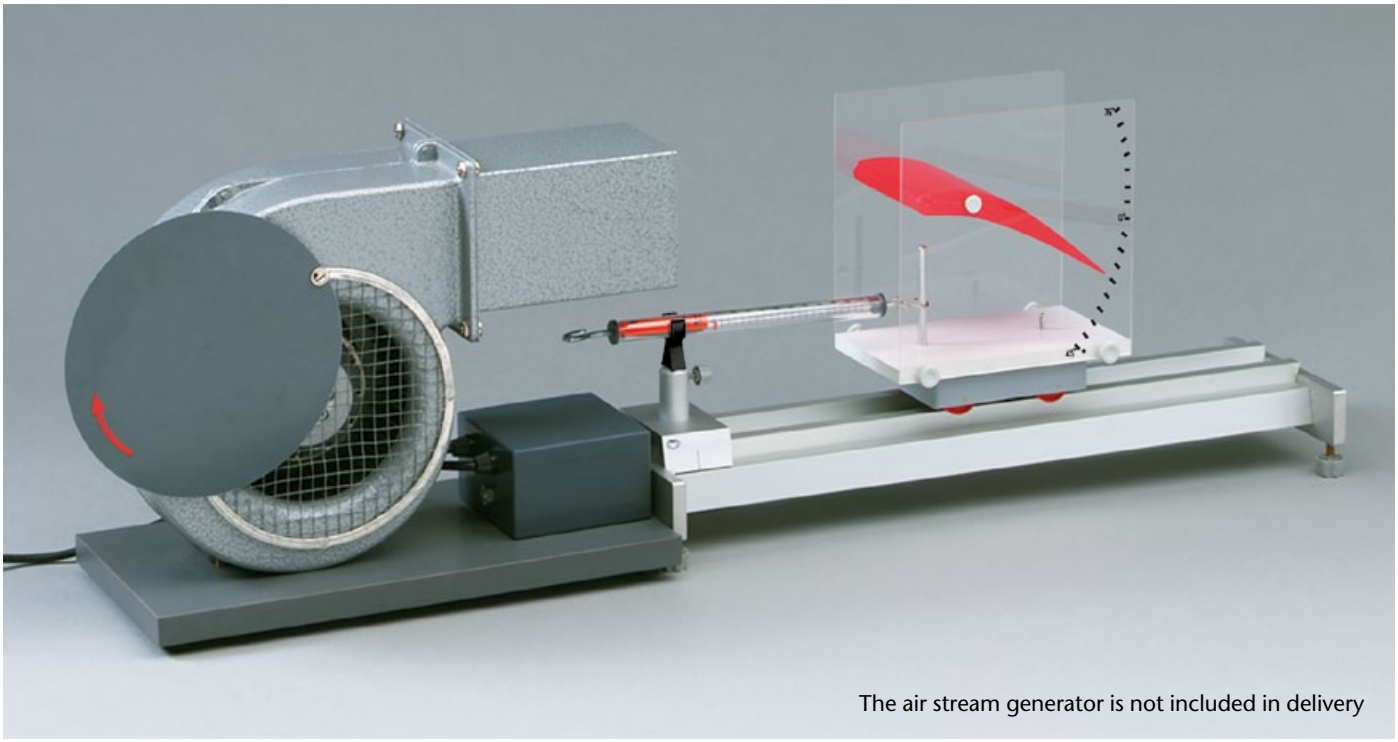
Experiment description



Air stream generator also required to create the air flow, e.g.:

29010 Air stream generator

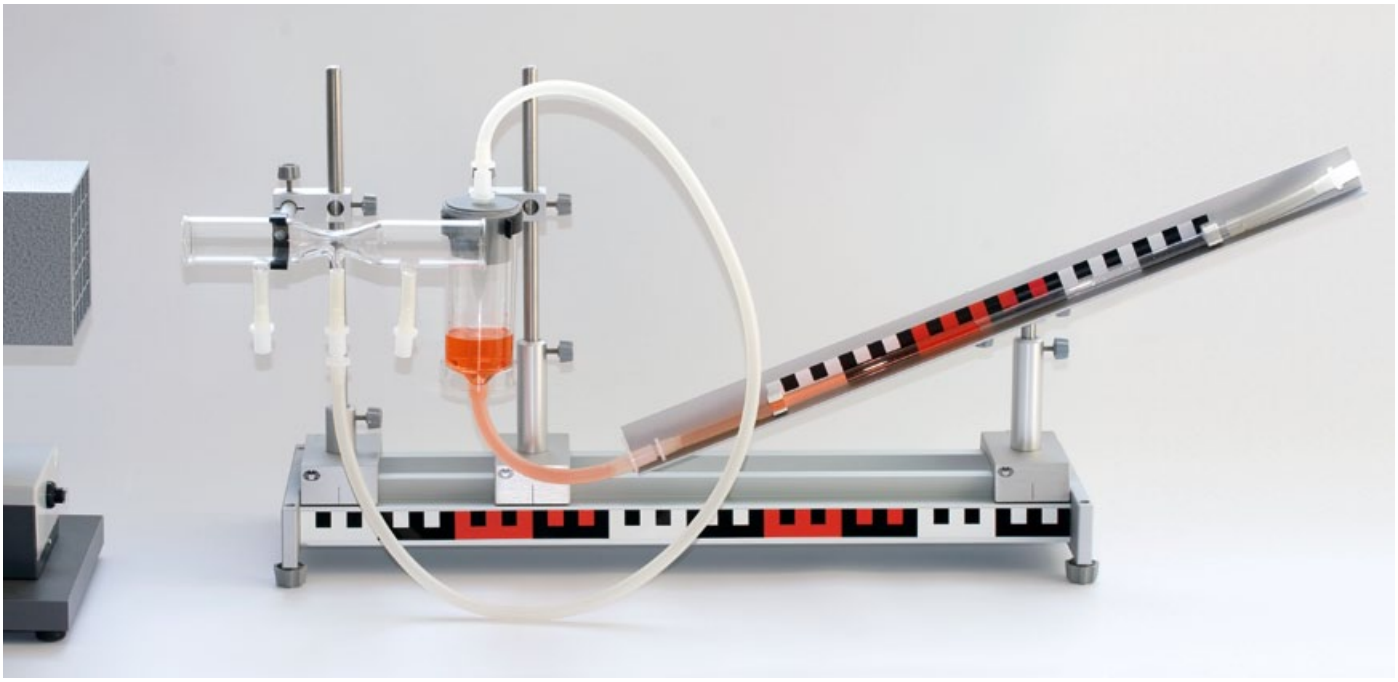
29008 Materials for demonstration



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



Demo

Demonstration kit **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:

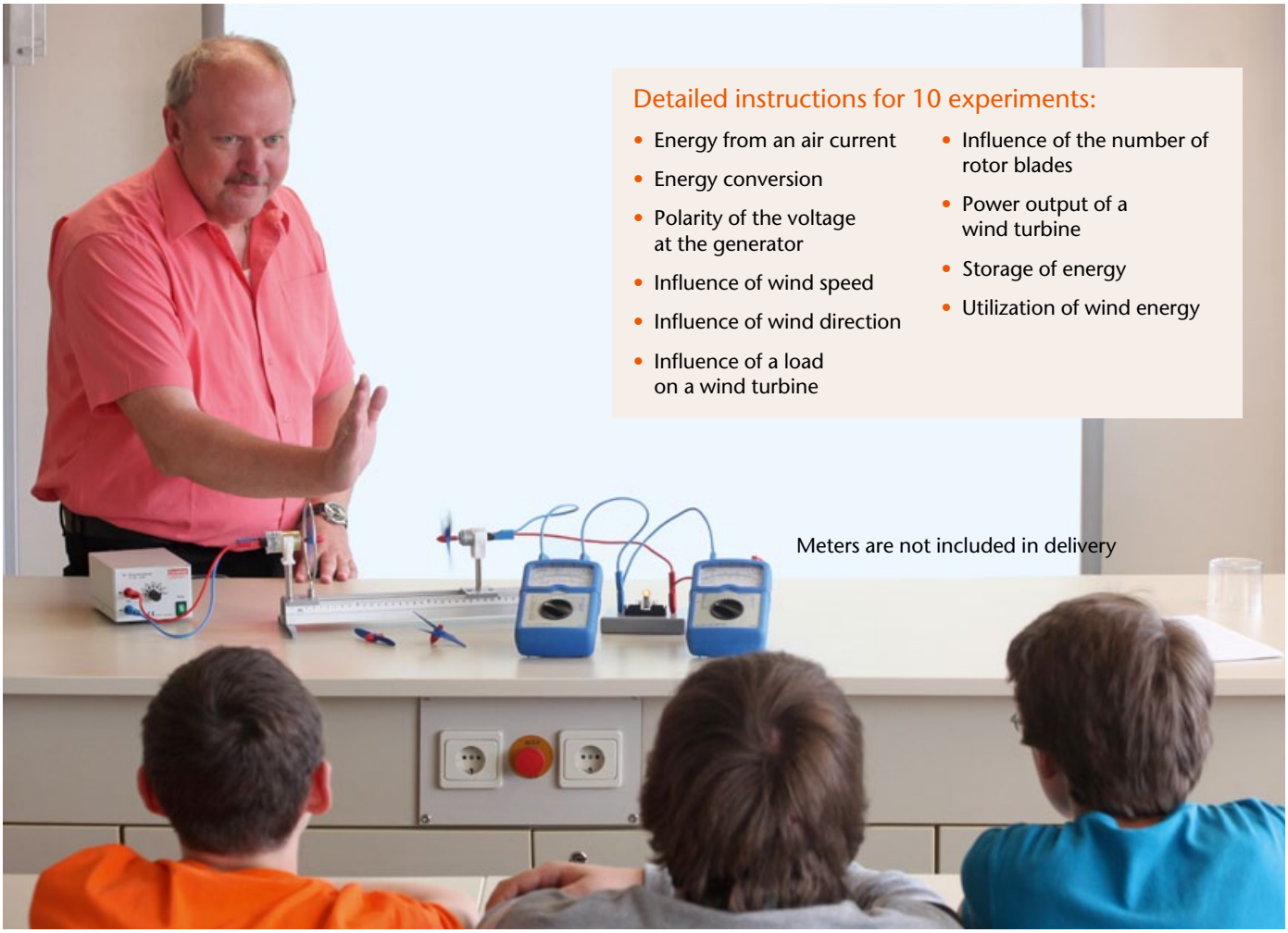
Experiment description

Renewable Energies

Meters additionally required, e.g.:

54985	Digital Multimeter with Bargraph (see page 73)
	or
54870	Analogue Multimeter (see page 72)

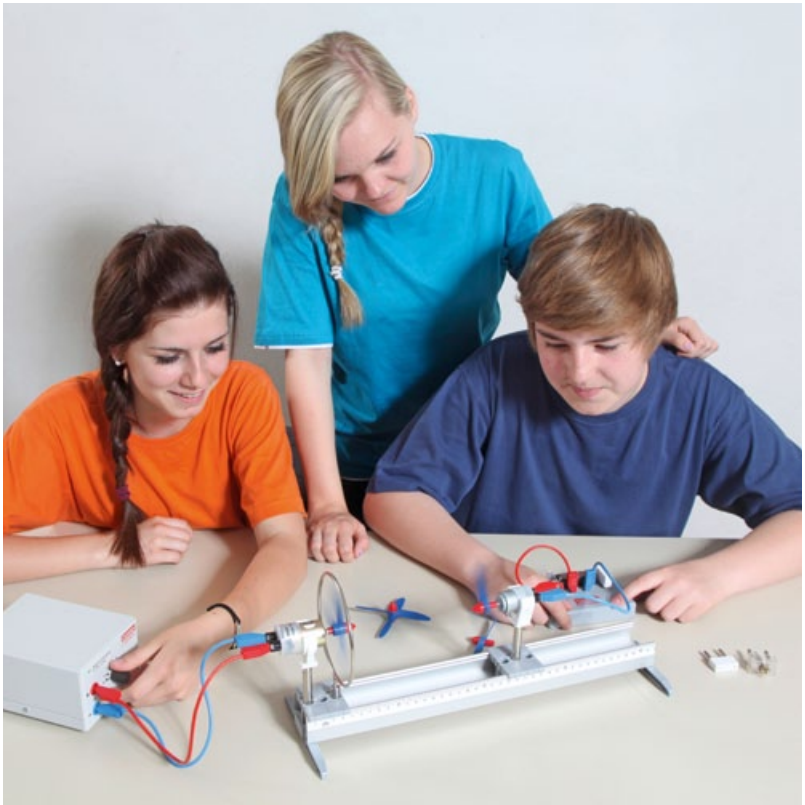
54620	Materials for demonstration

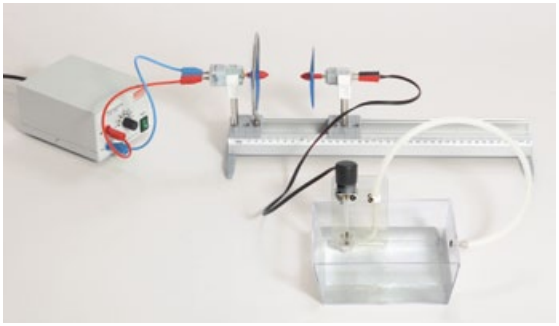


Detailed instructions for 10 experiments:

- 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

Meters are not included in delivery



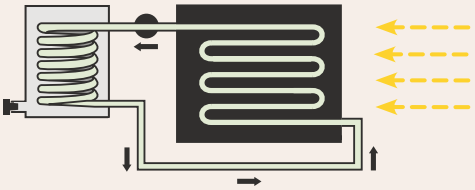


Demo

Demonstration kit 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.

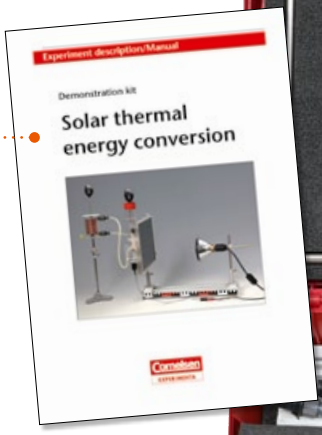


The solar collector ...

- converts energy radiated by the sun into heat using water to convey the energy. After shining the light on the collector for several minutes, it is possible to measure a distinct rise in temperature.
- is used in conjunction with the included reflector projector, which acts as the source of energy.
- has two removable front panes of glass to prevent convection losses.
- has a blackened collector spiral with six loops and two connectors for rapid release hose couplings.
- has interchangeable black and white painted rear covers, expanded polystyrene insulation and a removable plexiglass pane at the rear.

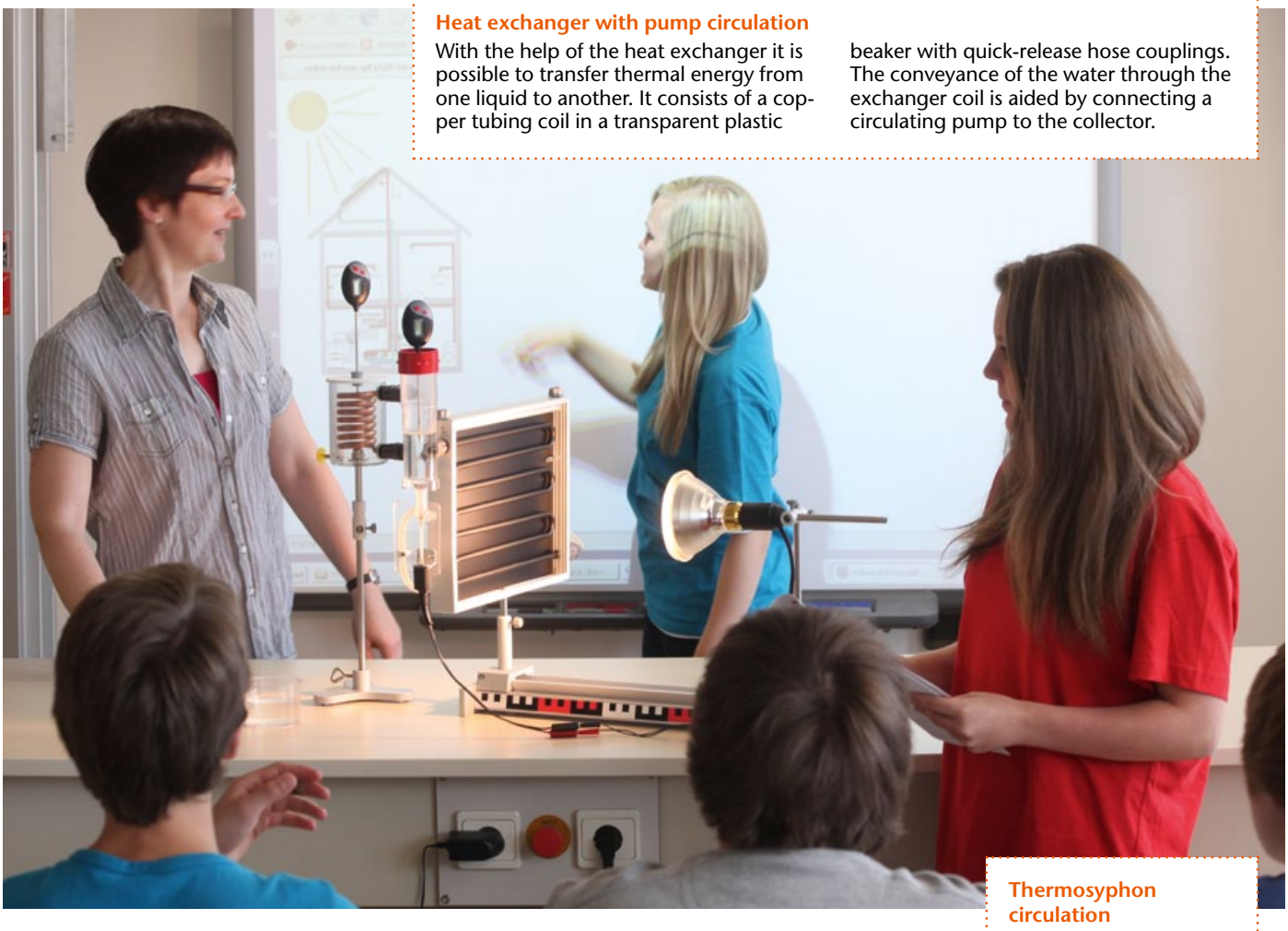
Included in delivery:

Experiment description



Renewable Energies

49355	Materials for demonstration



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.

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

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.

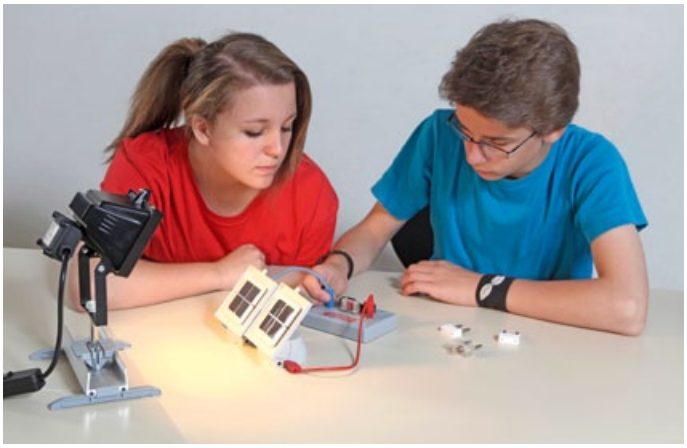
Demo

Demonstration kit 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.

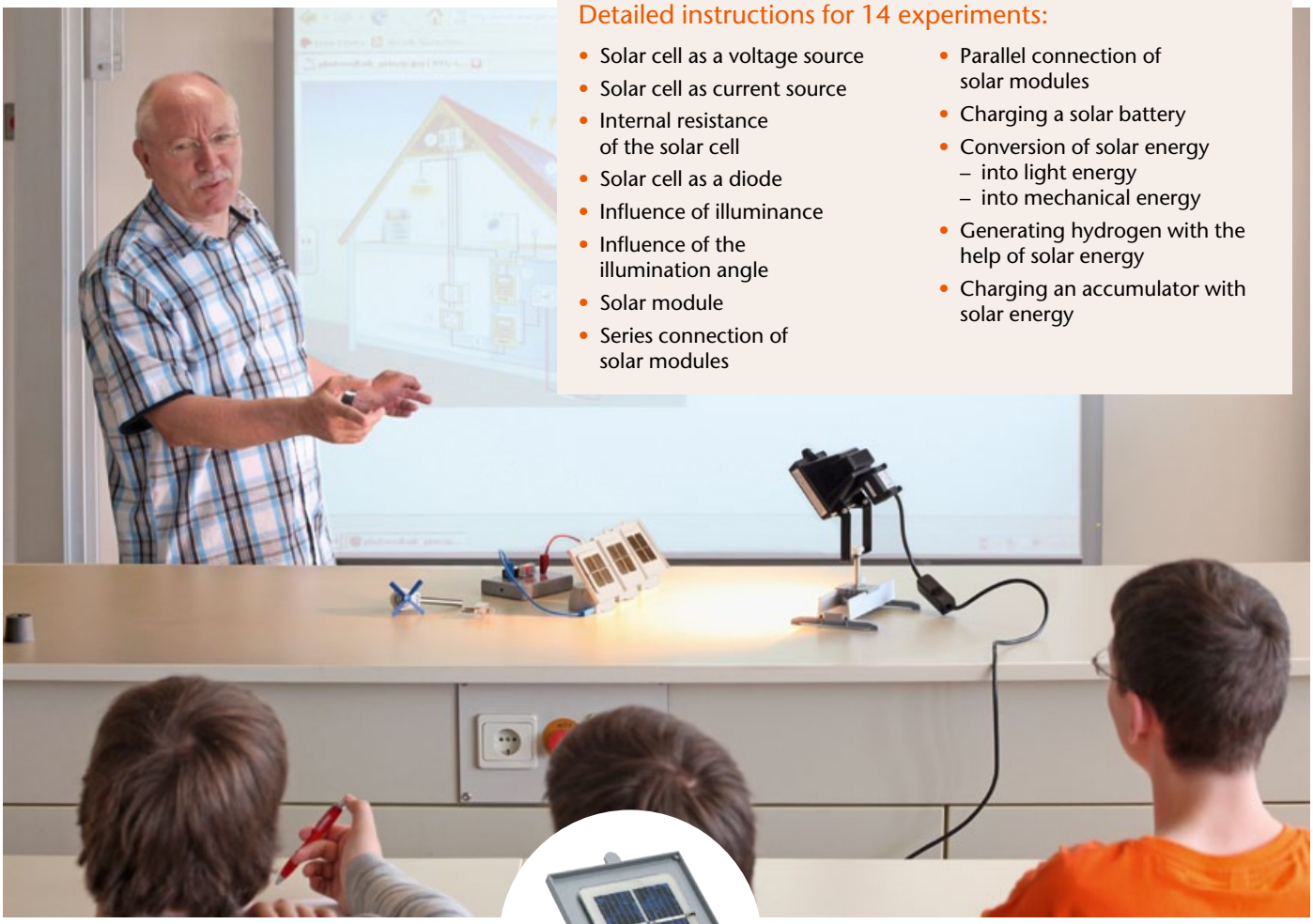


Included in delivery:

Experiment description

Renewable Energies

49346	Materials for demonstration



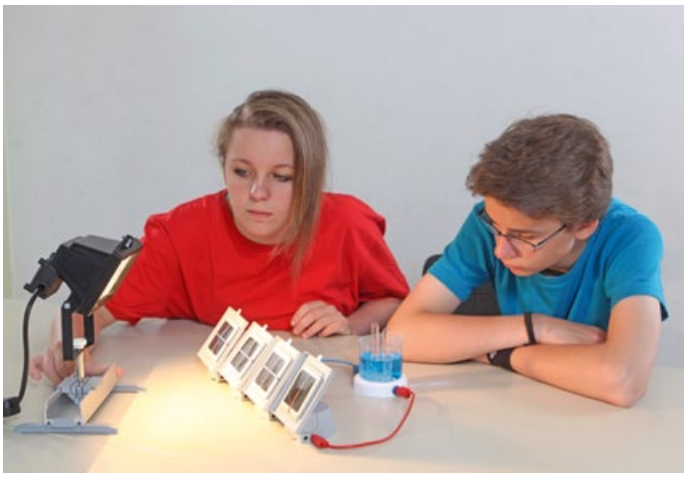
Detailed instructions for 14 experiments:

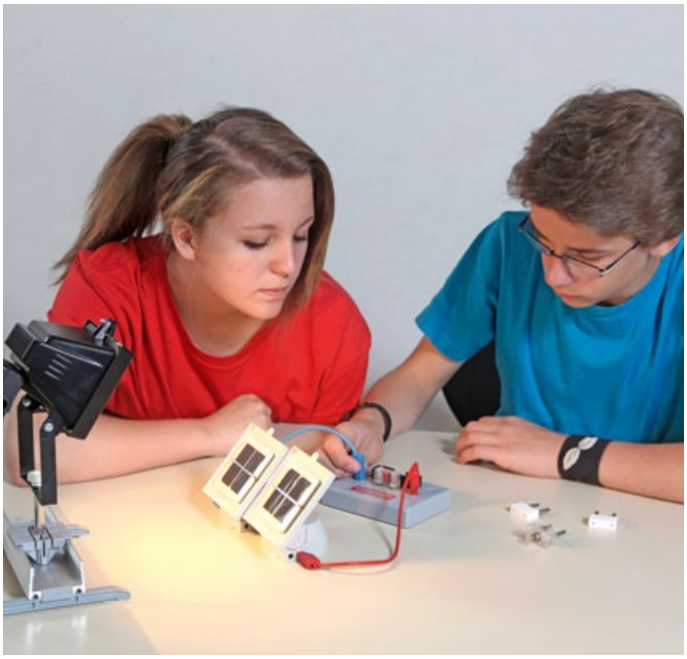
- Solar cell as a voltage source
- Solar cell as current source
- Internal resistance of the solar cell
- Solar cell as a diode
- Influence of illuminance
- Influence of the illumination angle
- Solar module
- Series connection of solar modules
- Parallel connection of solar modules
- Charging a solar 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 1V

Voltage: 1 V
Current: max. 300 mA
Size: 90 x 90 x 100 mm

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*.





Demo

Hydroelectric power plant

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.

Size: 240 x 175 x 200 mm

The hydroelectric power plant model can be used with water only, not with steam!

44631 Materials for demonstration

Demonstration set Surface tension

Demo

To determine the force which is necessary to tear off a ring which is placed on the surface of water.

The set contains:

- Tripod stand
- Stand rod, 500 mm
- Bosshead with slit
- Stand rod, 100 mm
- Rings with hook
- Dynamometer, 200 mN
- Surface tension ring
- Plastic pots with flow
- Silicone tube, 50 cm
- Supporting wooden blocks

44075 Materials for demonstration

Demo

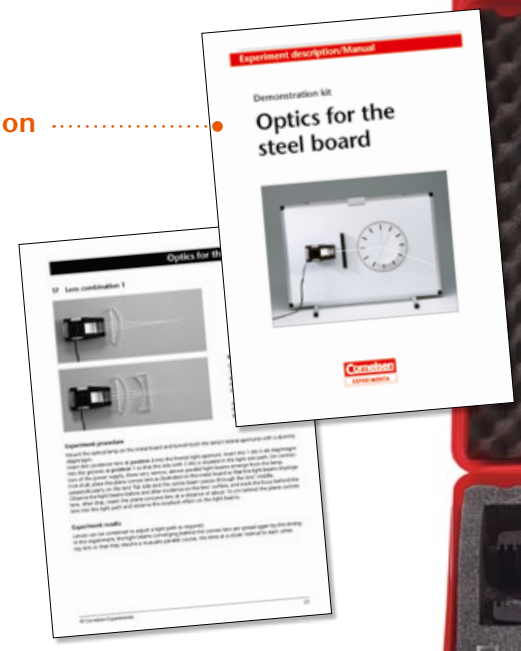
Demonstration kit **Optics** *for the steel board*

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.

Included in delivery:

Experiment description



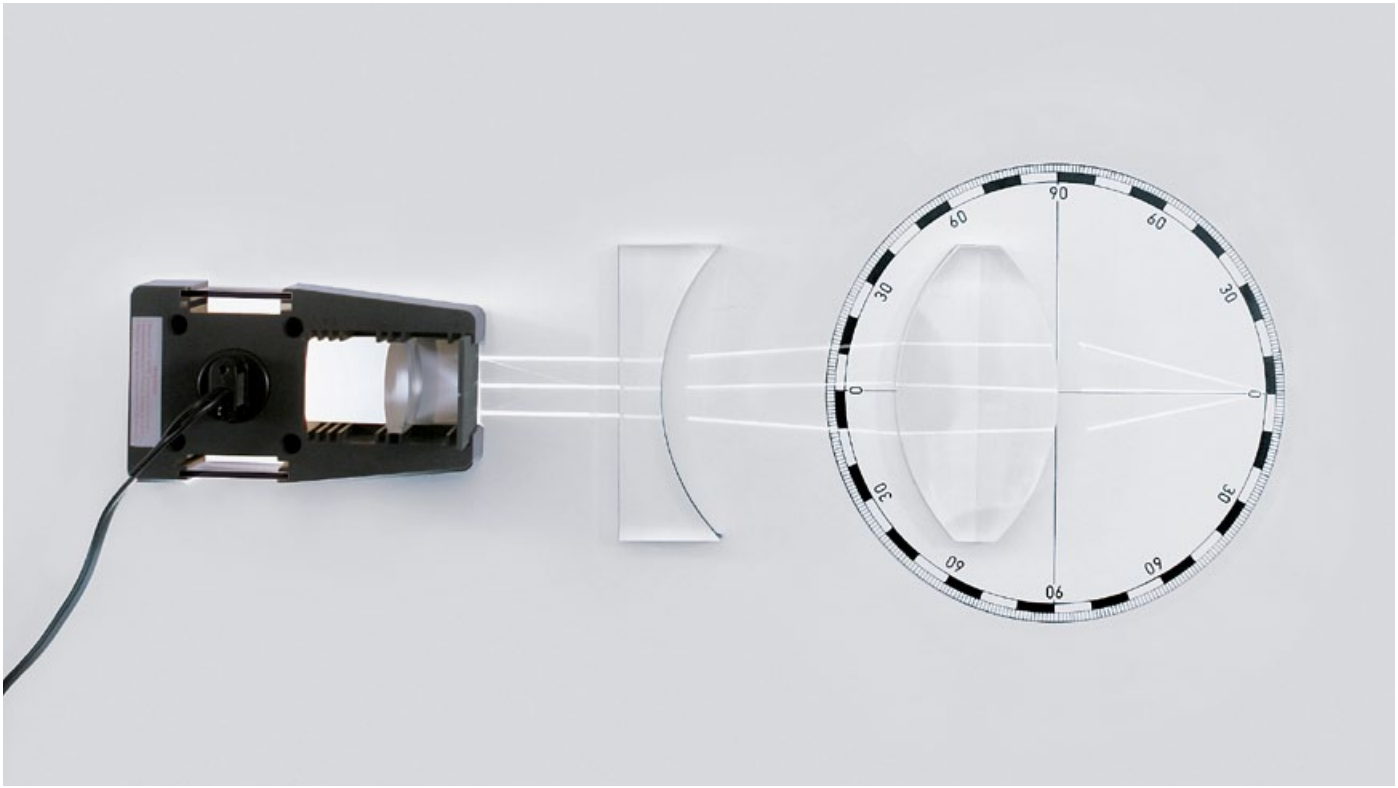
Power supply additionally required, e.g.:

55217 Power supply unit 12 V (see page 71)

Steel board additionally required, e.g.:

41621 Steel board with stand

47095 Materials for demonstration



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

Also recommended:

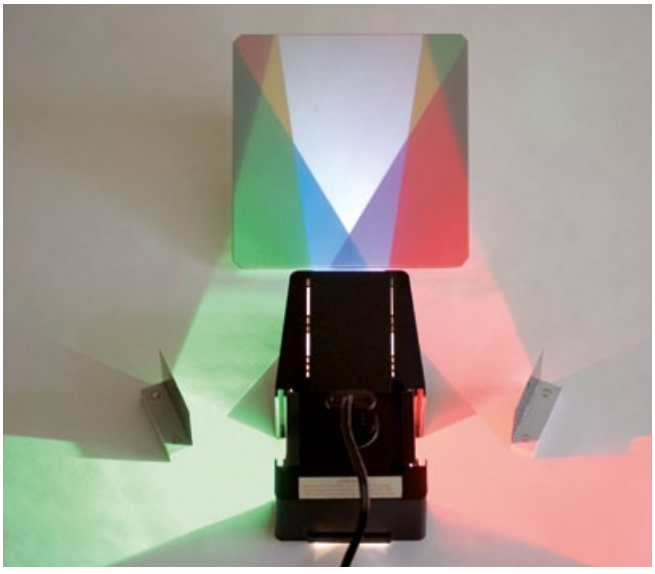
Coloured mixture accessories for *Optics for the steel board* (*47095*)

Consting of two plane metal mirrors on magnetic stand bases, one each foil filter red, blue and green in frame and a 30° inclined screen of white plastic on magnetic base.

Mirrors and filter: 50 x 50 mm
Screen: 150 x 150 mm

Additionally required:
47095 Optics for the steel board

47487



Demo

Demonstration kit **Geometric optics** *for the steel board*

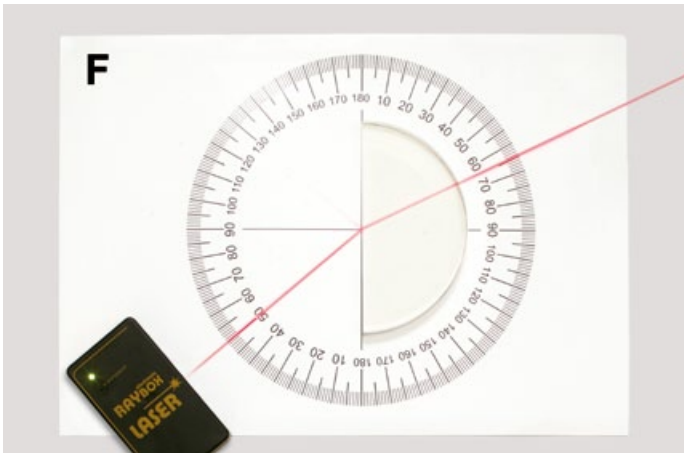
These model bodies can be used on a steel board in conjunction with *Laser Ray Box 47128* to demonstrate the following laws of ray optics:

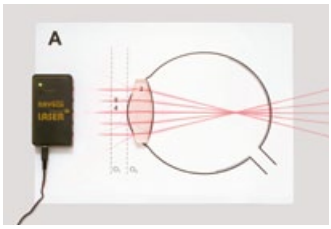
- Path of rays through convex or concave lenses
- Path of rays through a prism
- Reflection from plane and curved mirrors
- Refraction of light
- Refractive index

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.

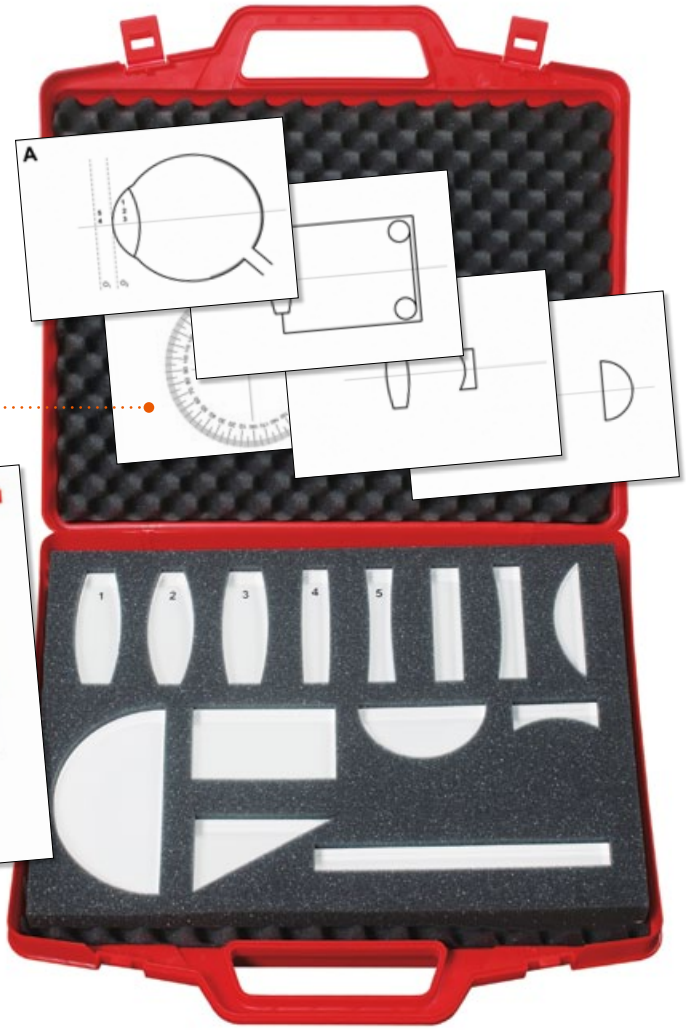




Adhesive sheets

Experiment description

Included in delivery:



Laser additionally required, e.g.:

47128 Laser Ray Box, magnetic adhering

The Laser Ray Box can be stored in the case of the kit

47080 Materials for demonstration

Demonstration kit Functional human eye model

To demonstrate the optical functions of the eye such as creation of the image of an object on the retina, accommodation (change in curvature of the lens), short- and long-sightedness.

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

Included in delivery:

Experiment description

47030	Materials for demonstration

Demo

Demonstration kit **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.

Optical light using halogen lamp, 12 V/50 W

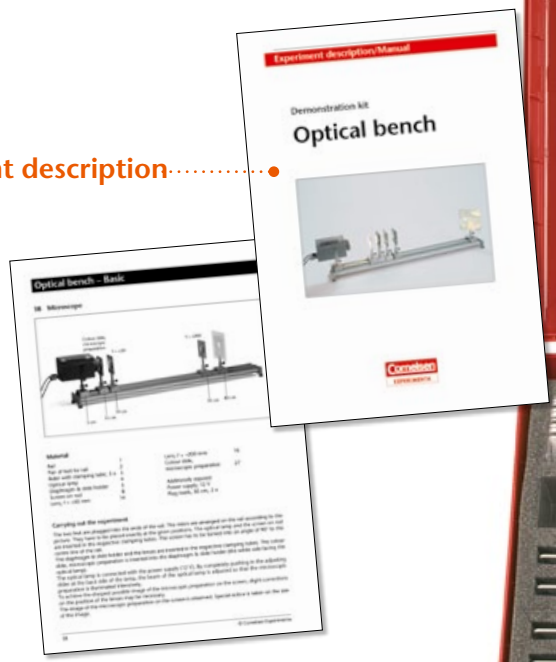
- Particularly bright light source for universal use in experiments on an optical bench and for projection purposes.
- Built-in reflective mirror, aspherical condenser,
- Movable and rotatable for aligning the light in lateral and axial planes
- 4-mm sockets plus fork-type mounting on rod for setting it up at an angle.

- Illumination span for halogen lamp: approx. 2000 hours

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.

Included in delivery:

Experiment description



Power supply additionally required, e.g.:

55224 Power supply unit, 6 and 12 V/5 A AC (see page 71)

47600 Materials for demonstration

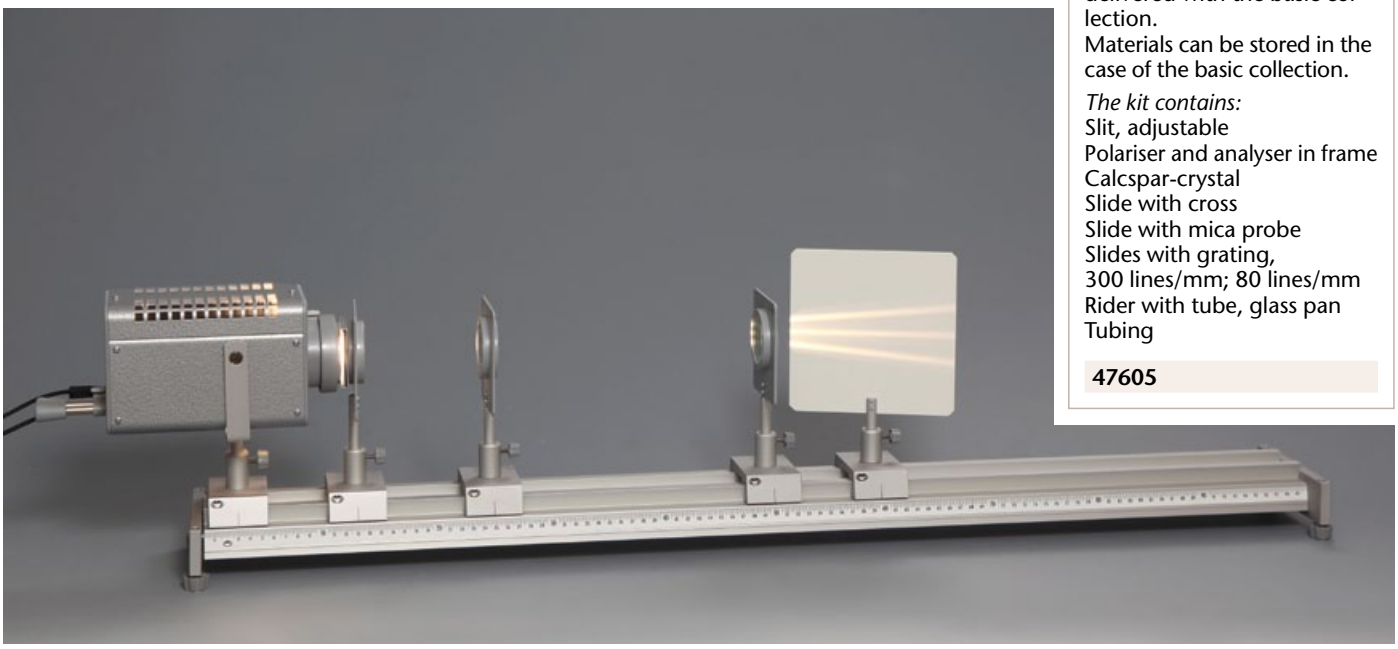
Detailed instructions for 27 experiments:

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



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
Calcspar-crystal
Slide with cross
Slide with mica probe
Slides with grating, 300 lines/mm; 80 lines/mm
Rider with tube, glass pan
Tubing

47605

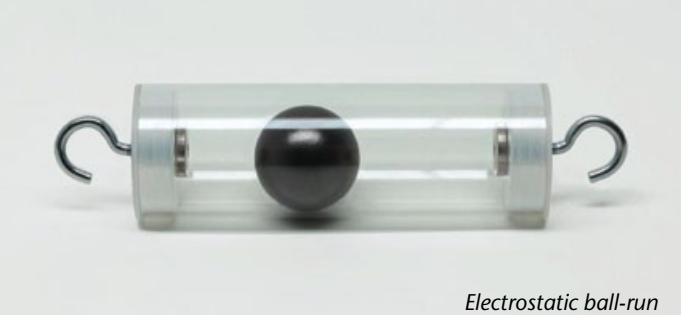
Demo

Demonstration kit 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.



Electrostatic ball-run

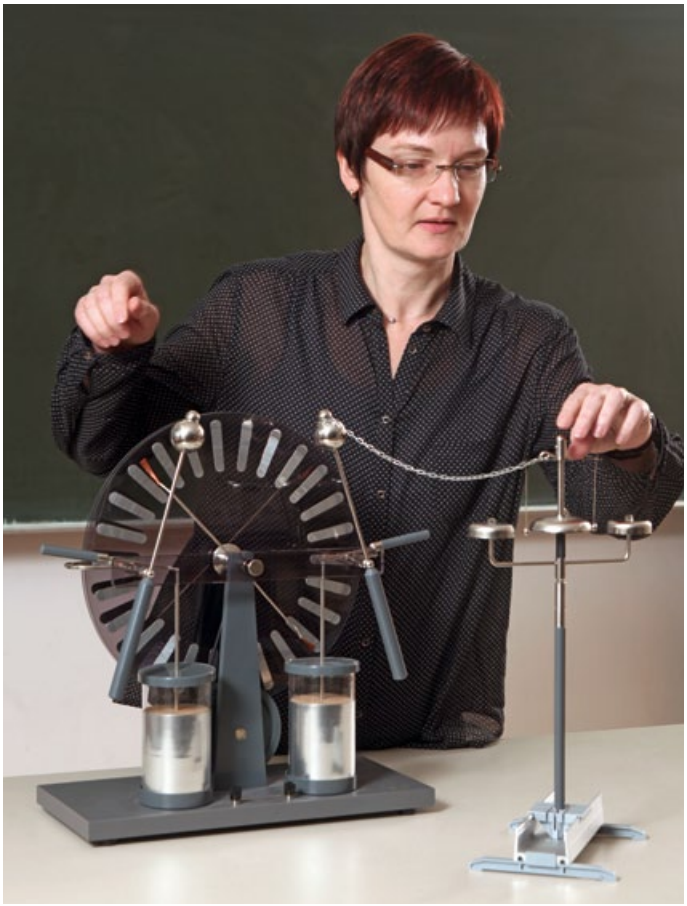
Included in delivery:

Experiment description

Recommended for the production of high electrostatic charge:

50315	High Power Wimshurst Machine (see page 66)
	or
50300	High Power Van de Graaff Generator (see page 67)

50332	Materials for demonstration

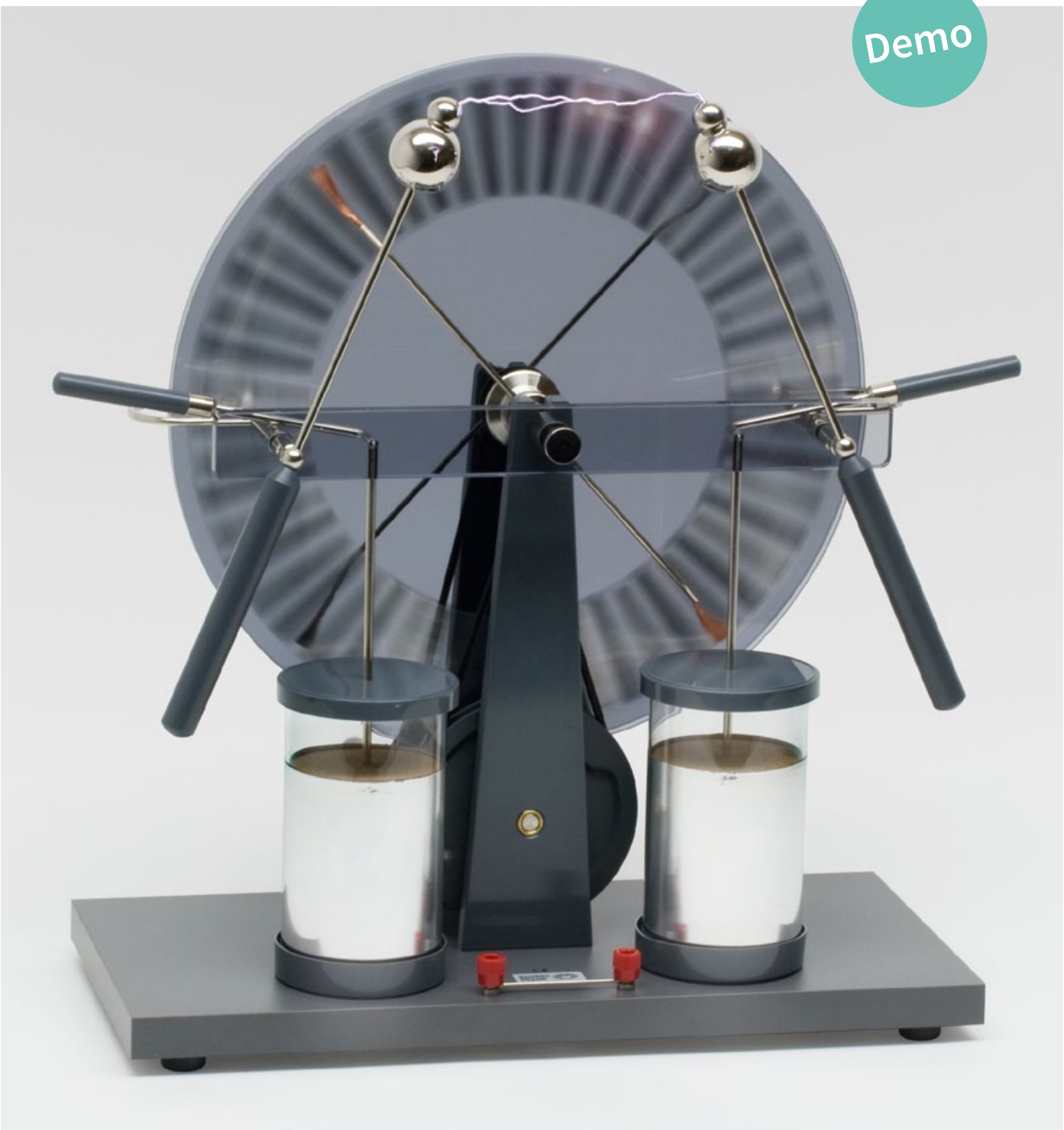


Detailed instructions for 8 experiments:

- Force action between charged bodies
- Brush electroscope
- Electric dance
- Peak discharge
- Electrostatic filter
- Electric chimes
- Electrostatic ball-run connected to
  – an influence machine
  – to a stand mount
- Lightning board

High Power Wimshurst Machine not included in delivery

High Power Wimshurst Machine



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:
50332 Demonstration kit 'Electrostatics'

50315

High Power Van de Graaff Generator

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.

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 dia.
- Stainless steel sphere, on rod, 300 x 12 mm dia., 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 µA
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:
50332 Demonstration kit 'Electrostatics'

50300

Demo

Demonstration kit 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.

Stopwatch additionally required, e.g.:

41810 Stopwatch for demonstration

Galvanometer additionally required, e.g:

54870 Analogue Multimeter (see page 72)

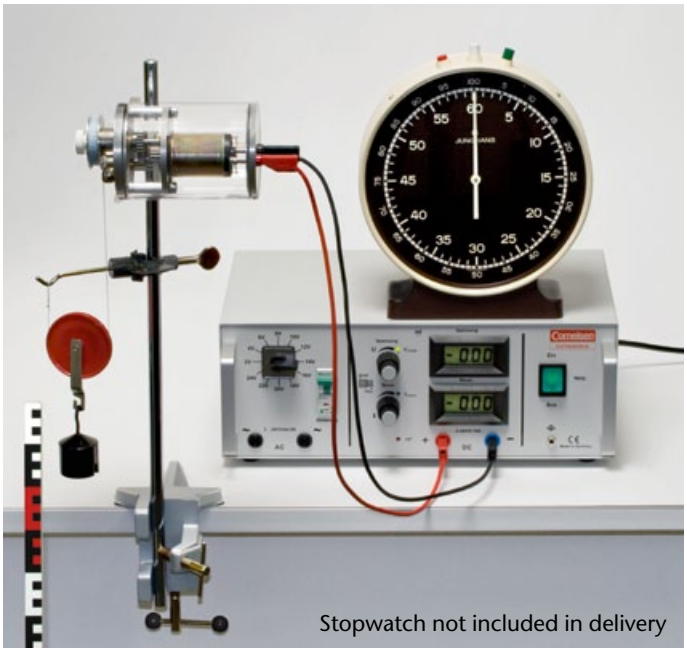
Recommended power supply:

55222 Power supply unit 12 V/3 A (see page 70)

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 ~ I), parallel circuit of consumers
- Energy current and electron current at the electric motor
- Ideas for the voltage concept (P ~ U), series circuit
- Experiments to determine the voltage definition



Stopwatch not included in delivery

Additionally required:

Accessory kit *'DynaMot'*

In the manual further experiments are suggested which can be conducted with the components of the accessory kit.

The kit consists of a lamp holder with 3 sockets MES, a lamp holder SES, set of bulbs for DynaMot experiments and two bridge plugs (jumpers) . All parts can be stored in the box of the Demonstration kit 'DynaMot'.

54845

Supporting Equipment

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 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, fi xed voltage selectable in six steps, DC output smoothed but not stabilized, with electronic fuse protection against over-heating 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 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, fi xed voltage selectable in six steps, DC output smoothed but not stabilized, with electronic fuse protection against over-heating 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 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

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
Operating voltage: 230 V/50 Hz AC
Size: 110 x 80 x 150 mm
Mass: 2 kg

55223

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

Supporting Equipment

Digital Multimeter with Bargraph and USB

Digital Multimeter with automatic range selection, which is characterized by its ease of use, modern and handy design, the extensive measurement functions and a USB interface for recording measurement data.

Due to the high safety standard of overvoltage category CAT III 1000 V and a large digital display with backlight and 62-segment bargraph, this device is best suitable for the education area.

Size: 95 x 190 x 45 mm
Mass: 400 g

- 22 mm, 3 5/6 digit LCD display (max. 5999) with backlight and 62-segment bargraph
- Automatic and manual range selection
- Temperature measurement using type-K probe
- Continuity test and diode test
- Data hold and Hz/Duty function
- Min/Max value mode
- Relative value function
- Auto power off and low battery indication
- Safety: EN 61010-1, CAT III 1000 V; CE; RoHS
- Accessories: holster, carrying case, test leads, Type K thermocouple, 2 pcs. 1.5 V batteries and manual

Voltage DC: 600 mV/6/60/600/1000 V; 100 µV; ±0.5 % +4 dgt.
Voltage AC: 6/60/600/750 V; 1 mV; ±0.8 % +10 dgt.
Frequency-range: 40 to 400 Hz
Current DC:
600/6000 µA/60/600 mA/6/10 A; 0.1 µA; ±1.0 % +10 dgt.
Current AC:
600/6000 µA/60/600 mA/6/10 A; 0.1 µA; ±1.5 % +5 dgt.
Frequency-range: 40 to 100 Hz
Ohm: 600 Ω/6/60/600 kΩ/6/60 MΩ; 0.1 Ω; ±0.8 % +4 dgt.
Capacitance: 40/400 nF/4/40/200 µF; 10 pF; ±3.5 % +8 dgt.
Frequency:
100/1000Hz/10/100kHz/1/20MHz; 10 mHz; ±0.5 % +4 dgt.
Temperature: –20 to +1000 °C; 0.1 °C; ±1.0 % +50 dgt.
Operating Voltage: 2 x 1.5 V AAA (UM-4) batteries

54986

Analogue Multimeter

Analogue Multimeter with mirror scale, point bearing moving-coil-mechanism and central range selector switch for easy operation. Ideal for quick measurements during lessons.

20 ranges; 75 mm mirror scale.

- Sensitivity:
  20 kΩ/V DC – 9 kΩ/V AC
- Continuity test with acoustic buzzer
- Safety: EN-61010-1;
  CAT II 600 V; CE; RoHS
- Accessories: carrying case,
  test leads, batteries and manual

DCV: 3/15/60/150/600 V; ± 3.0 % FS
ACV: 15/60/150/600 V; ± 4.0 % FS
DCA: 100µA/10 mA/500 mA/10 A; ± 3.0 % FS
ACA: 10 mA/500 mA/10 A; ± 4.0 % FS
Ohm: 200 Ω/2/20/200 kΩ/2 MΩ; ± 5.0 % arc
Operating voltage: 3 x 1.5 V AAA (UM-4) batteries
Size: 110 x 175 x 45 mm
Mass: 315 g

54870

Digital Multimeter with Bargraph

Digital Multimeter, characterized by its ease of use, modern and handy design and the extensive measurement functions.

Due to the high safety standard of overvoltage category CAT III 1000 V and a large digital display with backlight this device is very suitable for the education area.

Size: 95 x 190 x 45 mm
Mass: 400 g

- 23 mm, 3 3/4-digit LCD display (max. 3999) with backlight and 41-segment-bargraph
- Auto and manual range selection
- MIN/MAX and Data-Hold
- Hz/Duty function and relative value
- Temperature measurement using type-K probe
- Fast continuity test and diode test
- Auto power off and low battery indication
- Safety: EN 61010-1; CAT III 1000 V ; CE; RoHS
- Accessories: holster, carrying case, test leads, Typ-K-thermocouple, temperature adapter, battery and manual

DCV: 40/400 mV/4/40/400/1000 V; 10µV; ±0.5 % + 4 dgt.
ACV: 40/400 mV/4/40/400/750 V; 10 µV; ±0.8 % + 6
Frequency-range: 40 to 400 Hz
DCA: 400 µA/4/40/400 mA/20 A; 0.1 µA; ±1.0 % + 10 dgt.
ACA: 400 µA/4/40/400 mA/20 A; 1 µA; ±1.5 % + 5 dgt.
Frequency-range: 40 to 200 Hz
Ohm: 400 Ω/4/40/400 kΩ/4/40 MΩ; 0,1 Ω; ±0.8 % + 4 dgt.
Capacitance: 40/400 nF/4/40/400 µF; 10 pF; ±2.5 % + 8 dgt.
Frequency:
100/1000 Hz/1/10/100 kHz/1/10 MHz; 0.1 Hz; ±0.5 % + 4 dgt.
Temperature: –20 to +1000 °C; 1°C; ±1.0 % + 4 dgt.
Operating voltage: 9 V-Battery

54985

Mini 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.

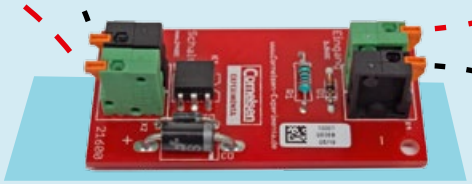
Solid plastic housing with hinged stand, 4 mm safety sockets, a pair of measuring cable with test prod, fine-wire fuse, K-type temperature sensor and 9 V battery.

Size: 70 x 128 x 28 mm
Mass: 140 g

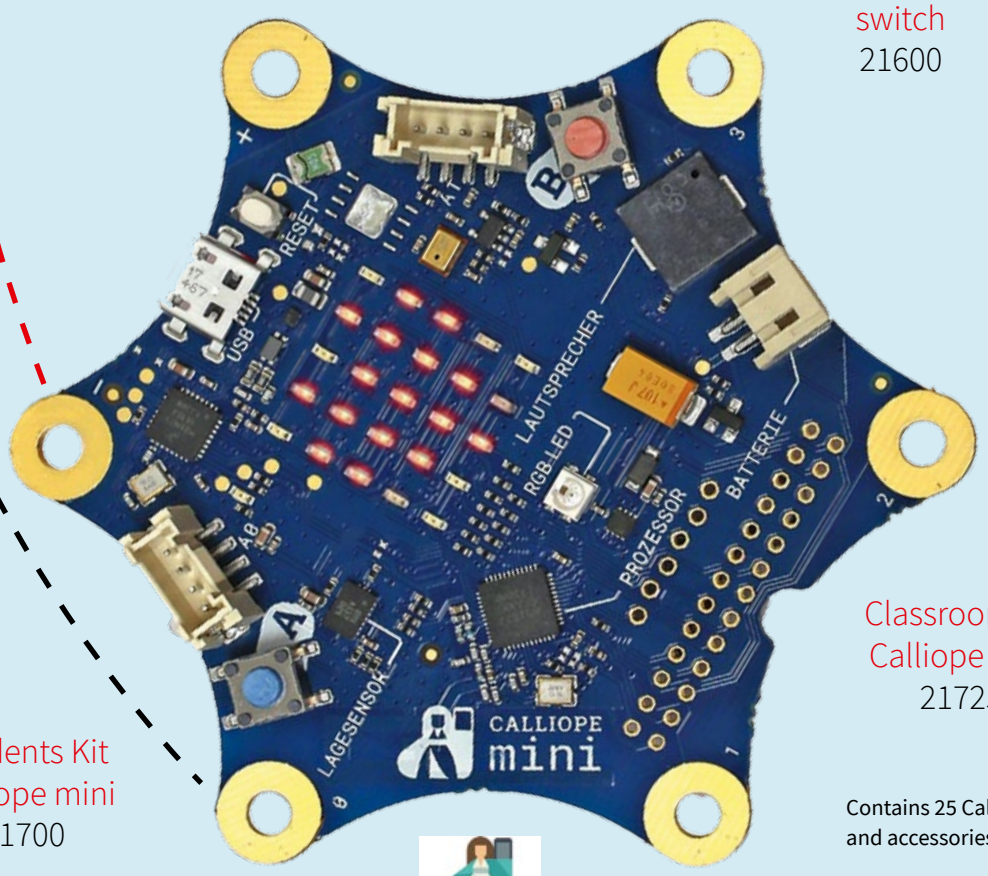
Voltage DC: 200 mV, 2/20/200/600 V; ±0.5 %
Voltage AC: 200/600 V; ±1.2 %
Current DC: 2/20/200 mA, 10 A; ±1.2 %
Resistance: 200/2000 Ω, 20/200/2000 kΩ; ±1.0 %
Temperature: 0 to 1000 °C; ±2.5 %
Safety: IEC-1010-1; CAT II 600 V
Battery: 9 V 6F22

54892

With Coding und Robotics for Computational Thinking



Elektronic switch
21600



Students Kit
Calliope mini
21700

Classroom Kit
Calliope mini
21725

Contains 25 Calliope mini and accessories

CALLIOPE

Coding in the classroom

Dealing with and mastering digital devices has long become a normal part of everyday life. So why not employ this digital literacy in your own subject area?

Pupils are eager to get involved when it comes to puzzling over and trying out as a group which of the possible solutions activate the robot, thrilled when the lights "dance" to the music and intrigued when the plant watering system works automatically.

Coding is less about writing lines of programming code, but more about developing an understanding of the digital world. To help shape it requires the unique ability to understand programming concepts. This means identifying problems and breaking their solutions down into individual steps, developing strategies and thinking in an abstract and creative manner.

eXperiBot®

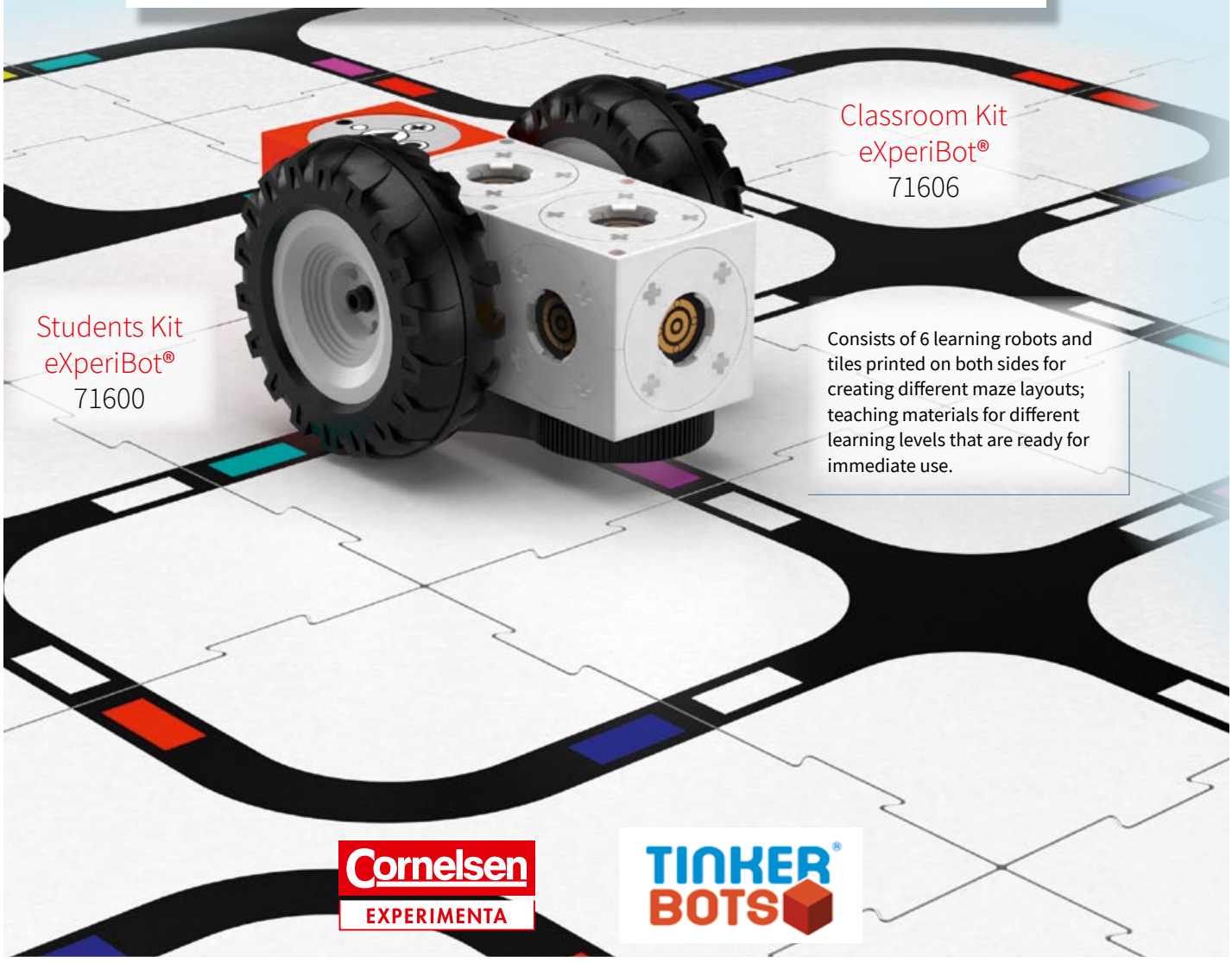
An innovative learning robot for the classroom

Available in September 2019

eXperiBot®, the new learning robot developed by Cornelsen Experimenta and Tinkerbots, places the emphasis on knowledge transfer and discovering creative solutions to digital problems.

eXperiBot® is easy to assemble and ready for operation in seconds. Several sensors allow eXperiBot® to get its bearings in an individually configurable maze.

The unique combination of innovative technology and educational teaching materials with a reference curriculum “Made in Germany” inspires and turns every pupil into a digital designer.



Classroom Kit
eXperiBot®
71606

Consists of 6 learning robots and tiles printed on both sides for creating different maze layouts; teaching materials for different learning levels that are ready for immediate use.

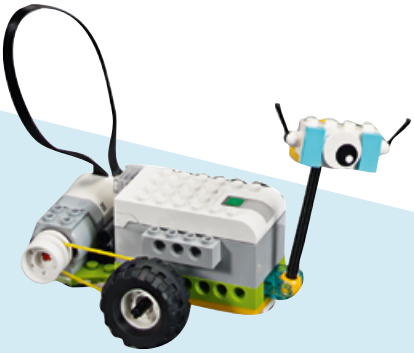
Students Kit
eXperiBot®
71600

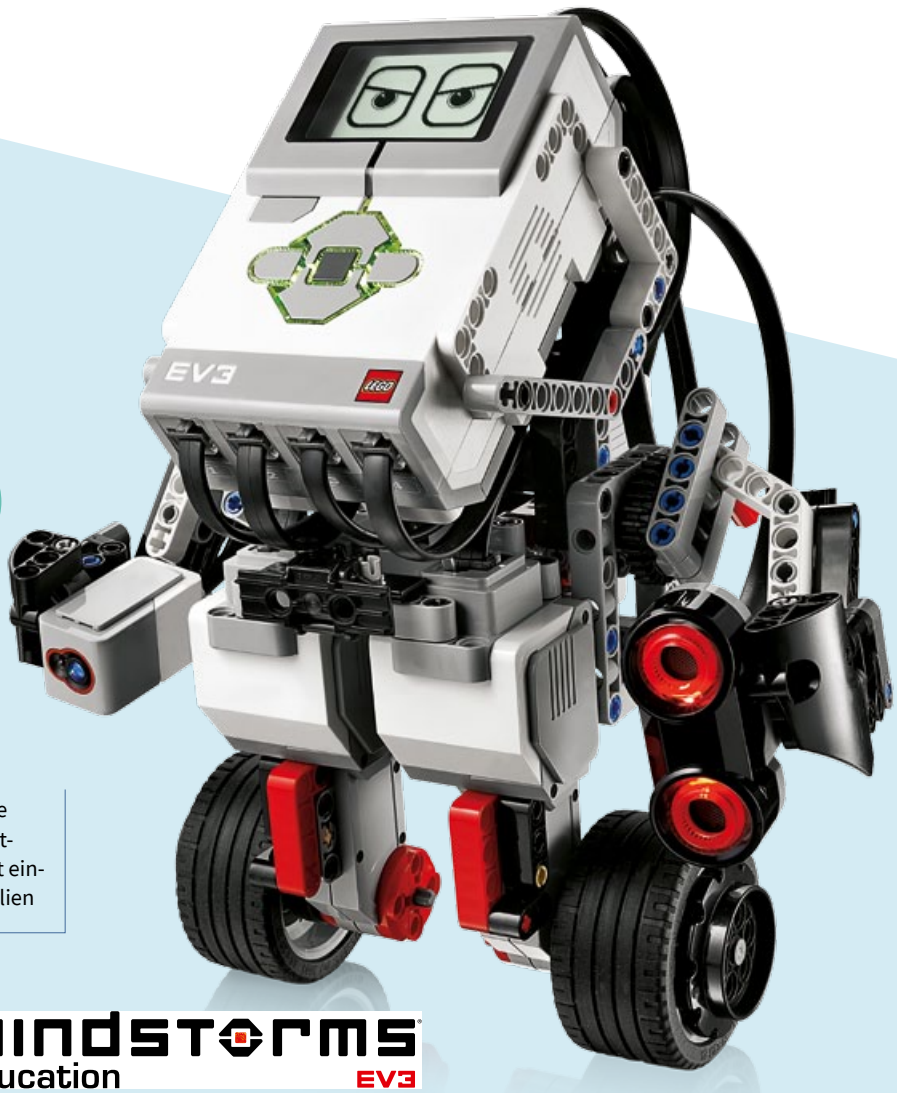
Cornelsen EXPERIMENTA

TINKER BOTS

Only available within EU

LEGO® Education
WeDo 2.0
Basic Kit 45300





Only available within EU

LEGO® Mindstorms®
Education EV3
Basic Kit 45544

Contains: LEGO® elements, sensors, motors, die intuitive Software inkluding Messwert-erfassungsoberfläche, sofort ein-setzbare Unterrichtsmaterialien

LEGO mindstorms education EV3

Concentrate completely on the experiment with eXperilyser®

The all-round app

eXperilyser® doesn't replace any experiments, but supports them using digital technology. Seven amazing modules in a single app cover experiments in all STEM subjects. eXperilyser® allows pupils to devote their attention to the experiment without neglecting the measurements and analysis.

A digital camera, such as one built into a tablet or smartphone, is used as a measuring instrument in all seven modules.

The camera is used to read measurement data, e. g. from digital displays (scales, multimeters), liquid columns (burettes) or needle deflections on dials (hygrometers, ammeters, blood pressure monitors). This data is then available in digital form for further analysis.

DATA LOGGING

Utilising analogue measuring instruments digitally

eXperilyser

Digitise and physically analyse motion in realtime
e. g. an oscillating motion (including coupled pendulums) is displayed as an s-t graph in real time.
The motion can be recorded and the individual data points stored for further analysis

VIDEO ANALYSIS
Bewegungen live digitalisieren und physikalisch auswerten

Make invisible paths visible
Observe with your pupils such things as where the ant trail really goes or which route most cars drive and when.

TRACKING
Unsichtbare Pfade sichtbar machen

Reliably capture unique instants
Reveal such things as which animal is taking the food or the moment the last drop of water causes the barrel to overflow.

CAMERA TRAP
Einzigartige Momente sicher einfangen

Experience s-t graphs yourself
e. g. pupils can translate the trace of a given s-t graph into their own motion.

GRAPH CHALLENGE
s-t-Diagramme selbst erleben

Speed up slow processes
Reveal such things as the motion of the stars across the night sky or how snails reproduce.

TIME LAPSE
Langsames in Geschwindigkeit versetzen

Easily measure extreme distances
e. g. measure the diameter of moon craters or the size of intercellular spaces.

DISTANCE MEASUREMENT
Extreme Längen leicht vermessen

One license for all seven modules:
Video analysis, tracking, graph challenge, distance measurement, time lapse, camera trap and data logging

eXperilyser®
Licence 71524

Classroom Kit
Video analysis 71500

Contains several pieces of apparatus for six groups of pupils: Materials for building pendulums; adhesive labels (incl. with scale); magnetic buttons in three colours; smartphone holder.

Age 13 – 18

Students kit **Chemistry I** *Substances / mixtures / water*

The kit is designed for the elementary instruction. It includes equipment and materials that are needed to conduct fundamental investigations of materials.

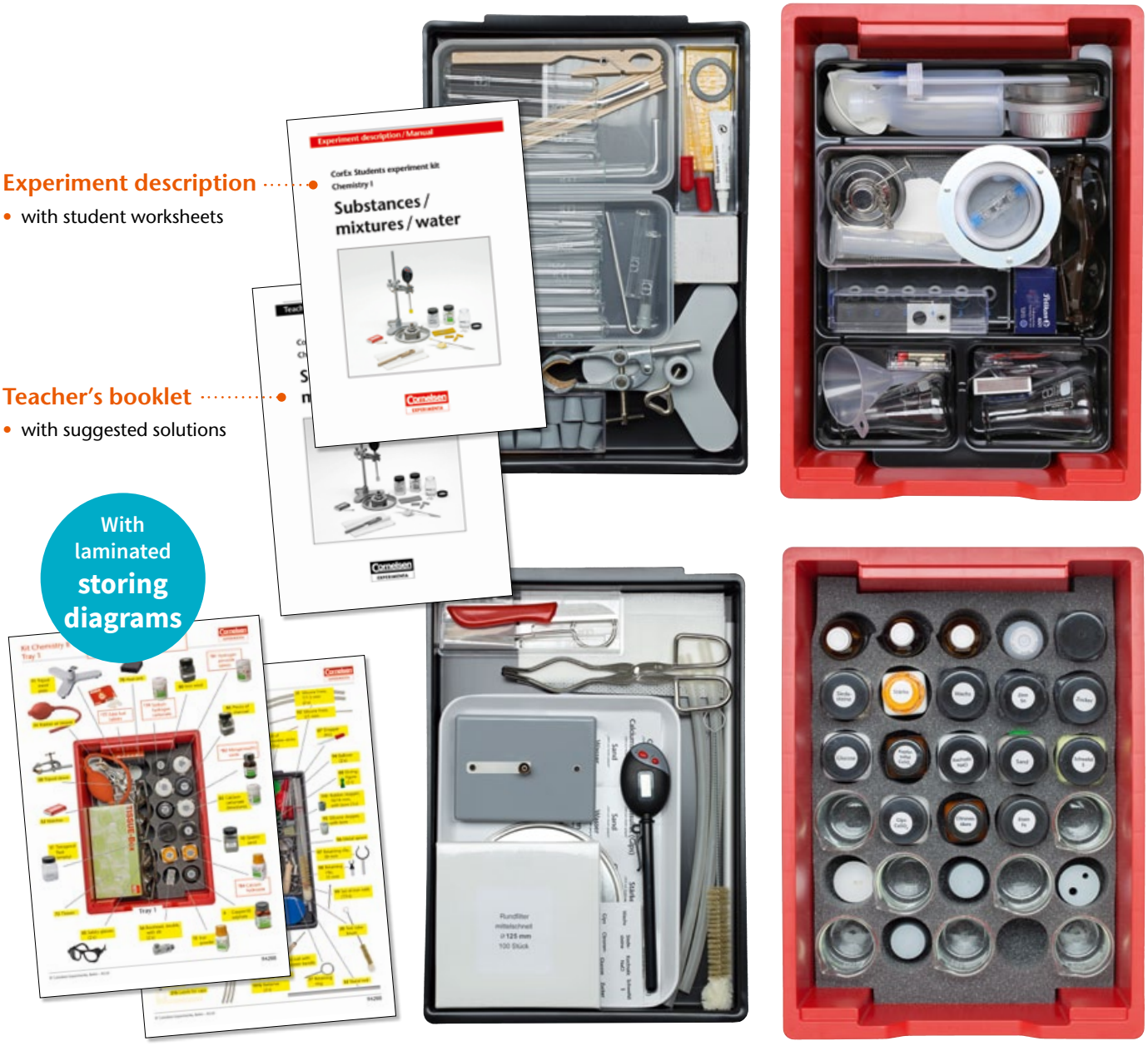
- Substances and their characteristics
- Mixtures and separation of substances
- Composition and characteristics of water

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

With laminated **storing diagrams**



94100	Materials for 1 work group

Detailed manual with 18 experiments:

Substances and their characteristics
- Appearance
- Solubility in water
- Electrical conductivity
- Behaviour when heated
- Solubility of different substances in oil and water
- Melting temperature

Mixture and separation of substances
- Sand/iron powder
- Sand/salt
- Distillation of copper sulphate solution
- Distillation of orange juice
- Distillation of port wine

Composition and characteristics of water
- Aggregate states
- Components of water
- Detection of water
- Electrical conductivity of water
- Processes of solubility of sugar
- Saturated solutions (2 experiments)

Age 13 – 18

Students kit Chemistry II *Air / combustion / redox reactions*

The kit allows activity-orientated lessons on the topics *air, combustion* and *redox reactions*.

Additional kit *chemistry II: Air, combustion, redox reactions*

The additional kit contains all equipment and materials from the kit *chemistry II* that are not included in *chemistry I*.
This addition and the materials from the kit *chemistry I* allow it to make all experiments from *chemistry II*. To make the experiments you need the kit *chemistry I*.

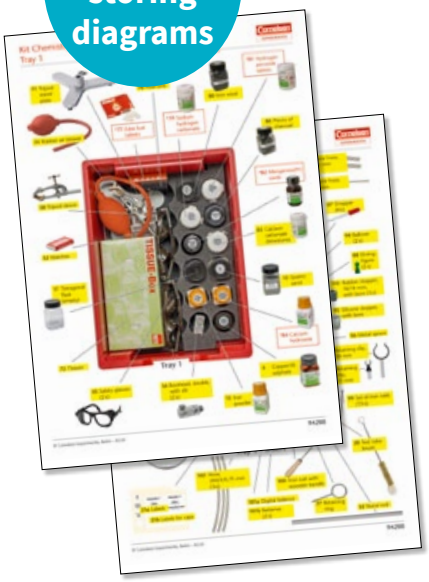
94105

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

With laminated **storing diagrams**



94200 Materials for 1 work group

Detailed manual with 21 experiments:

Air
- Air needs space (2 experiements)
- "Deep sea diver"
- Our breath

Combustion
- Carbon dioxide (2 experiements)
- Oxygen as a prerequisite to combustion
- What gas is formed? (2 experiements)
- Chimney effect
- What gas is left over? (Evidence of nitrogen)
- Combustion products
- Combustion in a closed system
- Iron wool on the balance
- Degree of dispersion and flammability
- Same substance – different ignition temperature
- Extinguishing fire
- Fire extinguisher
- Slow oxidation

Redox reactions
- Reduction of copper(II) oxide
- Refined copper

Age 13 – 18

Students kit Distillation

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

89756 Materials for 1 work group

Age 13 – 18

Students kit Extraction

With this 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.

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

89876	Materials for 1 work group

Age 13 – 18

Students kit Gas generator

With the kit small quantities of most of the standard laboratory gases can be generated.

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.

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

89886	Materials for 1 work group

Age 13 – 18

Students kit 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

51901 Materials for 1 work group or demonstration

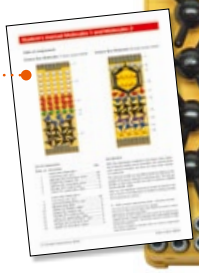
Age 13 – 18

Box *'Molecules 1'*

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



Student's manual

Size of box: 315 x 115 x 53 mm

18474

Box *'Molecules 2'*

Box 'Molecules 2' is to be used in conjunction with box 'Molecules 1' only, to build up organic compounds.

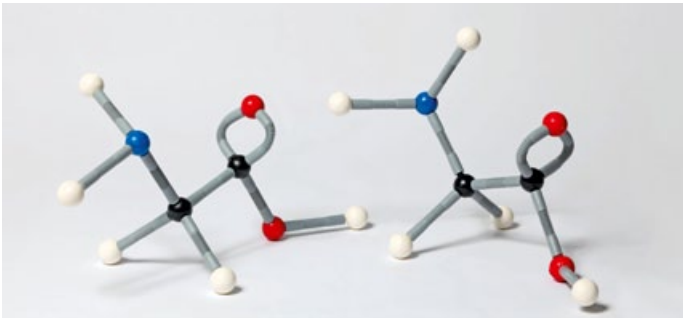
Contents:

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

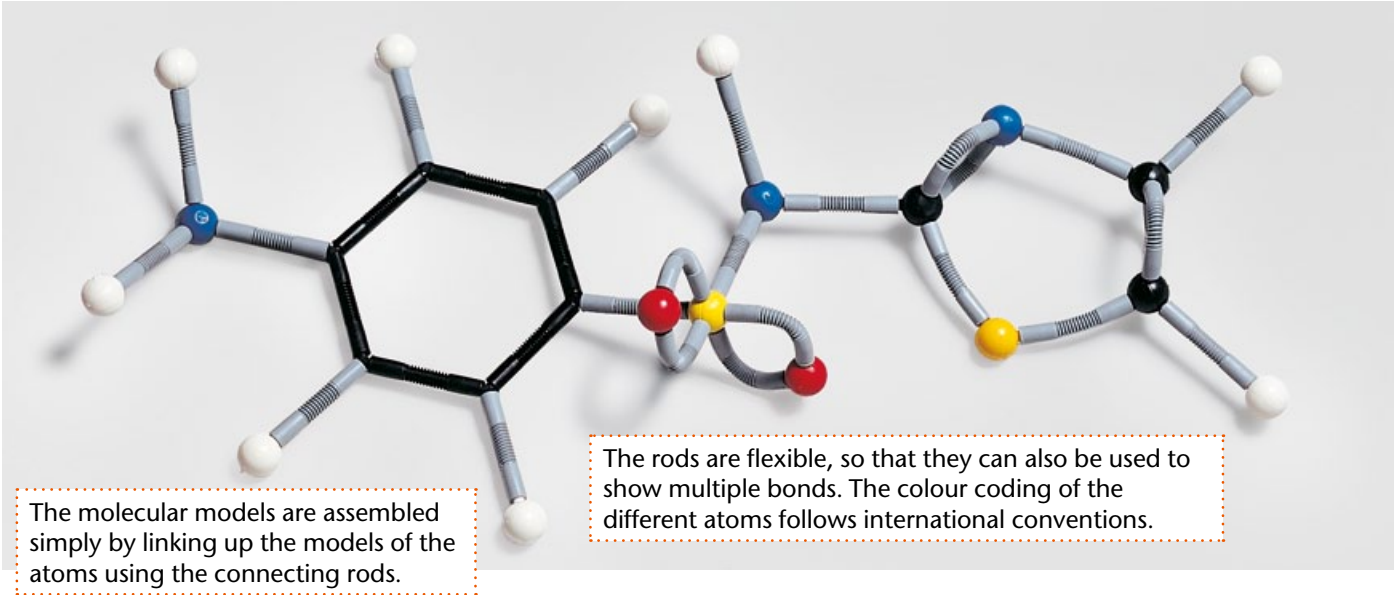
Student's manual

Size of box: 315 x 115 x 53 mm

31810



The positions of the atomic nuclei and the bonds between the atoms are shown particularly clearly by these structural (rod-and sphere) models.



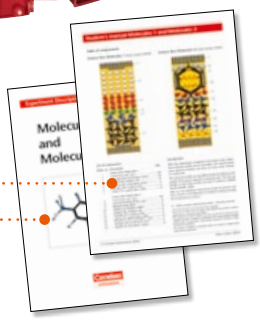
The molecular models are assembled simply by linking up the models of the atoms using the connecting rods.

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.

Kit *'Molecules 1'*

Contains materials for 10 work groups:

10 x Boxes 'Molecules 1'
10 x Student's manuals
1 x Teacher's manual



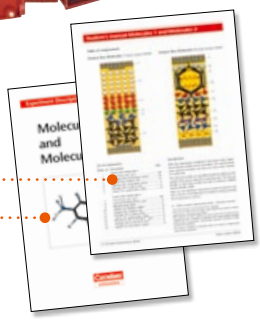
Size of kit: 540 x 450 x 150 mm

31764

Kit *'Molecules 2'*

Contains materials for 10 work groups:

10 x Boxes 'Molecules 2'
10 x Student's manuals
1 x Teacher's manual



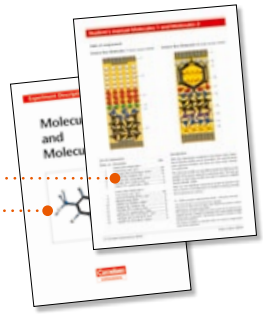
Size of kit: 540 x 450 x 150 mm

42880

Kit *'Molecules 3'*

Contains materials for 5 work groups:

5 x Boxes 'Molecules 1'
5 x 'Molecules 2'
10 x Student's manuals
1 x Teacher's manual



Size of kit: 540 x 450 x 150 mm

36685

Age 13 – 18

Students kit Biology

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

The microtome ...

- is a very safe and easy to handle instrument to section biological material.
- cuts thin sections of botanical material or dead animals.
- The section can be taken by the tweezers and be prepared for further investigations.

Included in delivery:

Teacher's manual

18080	Materials for 15 work groups

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

Students kit Germination-Units

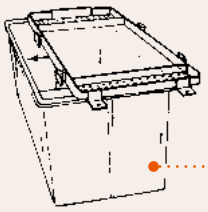
Topic **Botany**

- 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).



Multi purpose container
150 x 75 x 75 mm

Included in delivery:

Teacher's manual

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.

18085 Materials for 12 work groups

Set Berlese-Apparatus including Stereoscope

The Berlese apparatus (also known as the Berlese-Tullgren funnel) was developed for the biological investigation of soil samples. It is primarily used to sort out microorganisms (microarthropods) from mulch, leaf litter and pine needle litter for experimental purposes.

The Berlese apparatus demo set is intended for both qualitative and quantitative investigation of illustrative soil habitats, and it can be employed in general science lessons as well as for more specialised teaching.

The set 'Berlese-Apparatus' with the stereoscope *89930* enables observing microorganisms.

712009	Set Berlese-Apparatus including Stereoscope *89930*
71200	Berlese-Apparatus

High motivation for experiments with Cory & Nelson

Available in September 2019

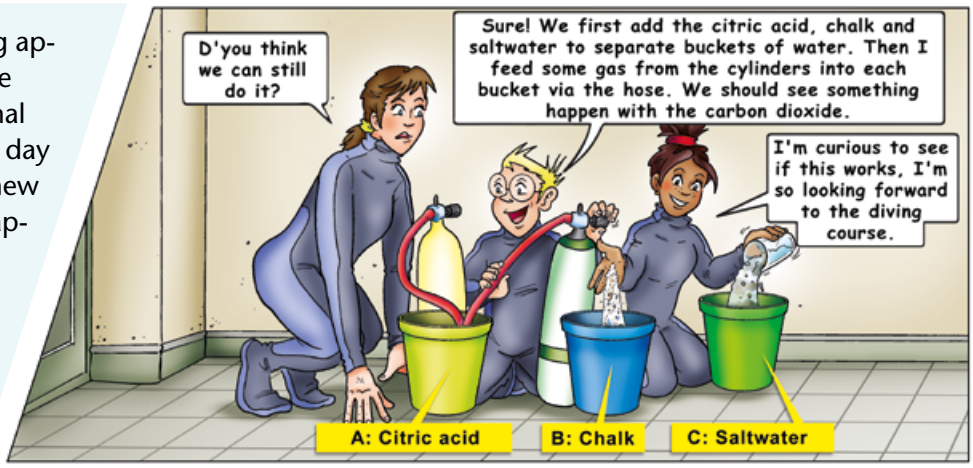
NEW PRODUCT

Air resistance
Heating up air
Air composition
Sound transmission
Air pressure

Air eXperTeenies

The new Natural Science Series that turns school children into experts!

Comics tell stories. The storytelling approach highly excite students since natural science topics get a personal meaning. The experience of every day life phenomena is the aim of our new experiment kit. Each experiment approach is accompanied by a short comic story with the main characters Cory & Nelson. The first kit includes more than 15 experiments linked to the topic "Air".



Experiments at stations do not lead into a defined direction: **there is no right or wrong.**

Each learner receives the support she or he needs. The students are designated as expert for a certain station. This way they are in charge of his or her scientist team.

The "**station expert**" supports his / her **team** while realizing the experiment: either with posed questions, selection of material, the construction of the experiment or **safety precaution**.

The expert alternates at the next station.

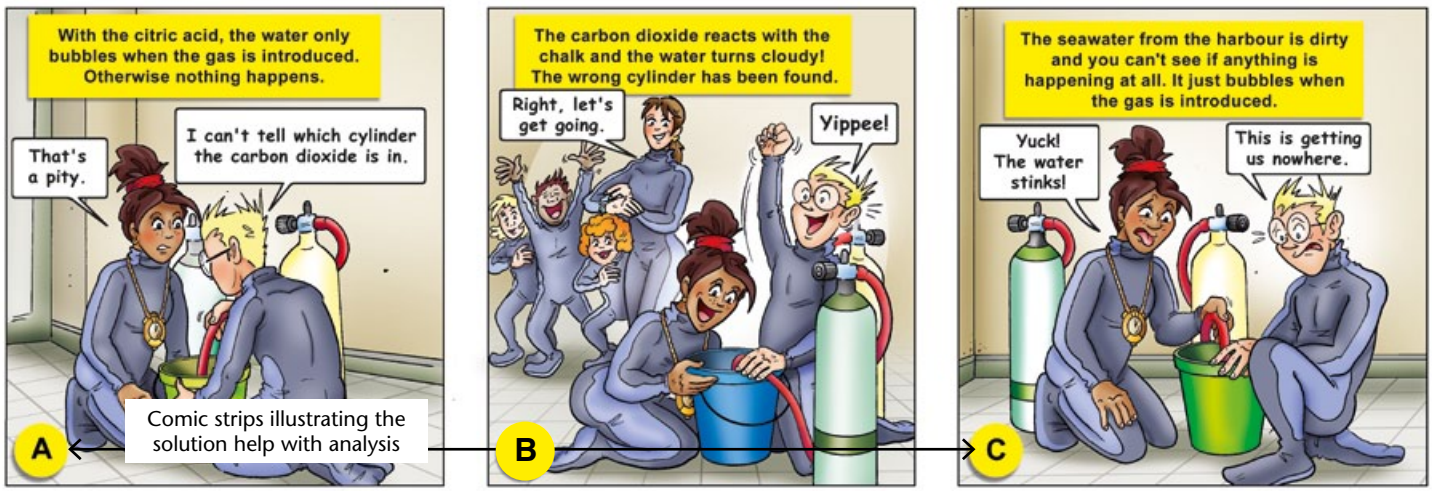
This way everyone can participate in experimenting, find out correlations that lead to the answer of individual questions.

24100	Materials for 5 workstations

While experimenting the teacher is relieved through the expert and each student is individually supported.

The self-confidence and sense of responsibility is strengthenend due to the exchange of the expert function.

While teaching natural science the exchange between the student also enforces teamwork and sense for language.



Comic strips illustrating the solution help with analysis

Students kit 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

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
  - liquid materials
- Heat resistance and ignition
- Magnetic behaviour
- Solubility
- 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 / Separation
- Separation by deposition (sedimentation)
- Separation by
  - filtration
  - evaporation
  - vaporization/distillation
  - 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
  - gases when warmed
  - 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

Age 11 – 14

Students kit Everyday electricity and magnetism

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

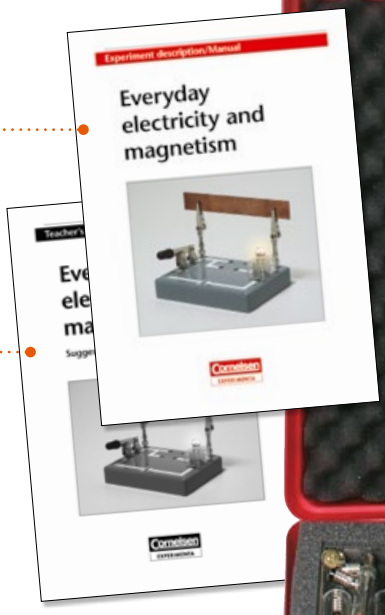
In electrostatics there are experiments for demonstrating electrical charge and investigating how charges behave. In the magnetism section it is possible to study the properties of permanent magnets.

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.

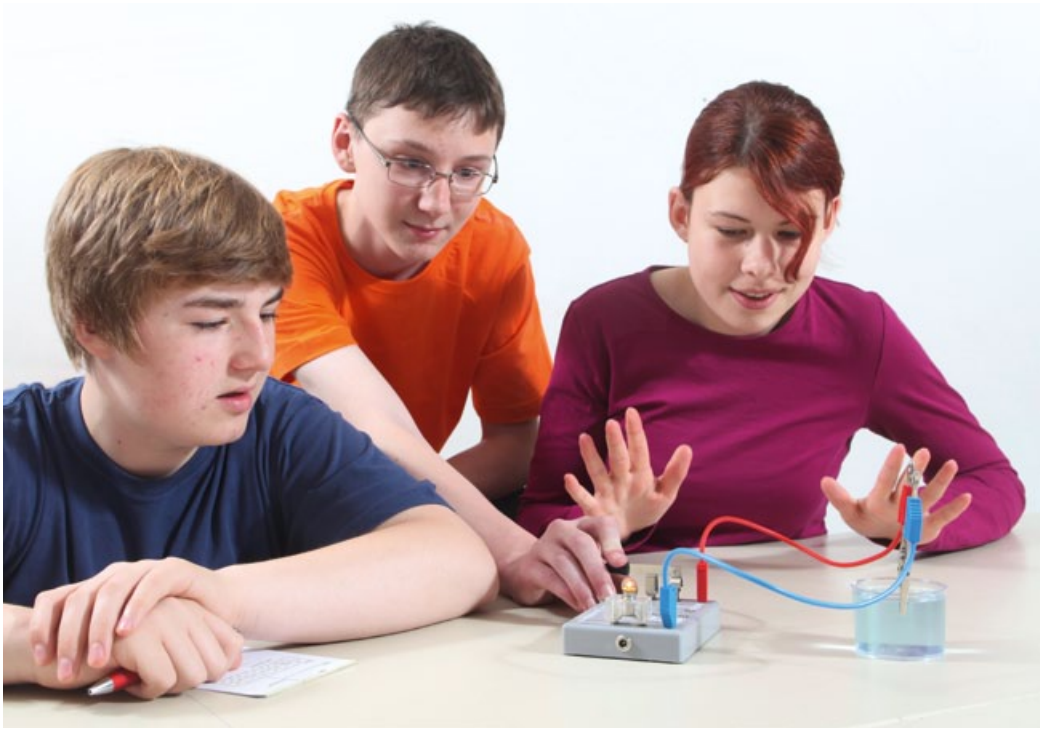
Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions



22006 Materials for 1 work group or demonstration



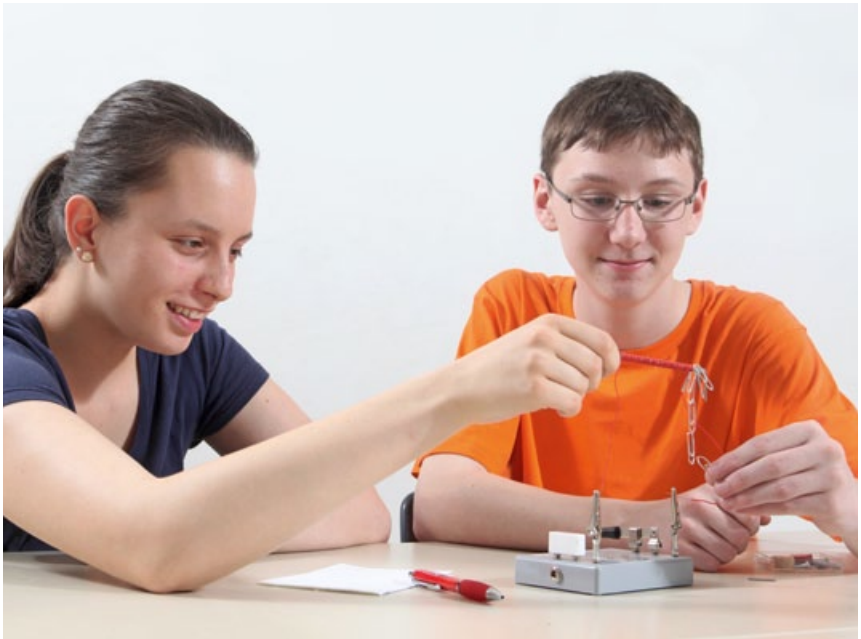
Detailed instructions for 23 experiments:

Electricity

- Electric charge
- Effects of electric charge
- Forces between electric charges
- Demonstration of electric charge
- Electric circuits
- Electrical conductivity of
  - solid substances
  - liquid substances
- Wiring of voltage sources
- Lamps connected in parallel
- Lamps connected in series
- Heat / 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



Students kit 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.

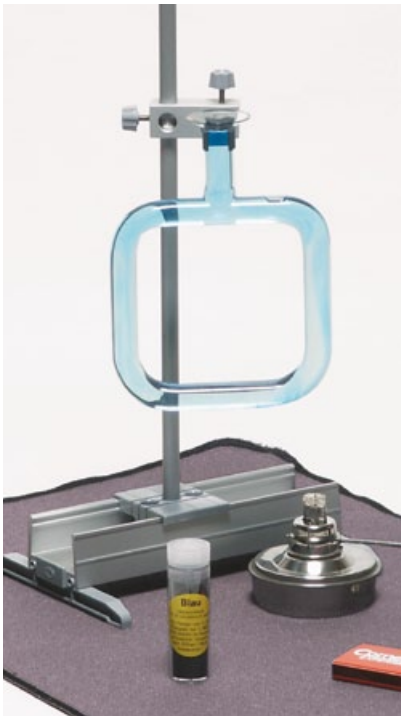
In a further set of topics, experiments are performed to elucidate the concept of heat and how heat from the sun could be utilised.

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions

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

Age 11 – 14

Students kit 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

22012 Materials for 1 work group or demonstration

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

Recommended:

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

Students kit 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

22014	Materials for 1 work group or demonstration

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

Age 11 – 14

Students kit What you feel, what you see what you hear

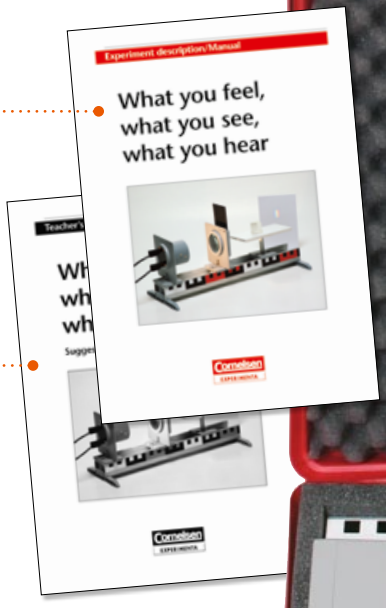
This kit contains equipment and resources for scientific experiments covering multiple disciplines to perform simple experiments on three of the five senses, touch, hearing and sight. Some simple experiments are used to study the propagation of light, the sense of sight and the function of key optical 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:

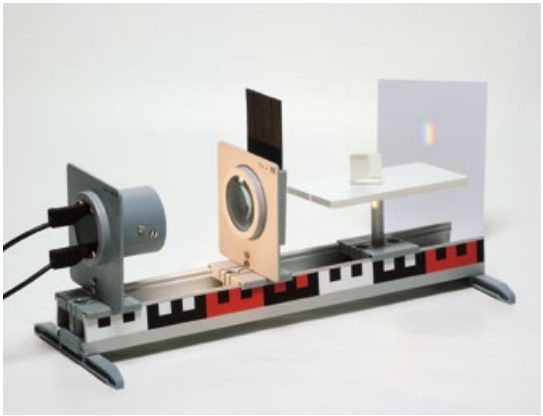
Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions



Additional power supply required, e.g.:

55217 Power supply unit 12 V (see page 71)



22018 Materials for 1 work group or demonstration

Detailed instructions for 28 experiments:

What you see

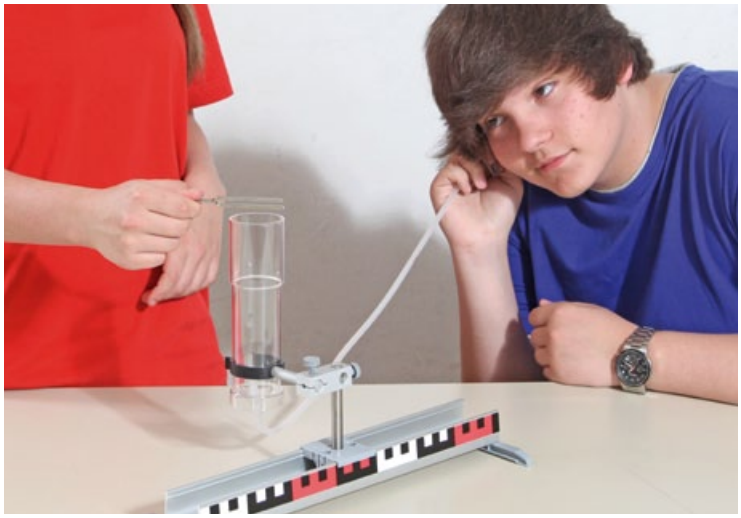
- Propagation of light
- How to create beams of light
- Light and dark
- Light and shadow
- Deflection of light
- How reflections happen
- Light can change direction
- Focusing and dispersing light
- How images are created
- How the eye sees
- Why do people need glasses?
- Not all spectacles are the 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



Students kit Forces and motion in nature and technology

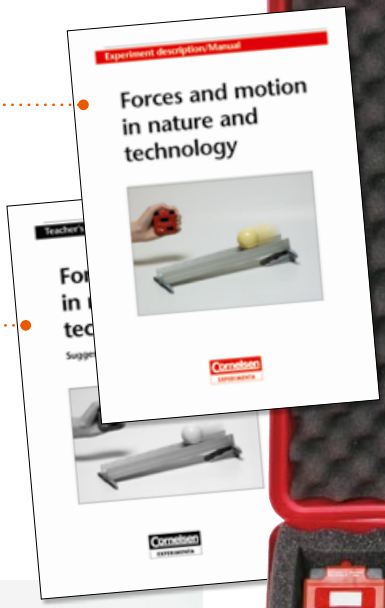
This kit contains equipment and resources for scientific experiments covering multiple disciplines to conduct simple experiments on the effects of mechanical forces.

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:

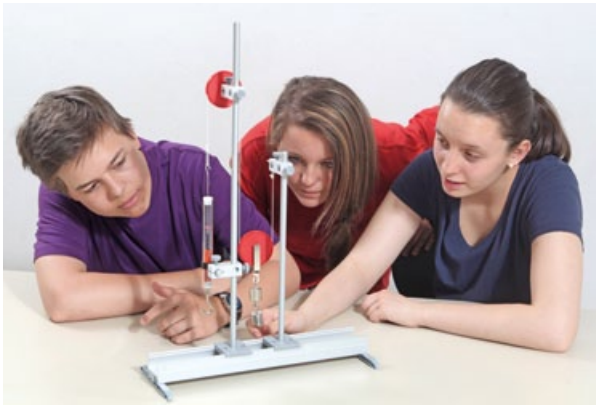
Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions



22021 Materials for 1 work group or demonstration

All
stand equipment
included!



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

Students kit Plants, animals, habitats

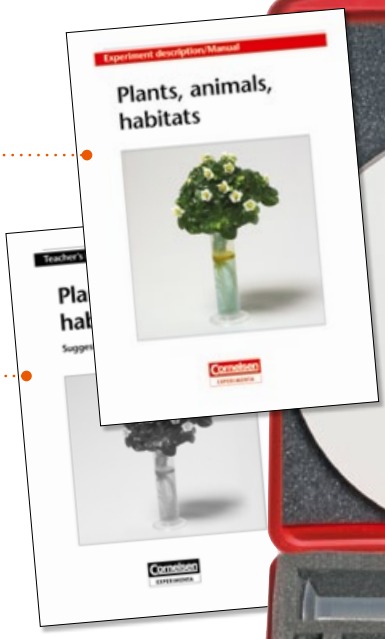
This kit contains equipment and resources for scientific experiments covering multiple disciplines to investigate the living conditions of plants and microscopic creatures.

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.

Included in delivery:

Experiment description
- with student worksheets

Teacher's booklet
- with suggested solutions



22024 Materials for 1 work group or demonstration

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 of water bodies
- 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 soils
- Examination of soil samples for living creatures

VINUS explores the world

Using a story to get pupils excited about experiments

"Whoa, slow down there," says Ben trying to rein him in. But Vinus is unstoppable.
"What you call air sure can't be very heavy," he simply keeps on talking.
"You can't even see it and you can't lift it like this stone." Lili laughs …

NEW PRODUCT

This is a typical excerpt from one of the stories about the little extra-terrestrial creature Vinus, whose space capsule makes a rough landing on Earth. Things on the Earth are perfectly normal for the children Ben and Lili and their dog Jojo, but that doesn't mean they can really explain everything correctly. So they set off together to investigate certain phenomena.

The use of storytelling as a methodology captivates the pupils right from the start. Through stories about Vinus and his friends, topics are transposed from the instruction syllabus to the real world of the children. This gives open questions personal meaning for the children. As a result, they are excited to find the solution to the question for themselves and retain a solid understanding of the responses and interrelationships.

Science instruction through storytelling

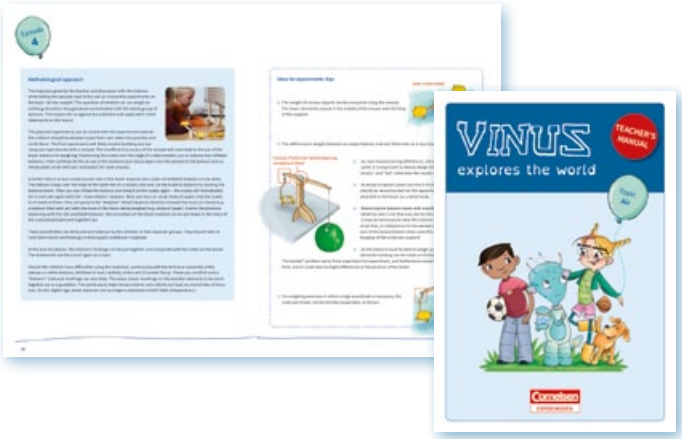
Vinus explores the world is an innovative series based on the storytelling method that combines stories with experimentation.

And here's how it work:

- For each topic, such as 'Air', there are separate stories – for the extra-terrestrial creature, they are **episodes**. The key points arising from an episode always lead to a concrete topic of instruction, e. g. "Air has a weight".
- The episode incites the children to develop their own questions and conjectures. **The concept story** helps them do so.
- This enables each child to reach the intended conclusions individually at their own pace and in their own way. There is no right or wrong here, detours are permitted.
- **The materials** are precisely matched to the content of the episode, thereby maintaining motivation throughout the duration of the experiment.
- This is investigative discovery learning, which furthermore demands social skills because problems are solved together.
- The observations and findings can be recorded in the logbook individually according to the abilities of the child.

Teachers manual

Stories for reading out loud • Methodical approach
Experiment ideas / tips • Pedagogical instructions
Additional information and practical everyday references
Discussion topics and technical answers • Substantive analyses



Concept stories

Visual repetition of the story • Orientation and insights for experiment ideas
Latitude for own thought and possible solutions • Solution approaches

Logbook for pupils

Concept stories as mnemonic device • Room for documenting results • Galactic Researcher PasSport
Hidden object game to colour in
Experiments to do at home

Equipment

represents what the story is about – less of a conventional example, but rather "fantastic" (e. g. Vinus hands and antennae), thereby instilling additional motivation.

Science instruction through storytelling

Episodes

NEW PRODUCT

Topic Air

Introduction to air
Episode 1: The chaotic Landing

Introduction to the phenomenon of air pressure and its effects
Episode 2: Struggling with the Unknown

Experimenting with air resistance
Episode 3: The Beginning of a Friendship

Experimenting with the notion that air has weight
Episode 4: Mysterious Air

Initiation of modelling concepts: Perception of air under water
Episode 5: Unruly Air

33106	Vinus explores the world – Topic Air, equipment for 6 groups (with concept stories), including 1 teacher's manual and 1 logbook

Perfectly matched supplies:

Teacher's manual – Air

- Story to read aloud or tell
- Methodical approach
- Possible experiment ideas / tips
- Pedagogical instructions
- Additional information to tell / practical everyday references
- Discussion topics and technical answers
- Substantive analyses
- DIN A4, 48 pages.

3310061

Logbook for pupils – Air

- Concept stories as mnemonic device
- Plenty of room to document findings
- Hidden object game to colour in
- Experiments to do at home
- DIN A4, 24 pages.

3310062 single
3310066 10-pack

Vinus doll

Vinus as a doll can be integrated into the experiments and engenders a high degree of identification among the children.
30 cm high, with zip on the back for emptying and filling the doll.

33050

Demo-Set Ufo

A vacuum pump is used to take the air from the space capsule (Magdeburg hemispheres principle).

The demo set contains:

- UFO as 2 hemispheres (assembled),
- Vacuum pump, 1 valve, small bag of confetti
- Vacuum bag that the Vinus doll fits inside
- Instructions with tips and suggestions

33150

Vinus explores the world – Topic Air, equipment for 1 group (with concept stories)

Equipment for 1 group (with concept stories).

33100

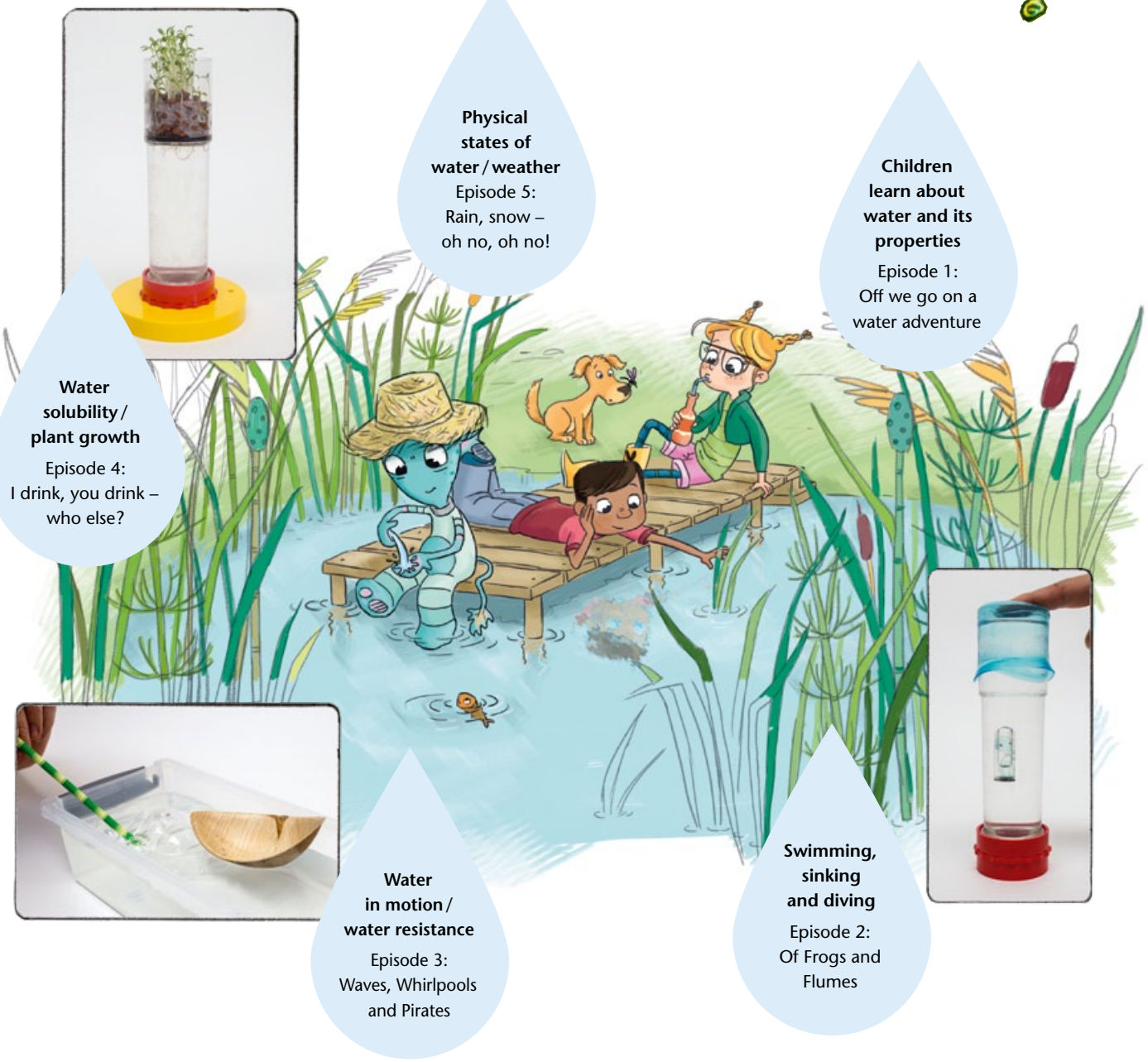
Science instruction through storytelling

NEW PRODUCT

Available in September 2019

Topic Water

Episodes



Physical states of water / weather
Episode 5:
Rain, snow – oh no, oh no!

Children learn about water and its properties
Episode 1:
Off we go on a water adventure

Water solubility / plant growth
Episode 4:
I drink, you drink – who else?

Water in motion / water resistance
Episode 3:
Waves, Whirlpools and Pirates

Swimming, sinking and diving
Episode 2:
Of Frogs and Flumes

33206	Vinus explores the world – Topic Water, equipment for 6 groups (with concept stories), including 1 teacher's manual and 1 logbook for pupils
33200	Vinus explores the world – Topic Water, equipment for 1 group

An excerpt from Episode 1:

“The children splash the water with their feet. All the fish dart away. Vinus plunges his shovel-hands into the water and then straight away his feet too. “That feels …”

He pauses to think about it. “Wet!” shouts Ben.

“Slippery,” says Lili, “and smooth.”

“Cool,” says Vinus, “and supple.”

He scoops up some water with his shovel-hands, but it flows away.

“That’s strange,” says Vinus. “The water runs away, but it also stays on my hands.”

He clasps his wet palms together.

As he pulls them apart again, he stops in his tracks.

“The water glues my hands together.”

Perfectly matched supplies:

Teacher’s manual – Water

- Story to read aloud or tell
- Methodical approach
- Possible experiment ideas / tips
- Pedagogical instructions
- Additional information to tell / practical everyday references
- Discussion topics and technical answers
- Substantive analyses
- DIN A4, 48 pages.

3320061

Logbook for pupils – Water

- Concept stories as mnemonic device
- Plenty of room to document findings
- Hidden object game to colour in
- Experiments to do at home
- DIN A4, 24 pages.

3320062 **single**

3320066 **10-pack**

Vinus doll

Vinus as a doll can be integrated into the experiments and engenders a high degree of identification among the children.
30 cm high, with zip on the back for emptying and filling the doll.

33050

Age 8 – 12

Students kit Sound and tone

This kit can be used in lessons covering physical and technical subjects as well as music and languages.

The kit is especially suitable for learning in groups at specific workstations but can be used for any other type of lesson too.

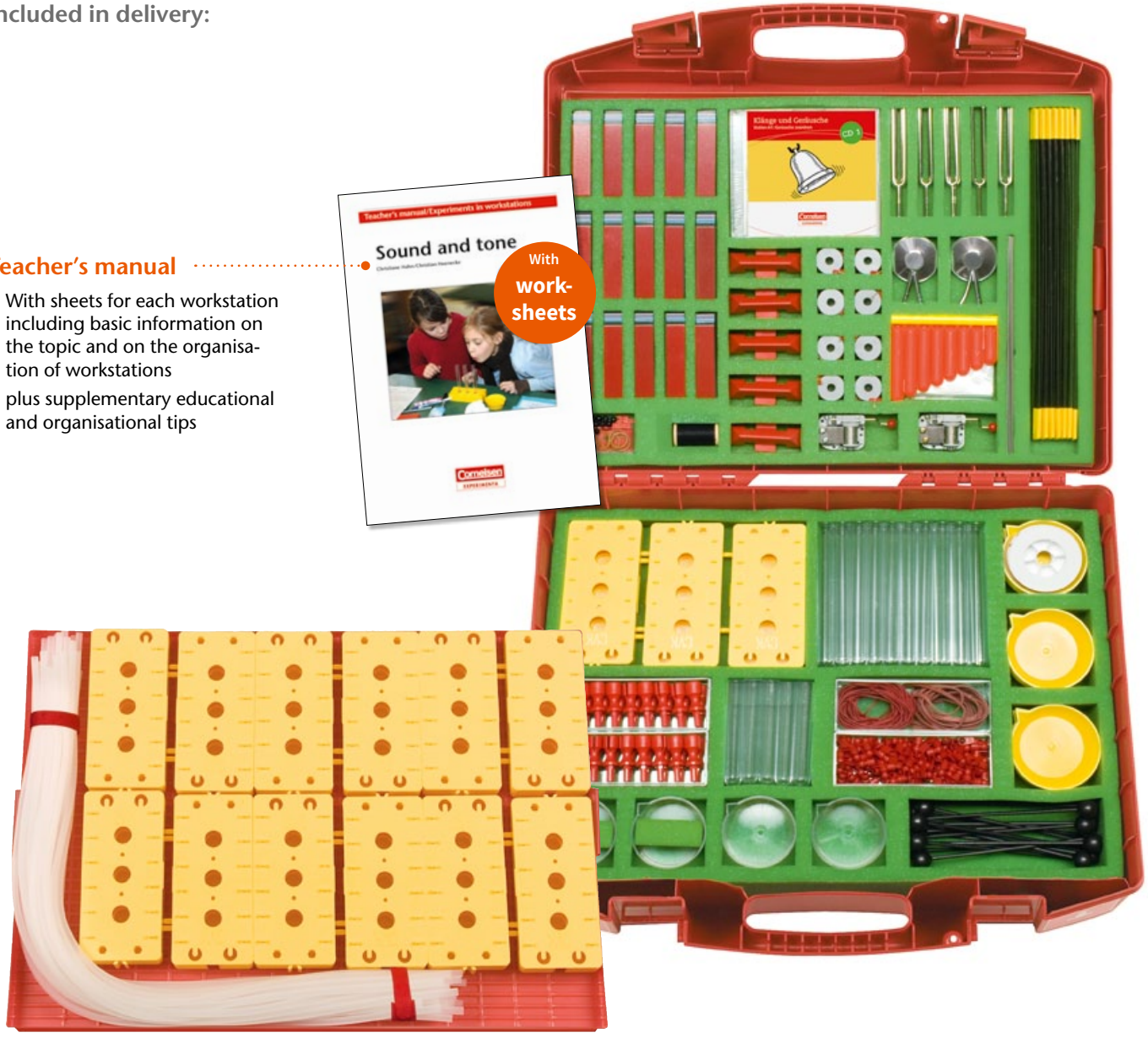
With the help of four CDs the children learn to classify sounds and noises and to identify and name them. They also learn to distinguish similar noises.

Needed in addition: One or two CD-players.

Included in delivery:

Teacher's manual

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



31720 Materials for up to 25 workstations

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

With copy templates covering 25 workstations.
The equipment can be used in these 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

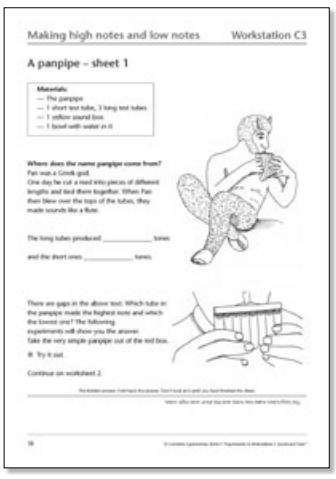
- Loud or quiet?
- The mysterious body
- A sound beaker
- A 'cackle box'

Transmitting sound

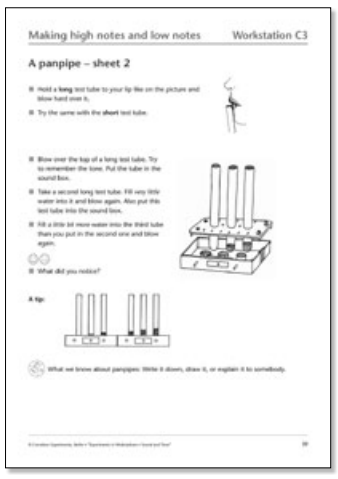
- Why do we have two ears?
- Along the string and into your ear
- A string telephone
- Sound travels
- The magic finger
- A stethoscope
- Hearing through plastic tubes

Conclusion

- Accompanying a story with suitable noises


Making high notes and low notes Workstation C3

A panpipe – sheet 1


Making high notes and low notes Workstation C3

A panpipe – sheet 2

Copy templates from the 'Teacher's manual'

Students kit Floating and sinking

This kit allows children to observe the essential phenomena of floating and sinking.

The key experiments are based on “boats” that the children can make from two sorts of plasticine: One sort is lighter than water and therefore floats whereas the other one is heavier than water and usually sinks unless it is moulded into a shape that can float.

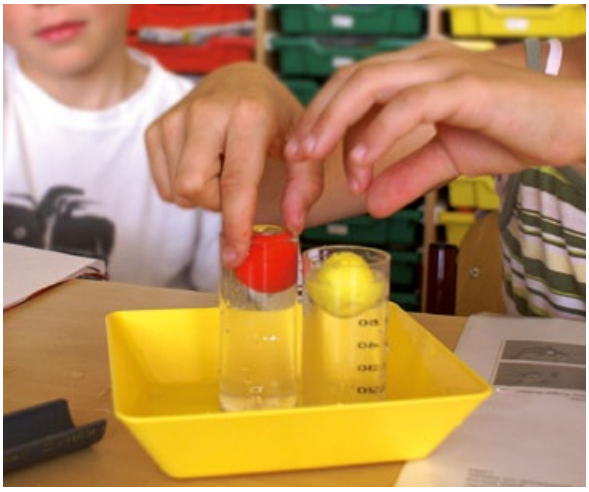
The box also contains balls and a cube made of materials used in the building of ships and boats: wood, steel, aluminium and plastic.

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 workstation including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips



31900	Materials for up to 14 workstations

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.
The equipment can be used in these 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?

Students kit Magnet and compass

Lessons about magnets

Children learn about the properties of magnets.

Half of the bar magnets in the kit do not have pole marks so that the children learn to determine north and south poles for themselves.

Lessons about the magnetic compass

Experiments with suspended or floating magnets lead to an understanding of how compasses work.

Children also learn to assemble their own compasses and to use them properly.

Included in delivery:

Teacher's manual

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

31756 Materials for up to 24 workstations

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

With copy templates covering 24 workstations.
The equipment can be used in these experiments:

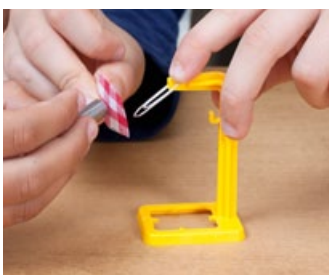
Magnet – Iron
- The big material test
- A 'metal exhibition'
- Uncle Scrooge's fishing game
- The big iron test
- Rusty bike?
- Using paper clips to find magnets

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



Students kit Air – Gases around us

We constantly breathe air in and out. Air pressure weighs down on all of us. But as it is mostly invisible children often think that air is “nothing”.

The experiments allow the children to learn about the properties of air and to understand that air is concrete and tangible.

The kit also provides demonstration material for spectacular experiments for the teacher.

Included in delivery:

Teacher’s manual

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

31710	Materials for up to 31 workstations

Teacher's manual
'Experiments in workstations: Experimenting with air'

With copy templates covering 31 workstations. The equipment can be used in these 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

Students kit Electric circuits

Children experience electricity everywhere in their everyday life. This kit helps to explain how electricity is used to produce light, heat and motion.

Children will also learn that electricity can flow under certain conditions only.

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

Included in delivery:

Teacher's manual

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

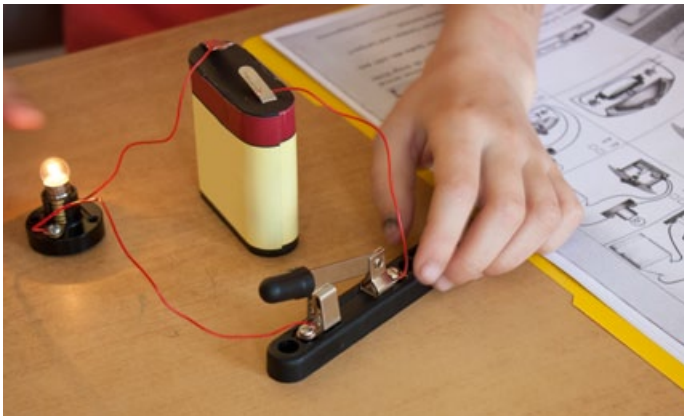
31772	Materials for up to 33 workstations

▶ Teacher's manual
'Experiments in workstations:
Electric circuits'

With copy templates covering 33 workstations.
The equipment can be used in these 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



Students kit Primary chemistry

Why does the sugar in the tea vanish after stirring? Why do blobs of grease float on the top of the soup while the noodles sink to the bottom? Why does sherbet dropped into water create a lot of fizz? For children water is part of their everyday lives. And they notice and watch these phenomena. Some of them – how substances behave in water – can be explored with this box.

By mixing water with various substances and conducting experiments under varying conditions, the students can investigate how the substances behave and identify any similarities or differences. This develops a systematic, networked and sustainable way of thinking that also gets students making the right connections and coming to the right conclusions.

The experiments follow a common theme, becoming increasingly difficult as they go on.

The following topics are covered:

- Solubility in water in general
- Conditions governing solubility in water
- Water-soluble and water-insoluble substances
- Reversing the dissolving process through crystallization
- Thermal changes caused by dissolving substances in water
- Changes in viscosity caused by dissolving substances in water
- Formation of gas caused by dissolving substances in water

Developed in cooperation with the **University of Dortmund** and **LANXESS**

+

90350 Materials for 6 work groups

What happens when we mix water with ...
... salt ? ... sand ? ... vinegar ? ... oil ? ... sugar ? ... soil ?

Teacher's manual
'What happens when we mix water with ...?'

With copy templates covering 10 workstations.
The equipment can be used in these experiments:

- Tea and sugar
- Water and sugar
- Water and sugar
  - with and without stirring
  - warm and cold
  - in large quantities
- Water and various substances
- Water and salt
- Water and urea
- Water and gelling agents
- Water and sherbet

Included in delivery:

Teacher's manual
„What happens when we mix water with ...?"

- The manual includes basic information on the topic and the organization of workstations for the teacher.
  It also contains information about the scientific background, didactic notes on each experiment and student worksheets.
- Including a list of materials and rules for experiments.

... with sherbet ?

... with gelling agents?

... with urea ?

... with sugar ?

Students kit Water purification

Water is vital to our lives and those of animals and plants. The kits *Water purification* and *Water supply* help children to understand the cycles of water.

They will learn where the water comes from, how it is distributed, utilized and finally rinsed away to be treated and put back into the cycle. They will recognize the importance of water for life and learn how to save water as a resource.

Examples of experiments:

- 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 workstation including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips

31802 Materials for up to 24 workstations

Teacher's manual *'Experiments in workstations: Water purification'*

With copy templates covering 24 workstations.
The equipment can be used in these 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

Kit Water supply

This kit contains an easy to set up demonstration apparatus which allows to demonstrate the following:

- Usage and function of a rotary pump for pumping water around a system of pressure pipes
- Usage and function of a main supply
- Function of an elevated tank and the principle of linked water vessels
- Function of a water tower and its usage as a reservoir

Included in delivery:

Teacher's manual

8231	Materials for demonstration

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

Students kit Wind and weather

Children learn how to recognise, distinguish and measure different weather phenomena such as

- temperatures
- cloud cover
- wind direction and force
- precipitation

They also learn reading and using the various weather symbols used on official weather forecast charts.

At the same time basic scientific skills like observation, documentation and evaluation as well as the use of instruments are practised and encouraged.

Included in delivery:

Teacher's manual

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

8959 Materials for up to 33 workstations

▶ Teacher's manual 'Experiments in work-stations: Wind and weather'

With copy templates covering 33 workstations. The equipment can be used in these 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

Students kit Primary optics

Can light go around the corner? Are there coloured shadows? Why is it dark at night?

Light and shadow, colour and reflection are optical phenomenons, that fascinate children. Experiments will help them to understand the natural scientific facts behind the phenomenon.

The field of vision, the structure of the human eye and other secrets become comprehensible.

All experiments tie in with the experiences of the children. In a playful way they will find out the laws of reflection, the composition of light and optical illusions. Playing with shadows will lead to surprising discoveries.

Included in delivery:

Teacher's manual
- With sheets for each workstation including basic information on the topic and on the organisation of workstations
- plus supplementary educational and organisational tips

- Optical illusions

31749 Materials for up to 22 workstations

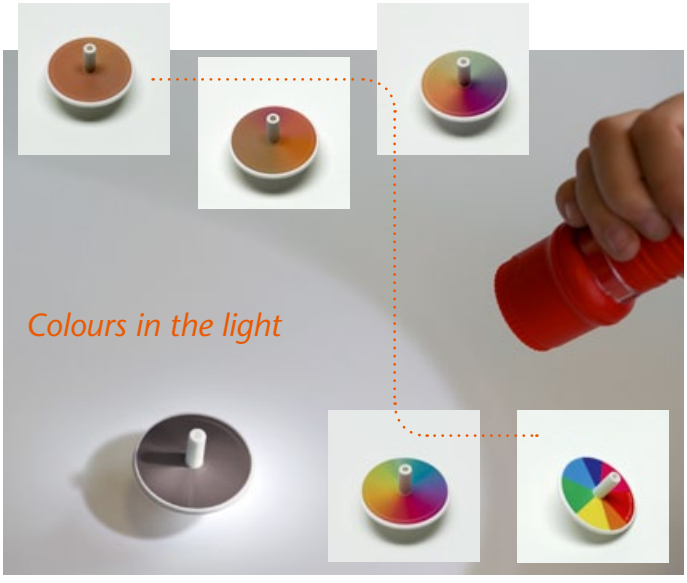
With copy templates covering 22 workstations:

Light and vision
- Human eye
- Field of vision
- Seeing in the dark
- Optical illusions

Shadow
- Shadow
- Shadow play
- Coloured shadows
- Day and night

Reflections
- Strange multiplication
- Flame in water
- Curved mirrors
- Flexible mirrors

Colours
- Colours of the rainbow
- Colours in the light



Students kit Balances and equilibrium

The kit provides simple seesaws, beam balances, spring balances, dial balances and balance beam (lever) calculating machines.

Children learn some historical and physical aspects of scales and weighing. They also learn

- to understand the principle of a seesaw
- to assemble and use a beam balance
- to calculate with a system of measures
- a common system of measures
- to appreciate the advantages of a common system of measures

Some examples of experiments:

- from seesaw to balance
- beam balance
- Egyptian balance
- Roman balance
- Spring scale with calibration
- Calculator balance (equal-arm lever)
- Calculator balance (unequal-arm lever)

Included in delivery:

Teacher's manual

- With tips on planning lessons and student experiments.

31780 Materials for 15 work groups

Age 8 – 14

Students kit Vehicles to build and drive

This kit contains 6 *learning sets (68544)* 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.

The precision of the individual parts allows 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.

64433	Materials for 6 work groups
68544	Learning set with materials for 1 work group

Students kit **Heat**

Thermometers teaching unit

Children learn how to make a thermometer by themselves, how to use it and how to determine freezing and boiling points of water on a thermometer without scale.

This way they learn the basic terminology and theories of heat and thermal expansion.

Evaporation and condensation teaching unit

Children learn to understand the water cycle by finding out what happens when a liquid is converted into a gas and that a gas can be converted back into a liquid.

Additionally recommended:

Insulated wide neck vessel

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

Content of vessel: 1 litre

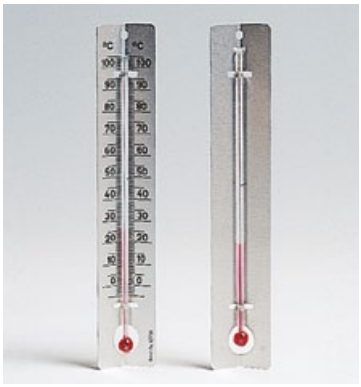
48880

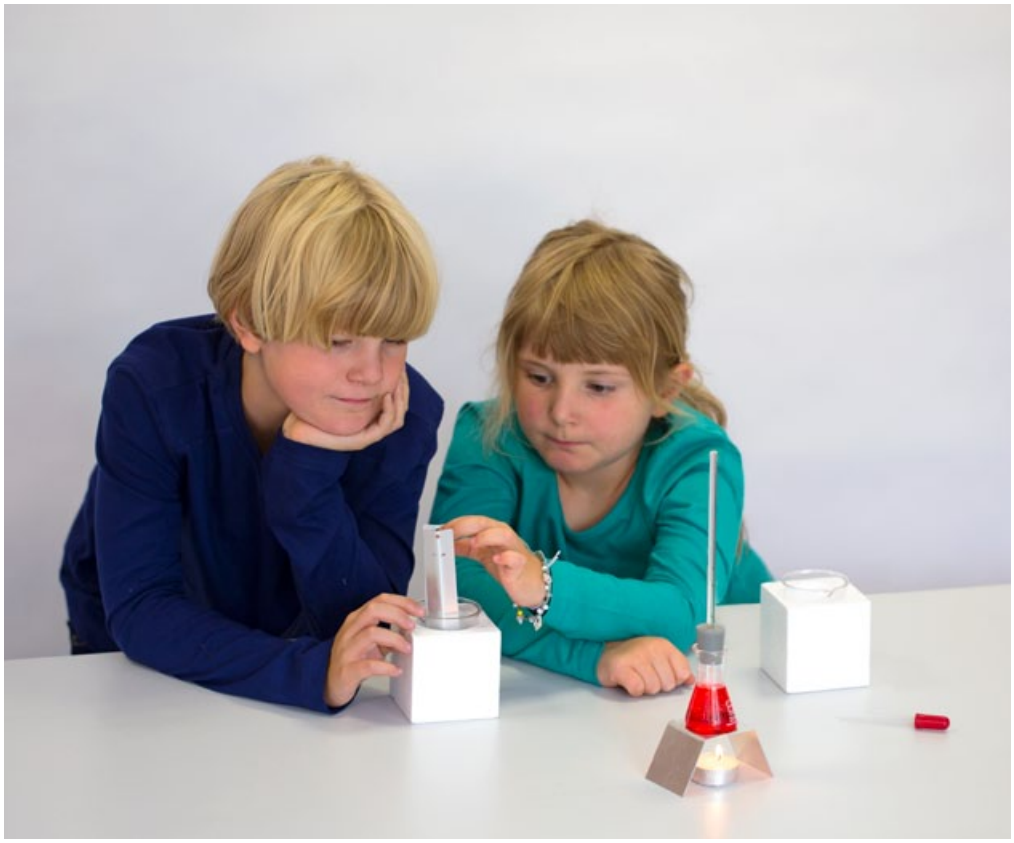
Included in delivery:

Teacher's manual

- With tips on planning lessons and student experiments.

31799 Materials for 15 work groups

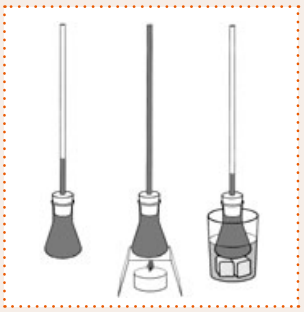




▶ Survey of experiments:

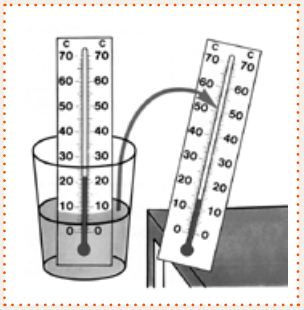
Thermometers teaching unit

- 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 condensation 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



Age 8 – 14

Students kit Primary science

This kit allows two or three groups of children to carry out simple experiments. Teachers can also use it for demonstration.

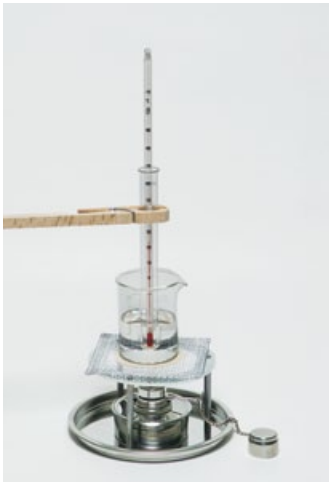
The manual describes 101 experiments on the following topics:

- Force/Energy
- Water
- Electric current
- Magnets
- Air and sound
- Light
- Heat
- Plants

Included in delivery:

Experiment description

16300	Materials for 1 – 3 work group or demonstration



Survey of experiments:

Force
- What is a force?
- Force and counterforce
- Forces change motions
- Forces at the tug-of-war

... and 10 further experiments

Heat
- A water thermometer
- How steam ...
  – is made from water
  – will become water again
- How seawater can be made drinkable

... and 9 further experiments

Electricity
- A simple electric circuit
- Lamps side by side in parallel
- Lamps one behind the other in series
- Good and bad conductors

... and 4 further experiments

Water
- Is water a body?
- Can water displace air?
- Can water stand inclined?
- Where does the water go?

... and 8 further experiments

Energy
- What is a force?
- Force and counterforce
- Forces change motions
- Forces at the tug-of-war

... and 2 further experiments

Light
- Which way does the light take?
- How the light can be controlled
- An object in the light beam
- Can light be swallowed?

... and 10 further experiments

Air and sound
- Is air also a body?
- Air is an elastic body
- How sound waves can be seen
- Can the sound go round the corner?

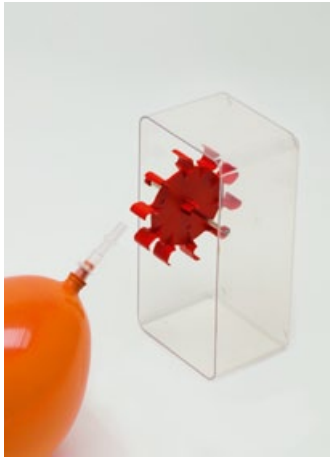
... and 12 further experiments

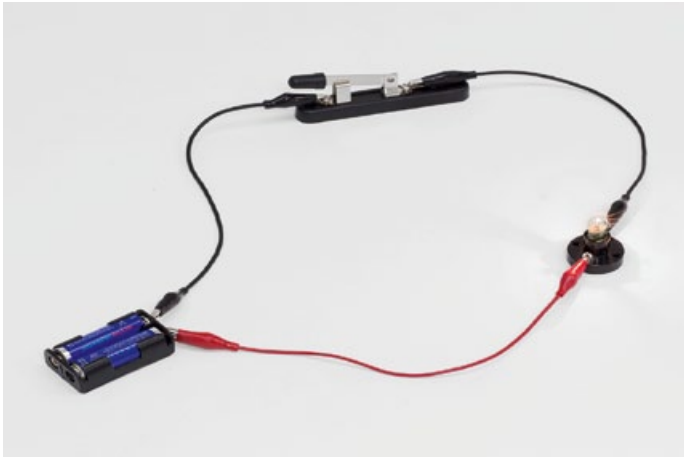
Plants
- Plants need light
- When plants sweat in the sun
- Plants improve the air
- Plants produce oxygen

... and 4 further experiments

Magnets
- Magnets have a force
- Do all materials react on a magnet?
- When magnets encounter
- Penetrating forces

... and 5 further experiments



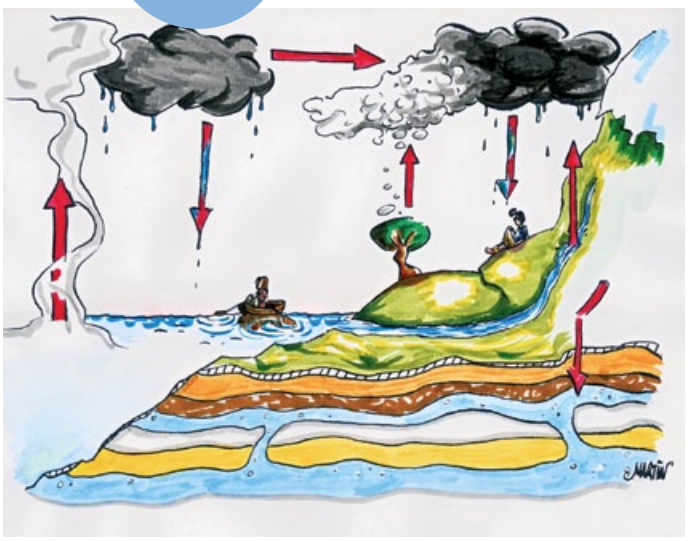


Students kit EcoLabBox

Age 8 – 16

The *EcoLabBox* allows children to carry out 45 experiments and to make water and ground analysis directly on local sites.

The kit helps to detect and measure the most important substances that influence our environment.



▶ In a case with foam insert for transport and storage (390 x 300 x 105 mm):

- German manual
- Reagent set for 59 experiments
- Extracting liquids for ground analysis for at least 20 pH, nitrate, phosphate and ammonium experiments
- Colour comparison card for relaying measured values
- Filtering tripod for filtering without spilling that can be directly mounted in the case
- Pocket magnifying glass with a magnification of 2 and 4
- Sample glasses, filter paper, laboratory bottles with a wide neck and measuring beakers
- DIN A2-sized posters for entering measuring results and further explanatory illustrations

Included in delivery:

Manual
German manual with 80 pages, including coloured illustrations, tables and detailed explanations

537557 Materials for 1 work group

Students kit Gear and drive models

Age 8 – 16

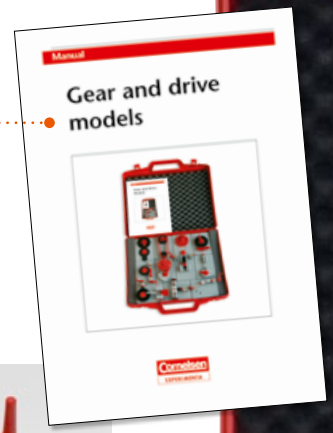
The models of the most important gears and drive systems are put together in a design ideal for educational purposes. They not only clearly demonstrate the design and function of the gears in the model but also allow students to derive basic knowledge from the models.

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.

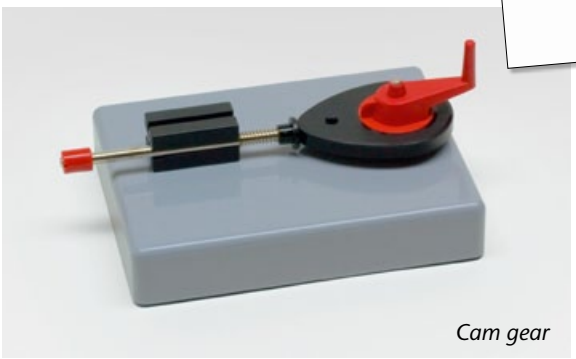
Differential gear train

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.



Cam gear

Rack and pinion gear

65500 Materials for 1 work group or demonstration

Age 8 – 14

Students kit General science

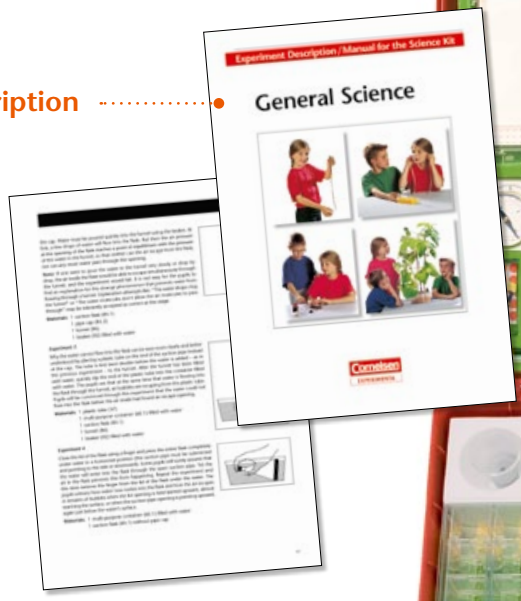
The kit was developed for schools which require a small but complete collection of teaching materials for experiments in science. The kit can accompany basic courses in elementary schools.

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.

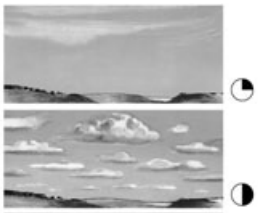
Included in delivery:

Experiment description

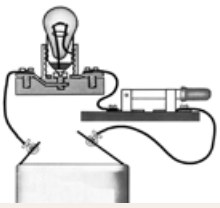


31500 Materials for 1 work group or demonstration

▶ Survey of experiments:

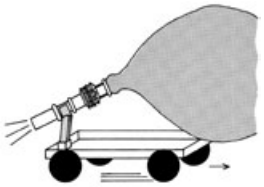


Weather
- What makes the weather?
- Recording the temperature
- Measuring the temperature day by day
- Clouds/Wind direction
- Recording the rainfall



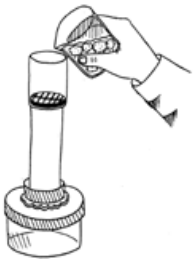
Electrical circuits
- Battery and bulb
- The glass of the bulb
- Simple circuit
- The switch in the circuit
- Series and parallel circuit
- Electric current generates heat
- The electromagnet

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 depressure
- Air acts as resistant force against bodies which are moving



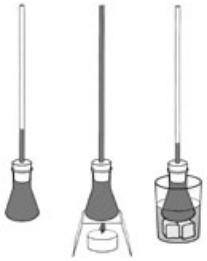
Chemistry
- Dissolving table salt
- Igniting a splinter of wood
- Heating sugar lumps
- Coating a nail with copper
- What role does air play for combustion?

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)

Heat
- Heating and cooling – water
  – 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



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

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

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
- Sound absorption
- String telephone

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/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.

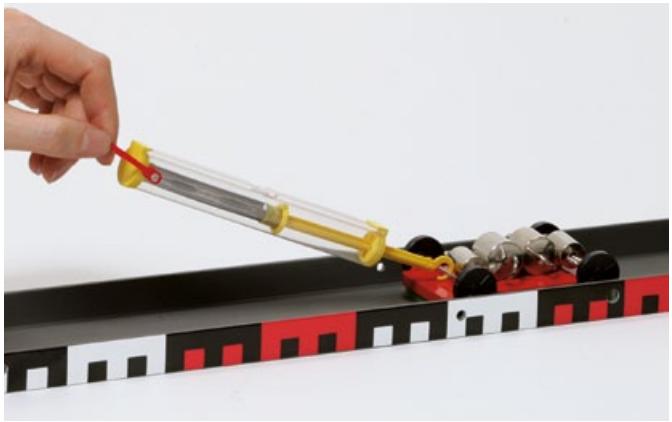
Human biology/Teeth: Comparative examinations of incisor and molar and explanation of caries as a result of inadequate tooth care.

Mini-Kit *'Mechanics'*

Age 8 – 14

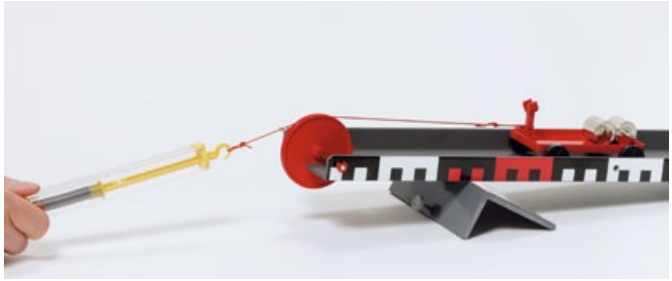
The kit contains a comprehensive manual and 17 different items for multiple use e.g. a rail profile, a stand base, a car, a dynamometer, pulleys, masses with hooks and scale pans.

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

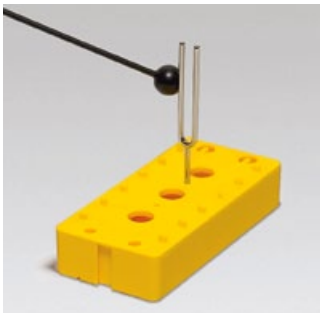
16102

Mini-Kit *'Sound'*

Age 8 – 14

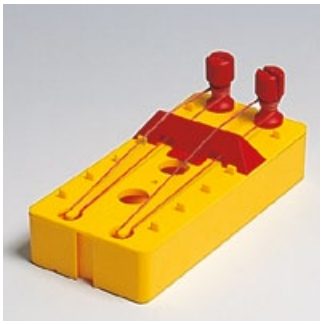
The kit contains a comprehensive manual and easy to set up equipment e.g. a sound box, a tuning fork, test tubes, sound plates, chord stretchers, rubber rings, springsteel strip and ear hoses, with which 8 basic experiments in the field of acoustics can be carried out.

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



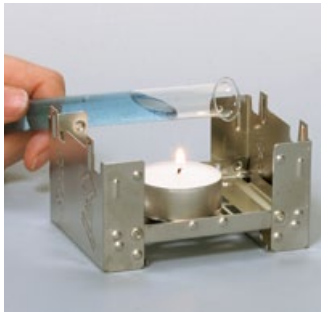
16104

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

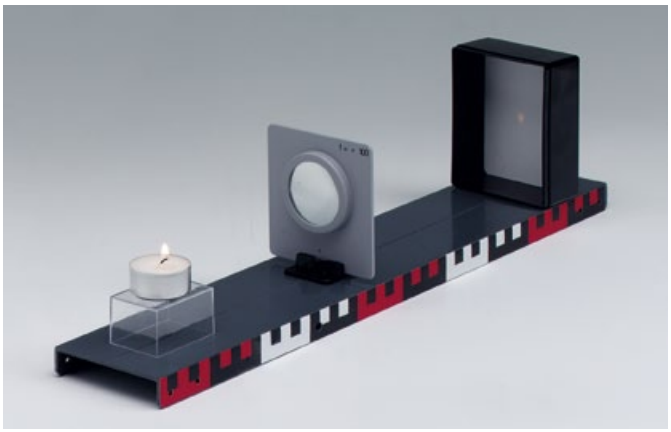
16106

Mini-Kit *'Optics'*

Age 8 – 14

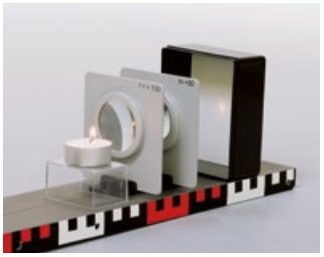
The kit contains a comprehensive manual and 19 different items e.g. an optical bench, a lamp with support, batteries, a slit diaphragm, biconvex lenses, screens and a shadow rod.

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'*

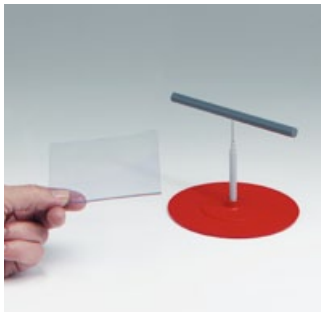
Age 8 – 14

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:

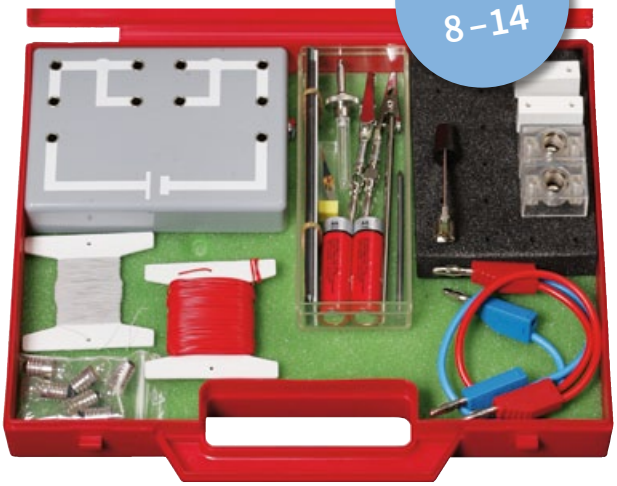
- Magnetic materials
- Magnets have a force
- Penetrating forces
- Magnetic field lines
- When two magnets encounter
- Can a magnet float?
- How a magnet can be produced
- The terrestrial magnetic field
- A magnet motor
- How magnetism can be used
- Electricity by friction
- Forces between two charged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



16115

Mini-Kit *'Electricity'*

Age 8 – 14



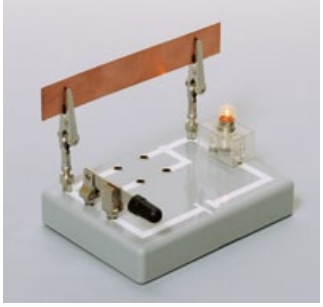
A special plug-base and plug-in elements are the most essential parts in the Mini-Kit 'Electricity'.

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.

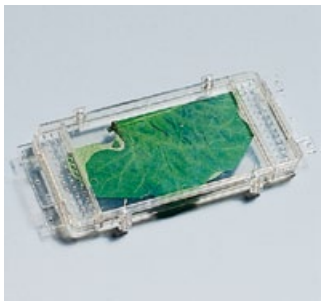
A very important basis for a profound and successful biological lesson is the carrying out of experiments with materials useful for this purpose.

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

Age 8 – 18

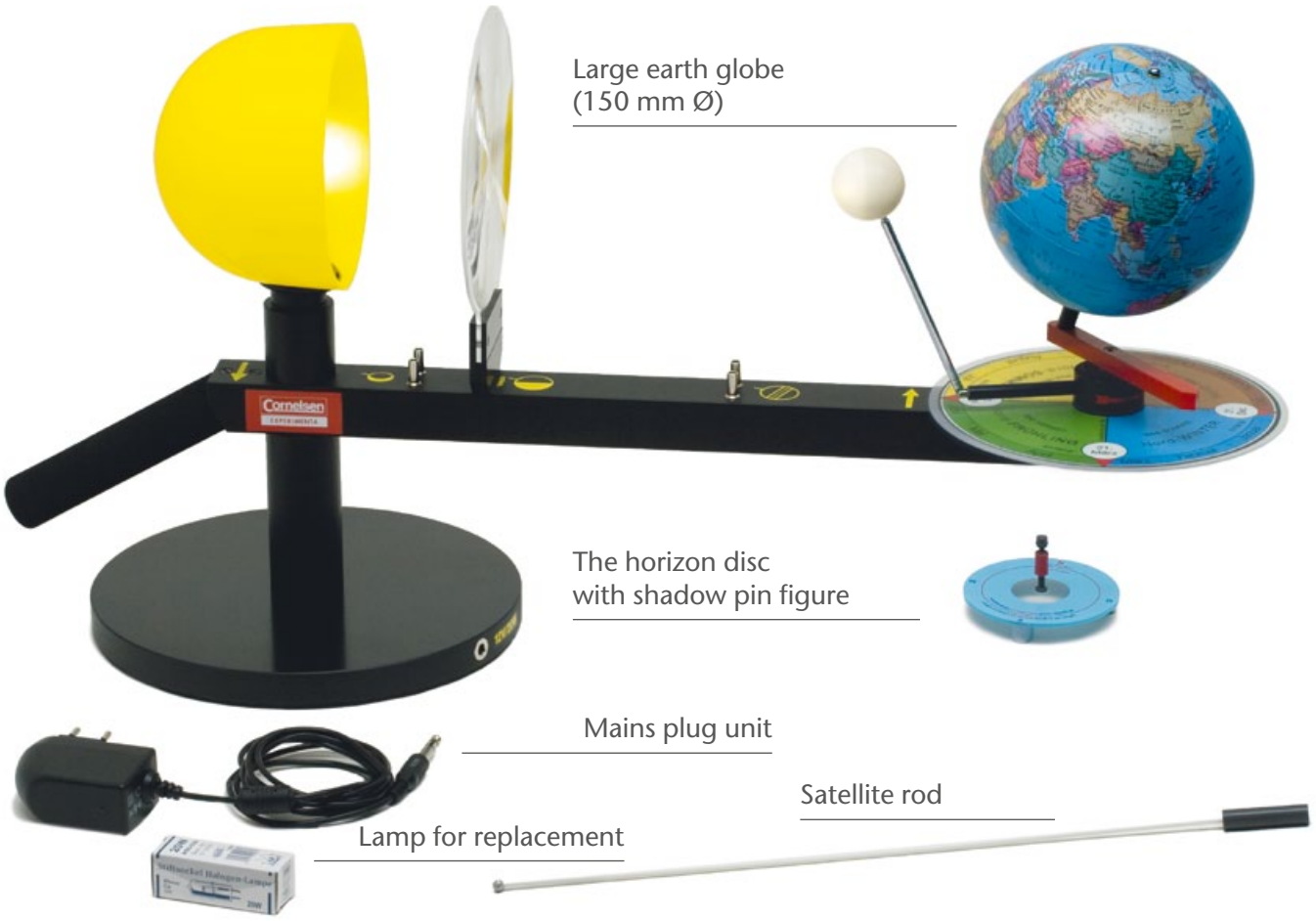
Tellurium N

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.

Further 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:



Also included:
Dust cover, water-soluble felt pen, cleaning-cloth

31121

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 'hale' 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.

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.

Tellurium N

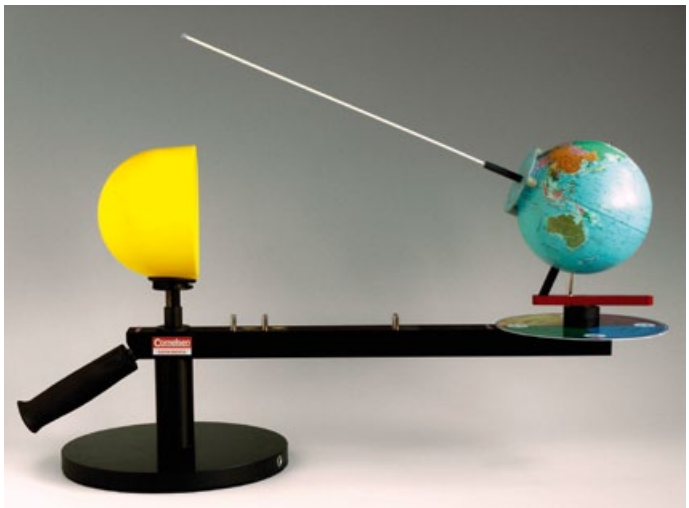
Included in delivery:

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

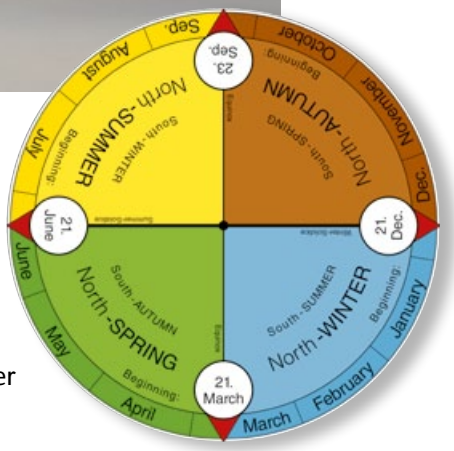


The satellite rod

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.

The moon on a telescopic support rod

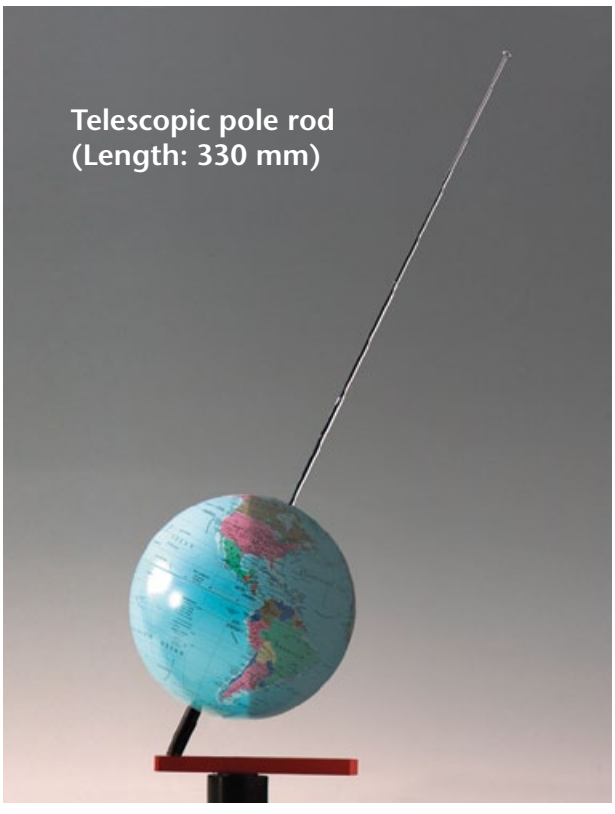
The moon can be moved around the earth by hand and adjusted in height to demonstrate lunar phases and eclipses.



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 inclined 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.



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).

Age 4–7

Anna 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

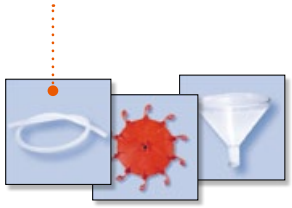
- All the experiments are carefully explained along with the scientific background.
- Short stories from everyday life involving Anna and Leon provide an introduction to the topics.

Instruction cards

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

Material cards

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



85021

▶ Experiments from the manual 'Anna and Leon experiment with water and air':

- Water can climb
- Water creates force
- Water can transmit power
- Water knows the level
- Water can squirt far
- Water can drive wheels
- You can see and feel air
- Air can open doors
- Air can carry people
- Air can stick things together
- Air can drive cars
- Air can lift up bodies
- Wind can generate power

Age 4–7

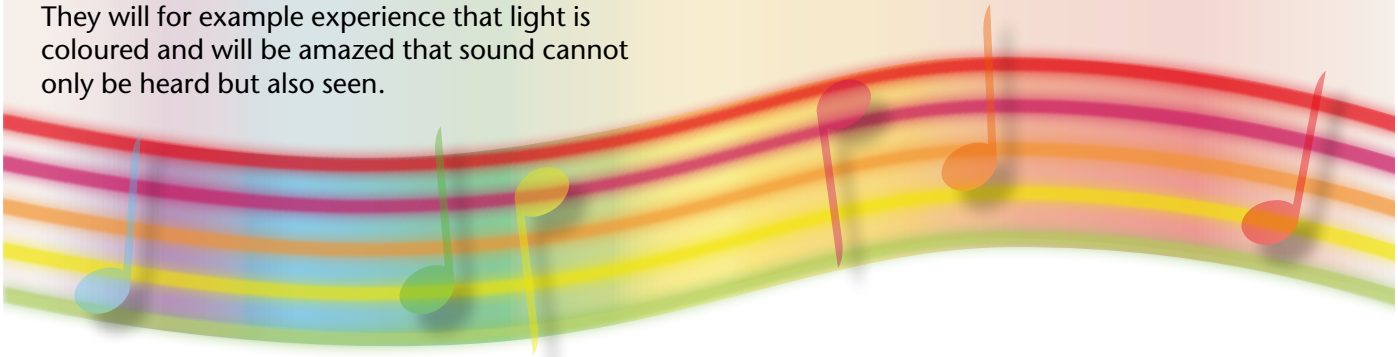
Anna and Leon experiment *with light and sound*

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.



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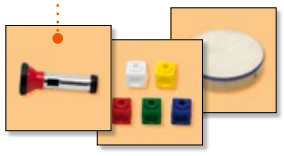


85022

Mirrors and magical pictures

▶ Experiments from the manual ‘Anna and Leon experiment with light and sound’:

- Light beams travel straight
- Light makes shade
- Diverting light
- Mirrors and magical pictures
- Behind the mirror
- Refraction of light
- Make small things look big
- Light is colourful
- Colours of the sky
- Blending colours
- High and low tones
- Sounds all around
- Vibrations create sounds
- Sounds can be heard and seen
- Transporting sound

High and low tones

Refraction of light

Colours of the sky

Age 4–7

Anna 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.

Included in delivery:

Manual

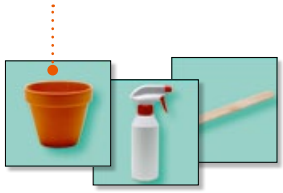
- All experiments are carefully explained along with the scientific background.
- Short stories from everyday life involving Anna and Leon provide an introduction to the topics.

Instruction cards

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

Material cards

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



85023

Plants grow from seeds

▶ Experiments from the manual 'Anna and Leon experiment in nature and environment':

- Plants grow from seeds
- Plants grow towards the light
- Plants need a clean environment
- Different plants grow differently
- Plants have different body parts
- Life under our feet
- Animals live everywhere
- The ground stores our water
- The many things beneath our feet
- Wind and weather are important
- Nature is a cycle
- Different habitats for different creatures
- How the ground is made
- How's the weather?
- How can we promote plants?

Plants grow in different ways

Plants grow towards the light

The many things beneath our feet!

Age 4–7

Anna and Leon experiment *with lever, pulley and magnet*

Lever, pulley and magnet – there is something moving!

This kit revolves around the forces which children come across in their daily lives. They will be surprised to discover where a lever is hidden and where a pulley turns round forces. Especially attractive for children are the effects of magnetic force.

With the materials they can detect the forces of lever, pulley and magnet.

Exciting, curricula-based experiments will enable the children to explore phenomena in environment and technics. Their interest in natural sciences will be wakened and encouraged.

The experiments are fail-safe and easy to reproduce. The robust materials are compactly stowed in a plastic tray with lid.

Included in delivery:

Manual

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

Instruction cards

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

Material cards

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

85025

▶ Experiments from the manual 'Anna and Leon experiment with lever, pulley and magnet':

- Everything has its weight
- At equilibrium
- What is heavier?
- A lever can help
- Up and down on the seesaw
- Make it easier with a pulley
- Everything is spinning around
- Who is pulling the brake?
- I want to stay this way!
- It's your turn!
- Who is pulling me?
- Quite elastic!
- Magnetic force
- Quite strong such a magnet!
- Come here, go away!

Age 4–7

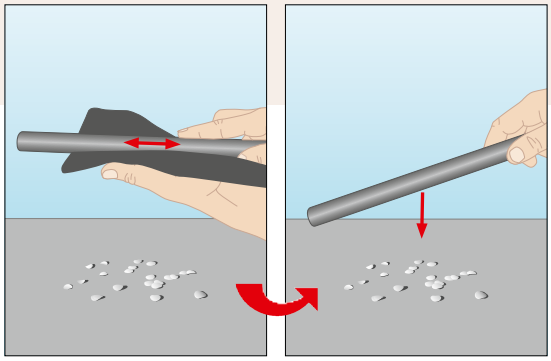
Anna and Leon experiment *with electricity*

Electricity – really fascinating!
Electricity is very important and children come up electricity in nearly all areas of life.

Playfully the children will experience how electrostatic charging develops and which effects it can have. The children learn how an electrical circuit is assembled and which different connections exist.

They can try which materials conduct electricity and which materials can be used as insulators.

The children can find out how a Morse telegraph or a simple alarm system is working.



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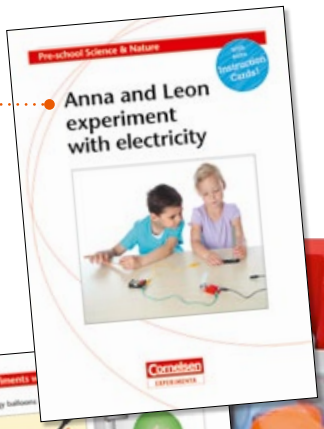

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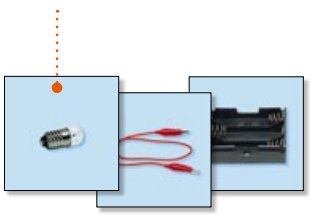
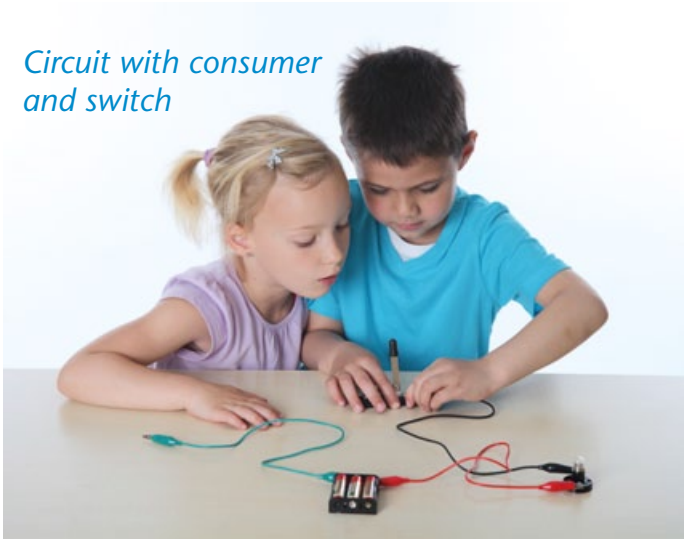


85026

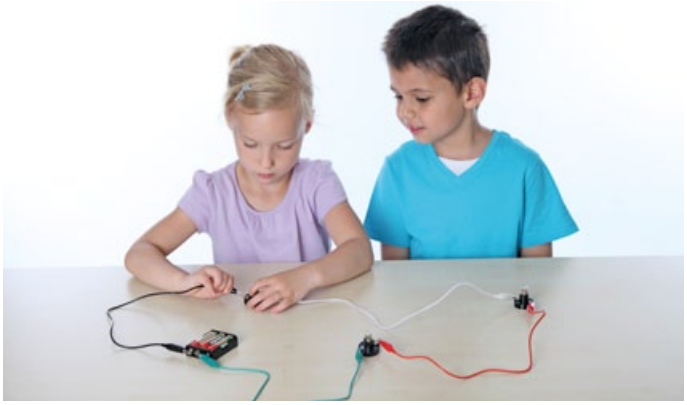
Electrostatic charging

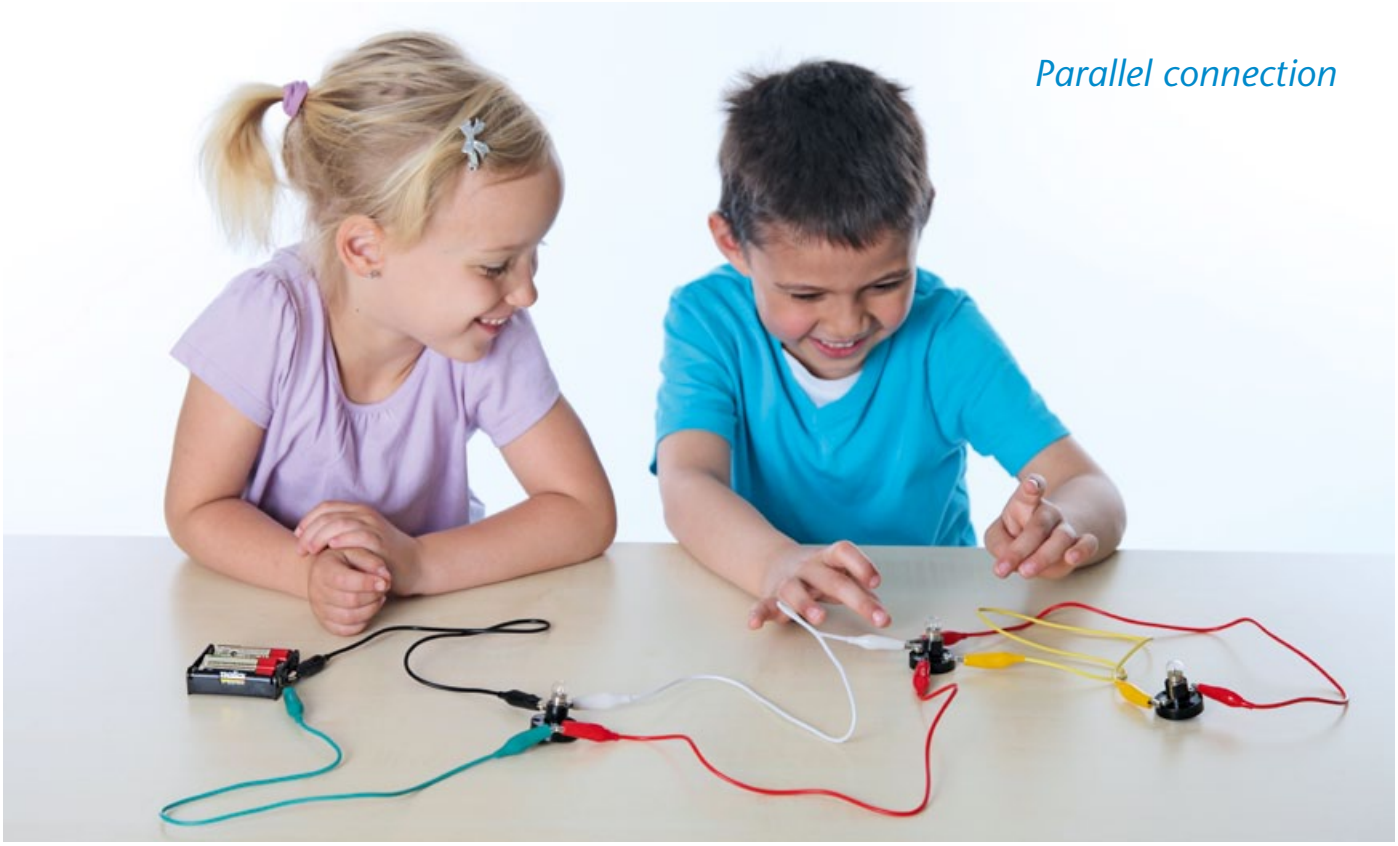


Circuit with consumer and switch

▶ Experiments from the manual 'Anna and Leon experiment with electricity':

- Clingy balloons – electrostatic charging
- Really attracting – electrostatic charging
- Electrostatic charging
- Always in a circle – circuit with consumer
- Conductors and insulators
- Circuit with consumer and switch
- All in a series – series connection
- Parallel connection
- Sending messages in Morse with light and bell





Parallel connection

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