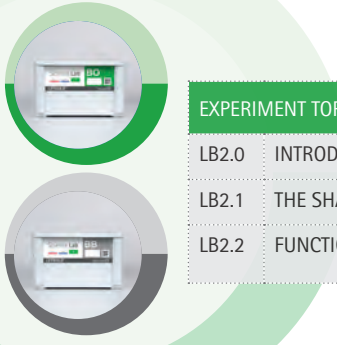
BIOLOGY

Overview of student experiments

Here you will find a complete overview of our Science Lab student experiments in the field of biology.

HUMAN BIOLOGY

EXPERIMENT TOPICS		CURRICULUM TOPICS	NO. EXPERIENCES	DETAILS
LB1.1	OUR SENSES	Tactile sense; Hearing; Sight; Smell	20	PAGE 184
LB1.2	OUR BODY	The cardiovascular system; The nervous system; Digestion; Sensory organs	33	PAGE 190
LB1.3	MAINTAINING A HEALTHY BODY	Nutrition; Hygiene; Food technology		



BOTANY

EXPERIMENT TOPICS		CURRICULUM TOPICS	NO. EXPERIENCES	DETAILS
LB2.0	INTRODUCTION TO METHODS	Microscopy	32	PAGE 198
LB2.1	THE SHAPE OF PLANTS	Leaf; Flower; Plant stem; Roots		
LB2.2	FUNCTION OF PLANTS	Germination and growth; Water balance; Photosynthesis		

more than 135 EXPERIMENTS IN TOTAL

ECOLOGY

EXPERIMENT TOPICS		CURRICULUM TOPICS	NO. EXPERIENCES	DETAILS
LB3.0	INTRODUCTION TO METHODS	Microscopy	35	PAGE 206
LB3.1	ECOSYSTEMS	Abiotic factors; Biotic factors; Biodiversity; Population ecology		
LB3.2	ANALYSIS OF ECOSYSTEMS	Analysis of waterbodies on site; Forest and soil analysis		
LB3.3	HUMANS AND THE ENVIRONMENT	Water pollution; Soil pollution; Air pollution		
LB3.4	EVOLUTION	Adaptation to the environment		

CELL BIOLOGY

EXPERIMENT TOPICS		CURRICULUM TOPICS	NO. EXPERIENCES	DETAILS
LB4.0	INTRODUCTION TO METHODS	Microscopy	19	PAGE 214
LB4.1	STRUCTURE OF THE CELL	Single-cell organisms; Multi-cell organisms		
LB4.2	PROCESSES IN THE CELL	The cell membrane; Cell cycle; Enzymes; Transport processes		

Science Lab

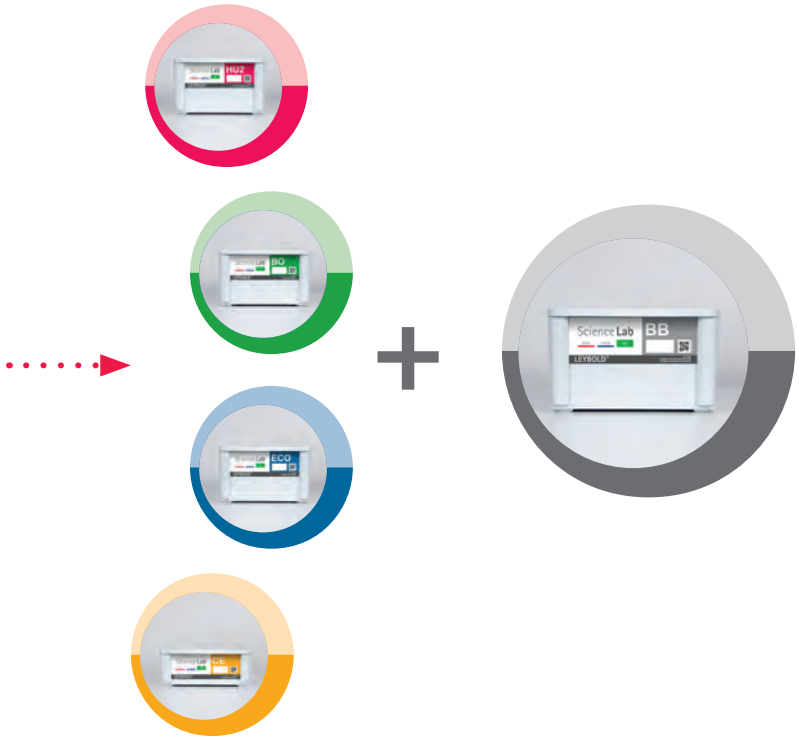
Biology Basic BB (207 300S)

BASIC SET FOR OUR INNOVATIVE STUDENT EXPERIMENT SYSTEM FOR BIOLOGY

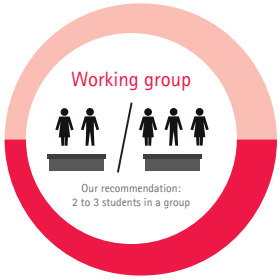
- This Basic Set contains **the basic devices** which are regularly needed for student experiments in Biology.
- Each device has its own specified space in the pre-formed storage tray.
- With the **different thematic sets** more than **135** student experiments can be performed in Biology.
- One Basic Set for all fields of biology and a maximum of two trays on the student workstation.

ADVANTAGES

- The Basic Set contains the material required for **one working group** - consisting of 2-3 students.
- Experiments from the Science Lab Biology can then be carried out with only one additional set, depending on the topic.
- Same devices = always the same handling: no need to re-learn devices for every topic.



Science Lab Biology Basic BB (Set)



Student experiment set of the student experiment system Science Lab in the field of biology. Basic equipment for experiments in human biology, botanics, ecology and cellular biology. Set-up material for one working group in pre-formed tray. The individual trays are stackable and can optionally be closed with a lid (647 003).
The equipment set Science Lab Biology Basic BB, in combination with at least one of the following biology sets, enables the performance of experiments at school, college and university level for worldwide curriculums:

- Equipment set Science Lab Human Biology HU2 (207 312S)
- Equipment set Science Lab Botanics BO (207 321S)
- Equipment set Science Lab Ecology ECO (207 331S)
- Equipment set Science Lab Cellular Biology CE (207 341S)

Scope of delivery:

Count	Name
4	Bosshead S
2	Stand base MF
3	Stand rod 40 cm, 10 mm Ø
1	Universal pencil
1	Stirring thermometer -10...+110 °C
1	Powder spatula, steel, 185 mm
1	Tray, high
1	Round filter, Type 595, 125 mm Ø, Set of 100
1	Blades, 5 pieces
1	Cover slips
1	Microscope slides 76 mm x 26 mm x 1 mm, set of 50
3	Watch glass dish 80 mm Ø
3	Petri dish, 100 x 15 mm, glass
1	Glass stirring rod 200 x 8 mm Ø
1	Measuring cylinder 100 ml, with plastic base
4	Dropping pipette 150 mm x 7 mm Ø
4	Rubber bulb
1	Universal clamp 0...80 mm
1	Spoon-ended spatula, PP, 180 mm
1	Scissors 125 mm, round-ended
1	Laboratory knife
1	Crucible tongs 200 mm
1	Test tube rack metal 20 mm Ø
1	Microscopic set, 6 parts in a box
207 300S	Science Lab Biology Basic BB (Set)

Additionally required:

Count	Cat.-No.	Name
1	207 312S	Science Lab Human Biology HU2 (Set)
1	207 321S*	Science Lab Botanics BO (Set)
1	207 331S*	Science Lab Ecology ECO (Set)
1	207 341S*	Science Lab Cellular Biology CE (Set)

* alternative

Additionally recommended:

Count	Cat.-No.	Name
1	647 003	Lid for tray

HUMAN BIOLOGY

Human biology is a key topic in biology lessons and, in addition to improving biology skills, also serves as a tool for health education.

The senses can be taught very well using experiments, where students can be the test subjects themselves.

This is the idea the Science Lab Set *Human Biology 1 (HU1)* is based on. Smell, sight, touch or hearing: the students can perform most of the experiments directy on themselves. The selection of experiments is complemented by anatomical experiments, e.g. the dissection of a porcine's eye.

The Science Lab Set *Human Biology 2 (HU2)* deals with the human body and health in general. The students will study the cardiovascular and digestive systems in classic experiments. A particular focus is placed on experiments concerning the nervous system. From reaction tests to memorisation tasks, the students can performed many experiments on their own body. The topic of health focuses on experiments on digestion as well as hygiene, with applicable microbiological experiments.

HIGHLIGHT

LB1.1.3.4 Apparent depth

In this experiment, an image is observed with 3D glasses. Although the surface is flat, the image appears to be three-dimensional.
For this experiment you will need the set **Science Lab Human Biology HU1 (207 311S)**.

Further information about our curriculum-compliant topics and student experiments as well as the corresponding sets can be found on the following pages.

Overview of topics and sets

EXPERIMENT TOPICS		REQUIRED SETS	NO. EXPERIMENTS	DETAILS
LB1.1	OUR SENSES	Human Biology HU1  207 311S	20	PAGE 184
LB1.2	OUR BODY	Biology Basic BB + Human Biology HU2  207 300S + 207 312S	33	PAGE 190
LB1.3	MAINTAINING A HEALTHY BODY			

LB1.3.2.2 Colony counting in the air

In this experiment, uncovered culture media are placed at different locations. After incubating the culture media, the germ count can be determined by counting the colonies.

For this experiment you will need the sets **Science Lab Biology Basic BB (207 300S)** and **Science Lab Human Biology HU2 (207 312S)**.

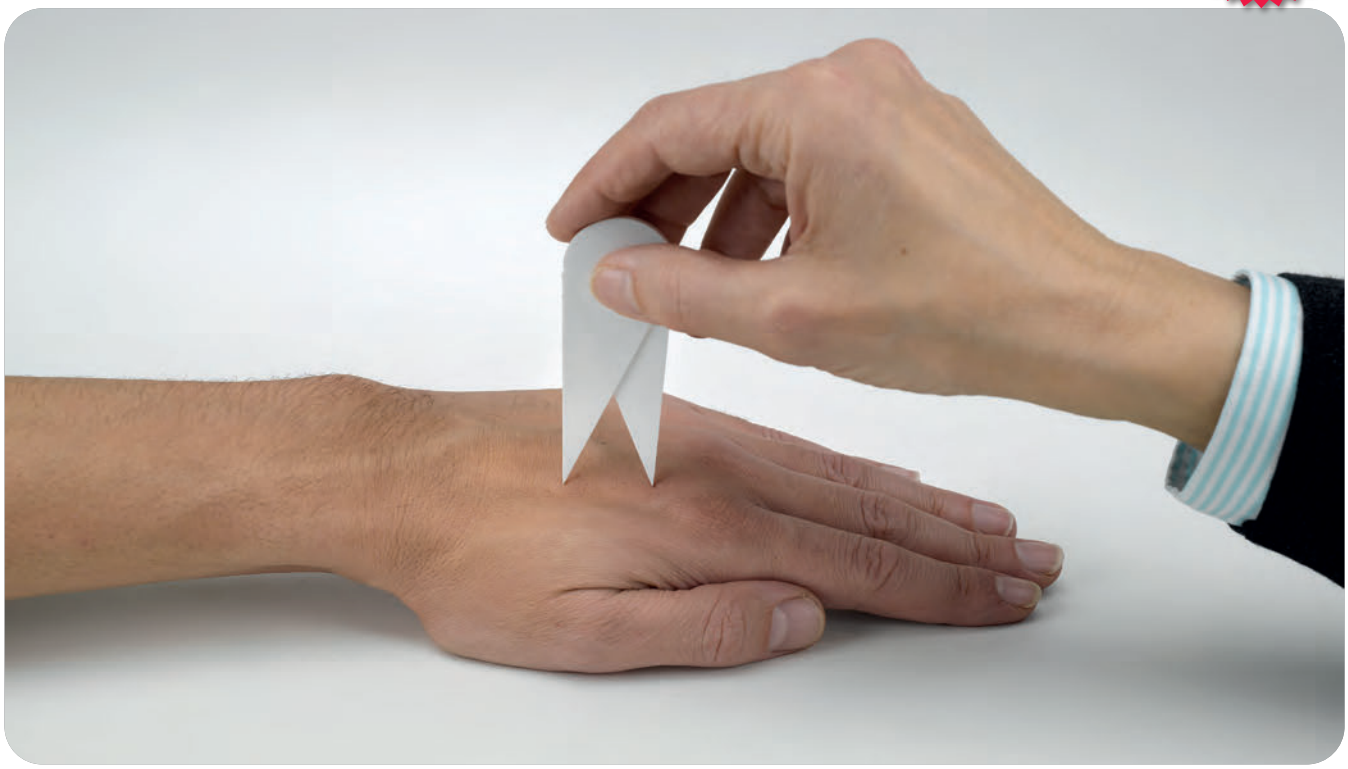
HUMAN BIOLOGY HU1

OVERVIEW OF OUR CURRICULUM-COMPLIANT EXPERIMENTS

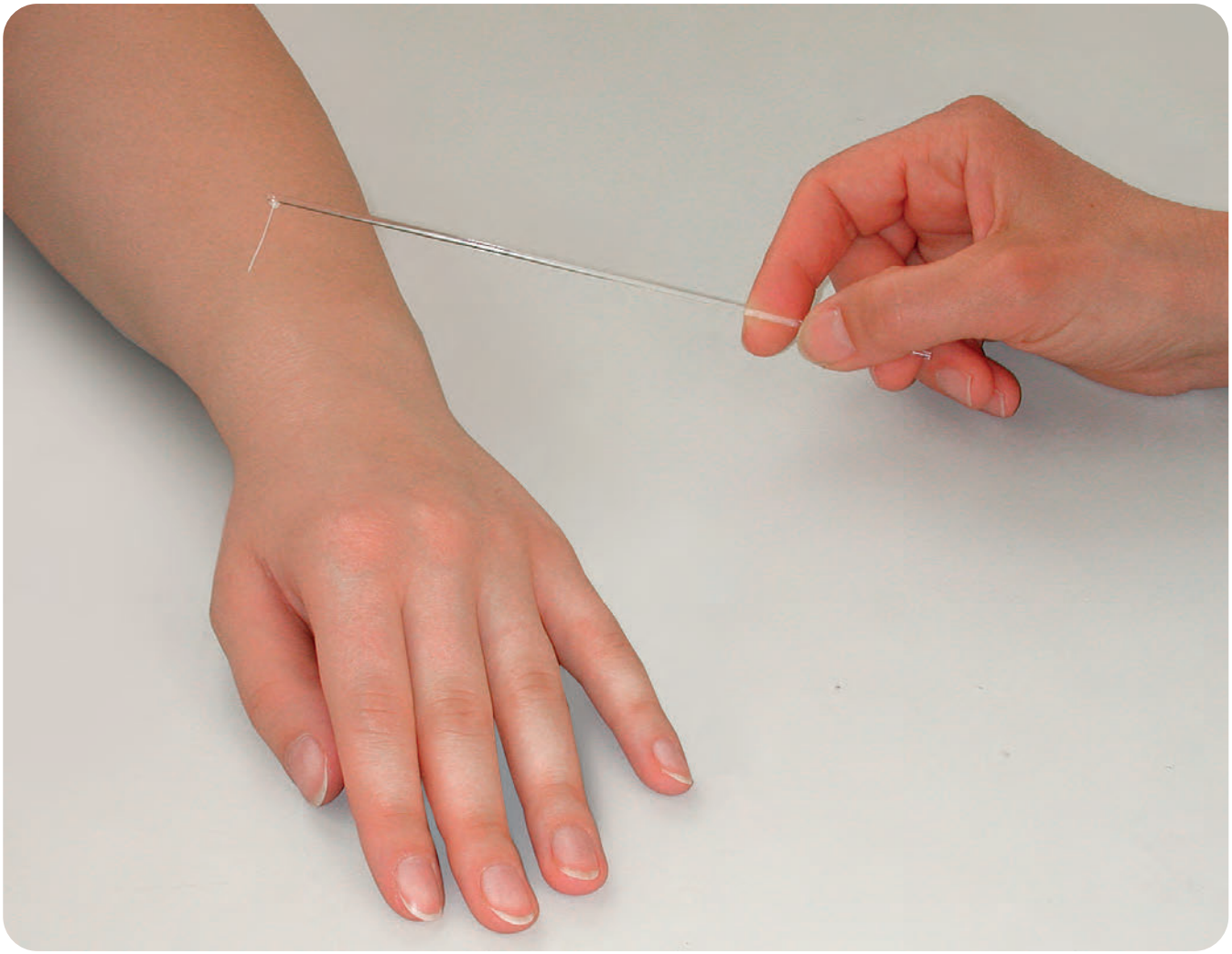
LB1.1	OUR SENSES	
LB1.1.1	Tactile sense	
LB1.1.1.1	Touch	
LB1.1.1.2	Distribution of contact points	
LB1.1.1.3	Cold points	
LB1.1.1.4	Distance perception on the skin	
LB1.1.1.5C	Heat discharge from the body (with Mobile-CASSY 2 WiFi)	DIGITAL
LB1.1.2	Hearing	
LB1.1.2.1	Hearing the body's own sounds	
LB1.1.2.2	Directional hearing	
LB1.1.2.3	Bone-conducted sounds and the perception of vibrations	
LB1.1.2.4	Sound radiation through the eardrum	
LB1.1.3	Sight	
LB1.1.3.1	Blind spot	
LB1.1.3.2	Optical illusions due to convergence	
LB1.1.3.3	Three-dimensional vision requires two eyes	
LB1.1.3.4	Apparent depth	
LB1.1.3.5	Stimulus rivalry and chromatic adaptation	
LB1.1.3.6	Coloured after-images	
LB1.1.3.7	Colour contrast	
LB1.1.3.8	Visual acuity	
LB1.1.4	Smell	
LB1.1.4.1	Perception of different smells	
LB1.1.4.2	Breathing and smell perception	
LB1.1.4.3	Adaptation of olfactory cells	

For experiments marked with „C", the measurements are carried out **digitally** with the Mobile-CASSY 2 WiFi.

20 EXPERIMENTS



LB1.1.1.4 Distance perception on the skin



LB1.1.1.1 Touch

OVERVIEW OF EQUIPMENT REQUIRED FOR PERFORMING EXPERIMENTS

LB1.1 HUMAN BIOLOGY

TOPIC SET	DIGITAL MEASURING DEVICE	LITERATURE
Human biology HU1	Mobile-CASSY 2 WiFi	Science Lab Biology digital
		

Detailed information on the above listed and **additionally required products** are available on the following pages.

Science Lab Human Biology HU1 (Set)

Student experiment set of the student experiment system Science Lab in the field of biology. Set-up material for one working group in pre-formed tray.
With the equipment set HU1, 20 experiments at school, college and university level for worldwide curriculums can be performed.
The students deal with the topic senses. While working out the curriculum required topics, they are also trained in communication and assessment skills.
In combination with the Mobile-CASSY 2 WiFi (524 005W), there are additional evaluation options which enable the students digital learning.

Scope of delivery:

Count	Name
1	Tape measure 2 m / 1 mm
1	Red-cyan glasses (3D)
1	Tray, low
1	Booklet of fragrance strips
1	Set of image optical phenomena
1	Cold-feeler
1	Tactile bristle

Count	Name
1	Tactile circle
1	Resonant tubing
1	Instrument for binaural audition
1	Tuning fork 440 Hz 4 x 8 mm
1	Stopwatch, digital

207 311S	Science Lab Human Biology HU1 (Set)

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

Additionally required per working group

Count	Cat.-No.	Name	Description
1	524 005W	Mobile-CASSY 2 WiFi	for experiment LB1.1.1.5

Additionally required per class

Count	Cat.-No.	Name	Description
1	520 73	LIT: LB Science Lab Biology, digital	
1	610 071	Disposable gloves, latex, medium, 100 pcs	
1	662 460	Essential oils set	

leylab.de/207311S

OVERVIEW OF ADVANTAGES

- Students examine their own body functions
- Little preparation time for teachers
- Tactile bristle, cold probe, directional hearing device: extra developed for such experiments

STUDENT MEASURING DEVICE

DIGITAL CLASS / EDUCATION

Mobile-CASSY 2 WiFi

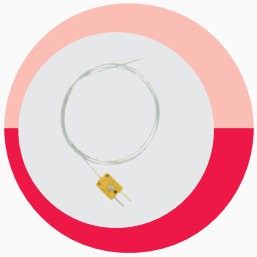
The universal student measuring device with WiFi for all measuring tasks in physics, chemistry and biology.

524 005W	Mobile-CASSY 2 WiFi	

You can find detailed information on the Mobile-CASSY 2 WiFi on page 228.

SENSORS

INCLUDED IN SCOPE OF DELIVERY



Temperature probe NiCr-Ni, type K

Included with the purchase of the Mobile-CASSY 2 WiFi (524 005W).

MOBILE-CASSY 2 WIFI

With the Mobile-CASSY 2 WiFi, voltage *(U)*, current *(I)*, power *(P)* and energy *(E)* can be measured via 4 mm safety sockets.

LITERATURE PACKAGES

Here you will find an overview of our literature packages.
You can find detailed information on our literature on the internet at www.leybold-shop.com.

TOPIC
SUBJECT AREA

LIT: LB1.1 Human Biology 1 – Senses

Printed version available in ring file of ONE subject area

Detailed experiment instructions for Science Lab Set HU1 (207 311S). Describes 20 experiments from the field of human biology - senses.

Topics:
Tactile sense; Hearing; Sight; Smell

520 7311EN	LIT: LB1.1 Human Biology 1 - Senses	

SUBJECT

LIT: LB Science Lab Biology, digital

includes ALL subject areas

Comprehensive biology experiment instructions for the Science Lab.
Contains 139 experiments in the fields of human biology, botany, ecology and cell biology.

Includes all interactive experiment instructions (Lab Docs) as html file.

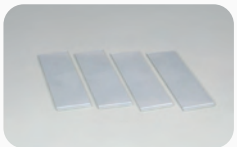
520 73	LIT: LB Science Lab Biology, digital	

Technical data of the digital version:

- Product key for literature (activation & selection of one literature language in LeyLab)
- Can then be used in LeyLab and Document Center (school/institute licence)
- System requirements:
  Document Center:
  - PC with Windows 7 or higher; internet access during installation; local network for distribution to students
  LeyLab:
  - PC, tablet or smartphone with a current browser; internet access

ADDITIONAL STORAGE ACCESSORIES




You can find detailed information on additional storage accessories from page 228.

Reaction time

Experiment examples
Human Biology HU 2

Blood pressure

Heart rate and pulse

Details from page 190

HUMAN BIOLOGY HU2

OVERVIEW OF OUR CURRICULUM-COMPLIANT EXPERIMENTS

Sensors		
	LB1.2	**OUR BODY**
	LB1.2.1	The cardiovascular system
●	LB1.2.1.1C	Respiratory volume and breathing rate (with Mobile-CASSY 2 WiFi) DIGITAL
	LB1.2.1.2	Detection of CO_2 in exhaled air
●	LB1.2.1.3C	Heart rate and pulse (with Mobile-CASSY 2 WiFi) DIGITAL
●	LB1.2.1.4C	Blood pressure (with Mobile-CASSY 2 WiFi) DIGITAL
	LB1.2.2	The nervous system
	LB1.2.2.1C	Model experiment: measuring the resting potential (with Mobile-CASSY 2 WiFi) DIGITAL
	LB1.2.2.2	The Ostwald-Lillie iron wire model
●	LB1.2.2.3C	Reaction time test: visual stimulus (with Mobile-CASSY 2 WiFi) DIGITAL
●	LB1.2.2.4C	Reaction time test: acoustic stimulus (with Mobile-CASSY 2 WiFi) DIGITAL
●	LB1.2.2.5C	Reaction time test: distraction (with Mobile-CASSY 2 WiFi) DIGITAL
●	LB1.2.2.6C	Reaction time test: determining the nerve conduction velocity (with Mobile-CASSY 2 WiFi) DIGITAL
	LB1.2.2.7	Finger labyrinth - memorisation with eyes closed
	LB1.2.2.8	Finger labyrinth - memorisation progress
	LB1.2.2.9	Finger labyrinth - memorisation with eyes opened
	LB1.2.3	Digestion
	LB1.2.3.1	Digestion in the mouth
	LB1.2.3.2	Pepsin-regulated digestion of proteins in the stomach
	LB1.2.3.3	Pepsin-regulated digestion of proteins in the stomach - temperature dependence
	LB1.2.3.4C	Fat digestion with pancreatin (with Mobile-CASSY 2 WiFi) DIGITAL
	LB1.2.3.5	Starch digestion with pancreatin
	LB1.2.4	Sensory organs
	LB1.2.4.1	Preparation of a porcine eye
	LB1.3	**MAINTAINING A HEALTHY BODY**
	LB1.3.1	Nutrition
	LB1.3.1.1	Testing foods for glucose
	LB1.3.1.2	Testing foods for starch
	LB1.3.1.3	Testing foods for fats
	LB1.3.1.4	Testing foods for proteins
	LB1.3.1.5	Testing foods for vitamin C
	LB1.3.2	Hygiene
	LB1.3.2.1	Preparation and sterilisation of culture mediums
	LB1.3.2.2	Colony counting in the air
	LB1.3.2.3	Determination of the germ content of banknotes and coins
	LB1.3.2.4	Comparing the germ content of washed and unwashed hands
	LB1.3.2.5	Simulation of an infection chain with baking yeast
	LB1.3.2.6	Bacteriostatic effect of different substances
	LB1.3.2.7	Sterilisation, cleansing or destruction of equipment and breeding grounds
	LB1.3.3	Food technology
	LB1.3.3.1	Detecting fermentation products of yeasts
	LB1.3.3.2	Temperature-dependence of the fermentation process

33 EXPERIMENTS

For experiments marked with „C", the measurements are carried out **digitally** with the Mobile-CASSY 2 WiFi.

- Reaction test adapter S
- Pulse sensor S
- Blood pressure sensor S
- Spirometer box

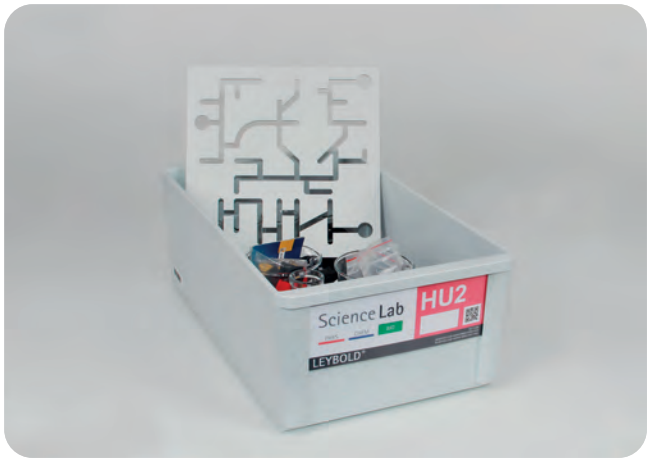
LB1.2.2.7 Finger labyrinth - memorisation with eyes closed

OVERVIEW OF EQUIPMENT REQUIRED FOR PERFORMING EXPERIMENTS

LB1.2 TO LB1.3 HUMAN BIOLOGY

BASIC SET	TOPIC SET	DIGITAL MEASURING DEVICE	LITERATURE	CHEMICALS
Biology Basic BB	Human biology HU2	Mobile-CASSY 2 WiFi	Science Lab Biology digital	Chemical Set HU2

Detailed information on the above listed and **additionally required products** are available on the following pages.



Science Lab Human Biology HU2 (Set)

Student experiment set of the student experiment system Science Lab in the field of biology. Set-up material for one working group in pre-formed tray.
With the equipment set HU2, together with the Science Lab Biology Basic BB (207 300S), 33 experiments at school, college and university level for worldwide curriculums can be performed.
The students deal with the topics body and health. While working out the curriculum required topics, they are also trained in communication and assessment skills. In combination with the Mobile-CASSY 2 WiFi (524 005W), there are additional evaluation options which enable the students digital learning.

Scope of delivery:

Count	Name
2	Connecting lead 19 A, 50 cm, red/blue, pair
4	Crocodile clip, polished
4	Beaker Boro 3.3, 100 ml, squat
1	Tray, high
1	Drigalski spatula, glass
1	Iron nail, set 2
1	Maze for finger
8	Test tube Fiolax 16 mm x 160 mm
2	Beaker Boro 3.3, 400 ml, squat
1	Erlenmeyer flask 250 ml, narrow neck, SB 29
1	Plate electrode zinc 43 x 28 mm

Count	Name
4	Plate electrode carbon 43 x 28 mm
1	Grindstone
1	Fermentation tube 200 mm x 8 mm Ø
3	Graduated pipette 10 ml
1	Pipetting aid
1	Sieve, plastic, 70 mm Ø
1	Rubber balloons, set of 10
3	Rubber stopper solid, 14...18 mm Ø
1	Rubber stopper, one 7-mm hole, 25...31 mm Ø

207 312S	Science Lab Human Biology HU2 (Set)

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

leylab.de/207312S

OVERVIEW OF ADVANTAGES

- Including the important topics on hygiene and nutrition
- Modern model experiments on resting potential and nerve transmission

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

Additionally required per student

Count	Cat.-No.	Name	Description
1	610 010	Laboratory safety goggles, Focomax	

Additionally required per working group

Count	Cat.-No.	Name	Description
1	207 300S	Science Lab Biology Basic BB (Set)	
1	656 017	Teclu burner, universal	
1	607 020	Safety gas hose with clamp 0.5 m	
1	524 005W	Mobile-CASSY 2 WiFi	for digital experiments
1	524 0461	Reaction test adapter S	
1	524 0471	Pulse sensor S	
1	524 0501	Blood pressure sensor S	
1	524 056	Spirometer box	
1	662 148	Hand-held button	Nervous system experiments (LB1.2.2)
1	662 149	Foot switch	Nervous system experiment (LB1.2.2)
1	ADACB501	Compact scale 500 g : 0.1 g	
1	666 8471	Magnetic stirrer with hot plate	Nervous system and Nutrition experiments (LB1.2.3, LB1.3.1)
1	666 851	Stirring magnet 25 mm x 6 mm Ø, circular	

Additionally required per class

Count	Cat.-No.	Name	Description
1	520 73	LIT: LB Science Lab Biology, digital	
1	679 312	Chemicals Science Lab Human Biology HU2	
1	675 3410	Water, pure, 5 l	
1	610 290	Parafilm, 100 mm-w.	
1	661 091	Boiling stones 100 g	
1	670 2230	Albustix test sticks, 50 pcs	
1	MA91314	Test sticks Ascorbic acid	
1	666 8036	Drying oven UNB 30 l	Hygiene experiment (LB1.3.2.7)
1	662 851	Pressure cooker, 6.5 l, 20 cm Ø	Hygiene experiments (LB1.3.2)

Detailed information on **Mobile-CASSY 2 WiFi**, **sensors**, **literature packages** and **chemical sets** are available on the following pages.

STUDENT MEASURING DEVICE

DIGITAL CLASS / EDUCATION

Mobile-CASSY 2 WiFi

The universal student measuring device with WiFi for all measuring tasks in physics, chemistry and biology.

524 005W	Mobile-CASSY 2 WiFi	

You can find detailed information on the Mobile-CASSY 2 WiFi on page 228.

SENSORS

Reaction test adapter S ●

For measuring reaction times, controlled by a hand or foot button, and for determining nerve conductor speed. Signalling accomplished as selected, either via three-colour LEDs (hand key) or acoustic sign (foot button) or software with CASSY (524 013, 524 006, 524 005W, 524 018).

524 0461	Reaction test adapter S	

Pulse sensor S ●

For measurement of the pulse frequency with the aid of an infrared sensor which is attached to the ear lobe or finger tip, whereby the sensibility is adjusted automatically. The individual pulse beats are indicated by a LED. The pulse sensor is electrically isolated from CASSY (524 013, 524 006, 524 005W, 524 018).

524 0471	Pulse sensor S	

Blood pressure sensor S ●

For blood pressure measurements using the oscillometric method with Sensor-CASSY 2 (524 013) or Pocket-CASSY (524 006, 524 018) without stethoscope and microphone. The pressure variations which are caused by the pulse waves are transmitted by the arm collar and measured together with the falling pressure in the arm collar. Alternative for use with the Mobile-CASSY (524 005W) after the auscultatoric method (designed by Korotkov). The characteristic noise phenomena are listened to with a stethoscope (additionally required).

The universal biology measuring instrument (531 837) gives an audible sound for the pressure variations.

524 0501	Blood pressure sensor S	

Spirometer box ●

For pneumotachographic measurement of various pulmonary volumes, the flow-volume curve and the forced expiratory volume per second with CASSY (524 013, 524 006, 524 005W, 524 018).

524 056	Spirometer box	

You can find detailed information on these and other sensors from page 229.

CHEMICALS

Chemicals Science Lab Human Biology

Chemicals for carrying out student experiments in Science Lab Human Biology HU2. The chemical set contains 20 different chemicals which can be used to perform every experiment at least 10 times.

679 312	Chemicals Science Lab Human Biology	

The individual chemicals from this set can be found in the chemicals overview which starts from page 220. There you will also find the relevant hazard symbols and classes as well as hazard warnings and safety instructions.

LITERATURE PACKAGES

Here you will find an overview of our literature packages.
You can find detailed information on our literature on the internet at www.leybold-shop.com.

TOPIC
SUBJECT AREA

LIT: LB1.2+LB1.3 Human Biology 2 – Body and Health

Printed version available in ring file of ONE subject area

Detailed experiment instructions for Science Lab Set HU2 (207 312S). Describes 33 experiments from the field of human biology - body and health.

Topics:
Cardiovascular system; Nervous system; Digestion; Sensory organs; Nutrition; Hygiene; Food technology

520 7312EN	LIT: LB1.2+LB1.3 Human Biology 2 - Body and health	

SUBJECT

LIT: LB Science Lab Biology, digital

includes ALL subject areas

Comprehensive biology experiment instructions for the Science Lab.
Contains 139 experiments in the fields of human biology, botany, ecology and cell biology.

Includes all interactive experiment instructions (Lab Docs) as html file.

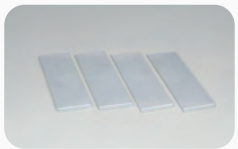
520 73	LIT: LB Science Lab Biology, digital	

Technical data of the digital version:

- Product key for literature (activation & selection of one literature language in LeyLab)
- Can then be used in LeyLab and Document Center (school/institute licence)
- System requirements:
  Document Center:
  - PC with Windows 7 or higher; internet access during installation; local network for distribution to students
  LeyLab:
  - PC, tablet or smartphone with a current browser; internet access

ADDITIONAL STORAGE ACCESSORIES



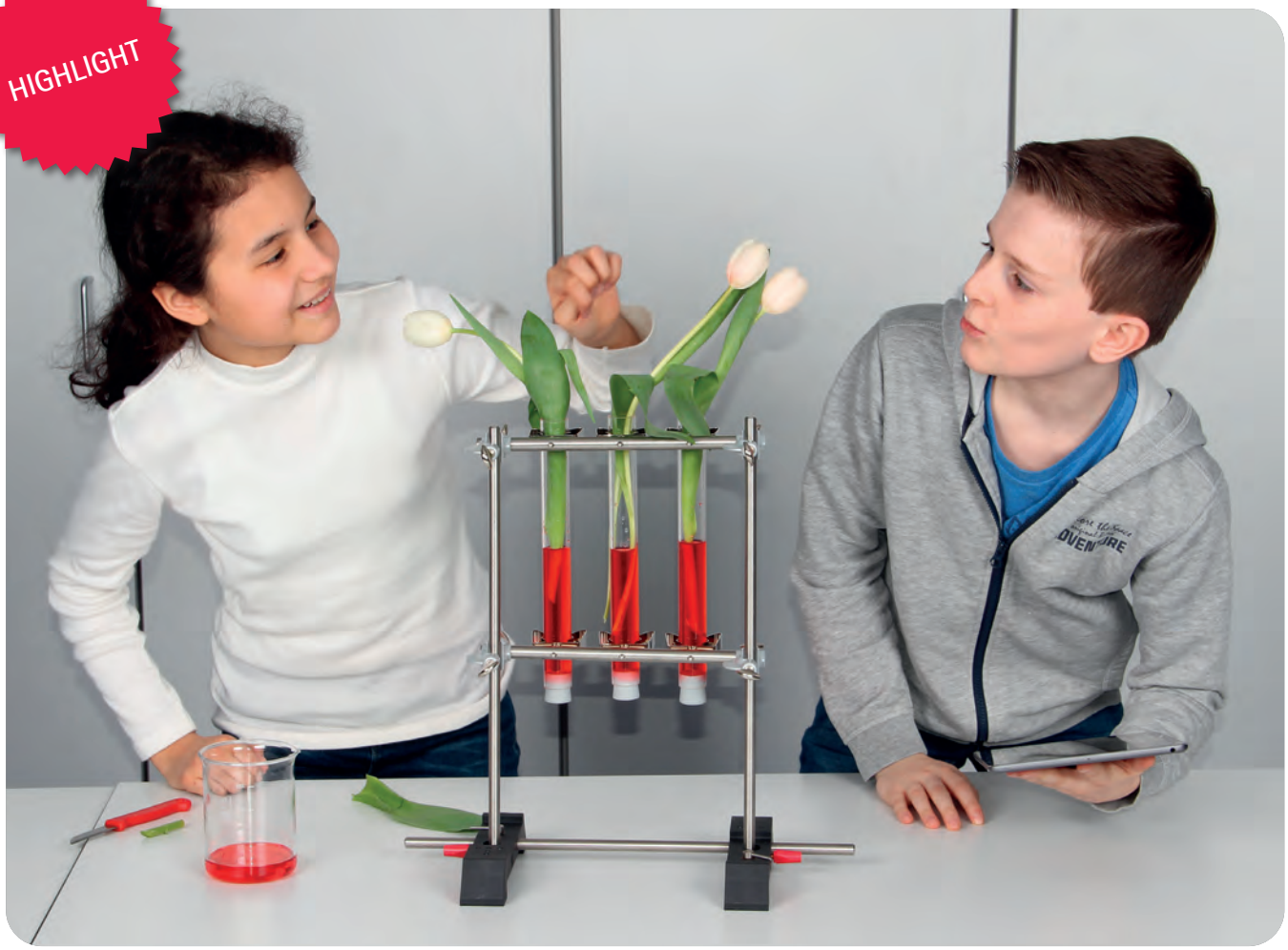




You can find detailed information on additional storage accessories from page 228.

BOTANY

The investigation of the shape and function of plants is easily accessible in forms of experiments. The Science Lab Set *Botany (BO)* can, for example, be used to examine leaves and flowers. A focus is placed on experiments for studying plant mechanisms, e.g. the water balance or photosynthesis.
A special emphasis lies on experiments that can easily be performed in one class/lecture and demonstrate the effects in a particularly impressive way.

HIGHLIGHT



LB2.2.2.2 Water transport in a shoot

In this experiment, the path of the water in the shoot of a plant is visualised. To do this, a freshly cut shoot of a white-flowered plant is placed in dyed water.
For this experiment you will need the sets **Science Lab Biology Basic BB (207 300S)** and **Science Lab Botany BO (207 321S)**.

Overview of topics and sets

EXPERIMENT TOPICS		REQUIRED SETS		NO. EXPERIMENTS	DETAILS
LB2.0	INTRODUCTION TO METHODS	Biology Basic BB	Botany BO	32	PAGE 198
LB2.1	THE SHAPE OF PLANTS				
LB2.2	FUNCTION OF PLANTS	207 300S	207 321S		

LB2.2.3.1 Light-dependency during photosynthesis

In this experiment, rising air bubbles on the shoot of an aquatic plant are counted. To do this, one plant is exposed to light beforehand and one is kept in darkness.
For this experiment you will need the sets **Science Lab Biology Basic BB (207 300S)** and **Science Lab Botany BO (207 321S)**.

Further information about our curriculum-compliant topics and student experiments as well as the corresponding sets can be found on the following pages.

BOTANY BO

OVERVIEW OF OUR CURRICULUM-COMPLIANT EXPERIMENTS

LB2.0	**INTRODUCTION TO METHODS**
LB2.0.0	Microscopy
LB2.0.0.1	Structure and functionality of an optical microscope
LB2.0.0.2	Making preparations
LB2.1	**THE SHAPE OF PLANTS**
LB2.1.1	Leaf
LB2.1.1.1	Examination of a leaf
LB2.1.1.2	Leaf structure of a moss leaf
LB2.1.1.3	Leaf cross-section with upper and lower epidermis
LB2.1.1.4	Surface cut: Stomata under the microscope
LB2.1.1.5	Plant cell: Structure of an onion cell
LB2.1.1.6	Organs for water evaporation
LB2.1.1.7	Many parts of a plant have evaporation protection
LB2.1.2	Flower
LB2.1.2.1	Examination of a flower
LB2.1.2.2	Pollen and pollen tube
LB2.1.3	Plant stem
LB2.1.3.1	Cross-section through a plant stem
LB2.1.4	Roots
LB2.1.4.1	Organs for water uptake
LB2.1.4.2	Root hair development
LB2.2	**FUNCTION OF PLANTS**
LB2.2.1	Germination and growth
LB2.2.1.1	Swelling
LB2.2.1.2	Swelling pressure
LB2.2.1.3	Dependence of germination on various factors
LB2.2.1.4	Light influences the germination of plants
LB2.2.1.5	Cellular respiration during germination
LB2.2.1.6	Selection capability of roots
LB2.2.2	Water balance
LB2.2.2.1	Plants cannot live without water
LB2.2.2.2	Water transport in a shoot
LB2.2.2.3	Water rises in capillaries
LB2.2.2.4	Importance of the stomata
LB2.2.2.5	Dependence of the water requirement on number and size of leaves
LB2.2.2.6	Water consumption of plants living in moist and dry habitats
LB2.2.2.7	Measurement of transpiration
LB2.2.3	Photosynthesis
LB2.2.3.1	Light-dependency during photosynthesis
LB2.2.3.2	Testing for oxygen during photosynthesis
LB2.2.3.3	Carbon dioxide and photosynthesis
LB2.2.3.4	Testing for starch during photosynthesis
LB2.2.3.5	Separation of leaf pigments via paper chromatography

32 EXPERIMENTS

LB2.2.1.4 Light influences the germination of plants (dry)

LB2.2.1.4 Light influences the germination of plants (wet)

OVERVIEW OF EQUIPMENT REQUIRED FOR PERFORMING EXPERIMENTS

LB2.0 TO LB2.2 BOTANY

BASIC SET	TOPIC SET	DIGITAL MEASURING DEVICE	LITERATURE	CHEMICALS
Biology Basic BB	Botany BO	Mobile-CASSY 2 WiFi	Science Lab Biology digital	Chemical Set BO

Detailed information on the above listed and **additionally required products** are available on the following pages.

Science Lab Botany BO (Set)

Student experiment set of the student experiment system Science Lab in the field of biology. Set-up material for one working group in pre-formed tray.
With the equipment set BO, together with the Science Lab Biology Basic BB (207 300S), 32 experiments at school, college and university level for worldwide curriculums can be performed.
The students deal with the shape and function of plants. While working out the curriculum required topics, they are also trained in communication and assessment skills.

Scope of delivery:

Count	Name
2	Stand rod 25 cm, with holes
1	Capillary apparatus
1	Lamp socket, E27, Euro plug
6	Clip plug, large
2	Beaker Boro 3.3, 100 ml, squat
1	Tray, high
1	LED Plant lamp
3	Test tube Fiolax 16 mm x 160 mm
1	Beaker Boro 3.3, 400 ml, squat
1	Erlenmeyer flask 250 ml, narrow neck, SB 29

Count	Name
1	Funnel PP 75 mm Ø
3	Plastic tube 240 x 25 mm Ø
1	Fermentation tube 200 mm x 8 mm Ø
1	Pestle 88 mm
1	Mortar porcelain 70 mm Ø
1	Magnifier 8x
1	Rubber stopper solid, 14...18 mm Ø
3	Rubber stopper solid, 19...24 mm Ø
1	Rubber stopper, one 7-mm hole, 25...31 mm Ø

207 321S	Science Lab Botany BO (Set)

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

leylab.de/207321S

OVERVIEW OF ADVANTAGES

- Student experiments for parallel display and comparison of several samples (set-up with stand rod with holes)
- Includes microscopy experiments and basics of microscopy
- Impressive experiments, e.g. swelling pressure during germination, measurement of transpiration or oxygen detection during photosynthesis

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

Additionally required per student

Count	Cat.-No.	Name	Description
1	610 010	Laboratory safety goggles, Focomax	

Additionally required per working group

Count	Cat.-No.	Name	Description
1	207 300S	Science Lab Biology Basic BB (Set)	
1	656 017	Teclu burner, universal	
1	607 020	Safety gas hose with clamp 0.5 m	
1	MIK5738860	Microscop EduLed FLQ	
1	661 243	Wash bottle PE, 500 ml	
1	ADACB501	Compact scale 500 g : 0.1 g	
1	666 8471	Magnetic stirrer with hot plate	Photosynthesis experiment (LB2.2.3)

Additionally required per class

Count	Cat.-No.	Name	Description
1	520 73	LIT: LB Science Lab Biology, digital	
1	679 320	Chemicals Science Lab Botany BO	
1	675 3410	Water, pure, 5 l	
1	610 290	Parafilm, 100 mm-w.	
1	661 055	Chromatography paper, 580 x 600 mm, 25 sheets	
1	661 080	Cobalt chloride test paper 2 x 7 cm, 100 stripes	
1	661 091	Boiling stones 100 g	
1	665 568	Microcapillaries	

Detailed information on **Mobile-CASSY 2 WiFi**, **sensors**, **literature packages** and **chemical sets** are available on the following pages.

STUDENT MEASURING DEVICE

DIGITAL CLASS / EDUCATION

Mobile-CASSY 2 WiFi

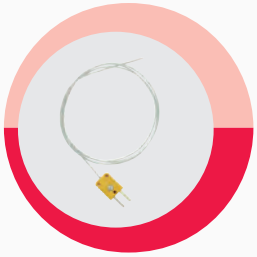
The universal student measuring device with WiFi for all measuring tasks in physics, chemistry and biology.

524 005W	Mobile-CASSY 2 WiFi	

You can find detailed information on the Mobile-CASSY 2 WiFi on page 228.

SENSORS

INCLUDED IN SCOPE OF DELIVERY



Temperature probe NiCr-Ni, type K

Included with the purchase of the Mobile-CASSY 2 WiFi (524 005W).

MOBILE-CASSY 2 WIFI

With the Mobile-CASSY 2 WiFi, voltage *(U)*, current *(I)*, power *(P)* and energy *(E)* can be measured via 4 mm safety sockets.

CHEMICALS

Chemicals Science Lab Botany

Chemicals for carrying out student experiments in Science Lab Botany BO. The chemical set contains 15 different chemicals which can be used to perform every experiment at least 10 times.

679 320	Chemicals Science Lab Botany	

The individual chemicals from this set can be found in the chemicals overview which starts from page 220. There you will also find the relevant hazard symbols and classes as well as hazard warnings and safety instructions.

LITERATURE PACKAGES

Here you will find an overview of our literature packages.
You can find detailed information on our literature on the internet at www.leybold-shop.com.

TOPIC
SUBJECT AREA

LIT: LB2 Botany

Printed version available in ring file of ONE subject area

Detailed experiment instructions for Science Lab Set Botany BO (207 321S).
Describes 32 experiments from the field of botany.

Topics:
Microscopy; Leaf; Flower; Plant stem; Roots; Germination and growth; Water balance; Photosynthesis

520 7321EN	LIT: LB2 Botany	

SUBJECT

LIT: LB Science Lab Biology, digital

includes ALL subject areas

Comprehensive biology experiment instructions for the Science Lab.
Contains 139 experiments in the fields of human biology, botany, ecology and cell biology.

Includes all interactive experiment instructions (Lab Docs) as html file.

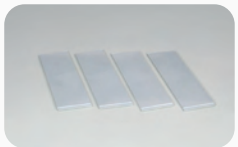
520 73	LIT: LB Science Lab Biology, digital	

Technical data of the digital version:

- Product key for literature (activation & selection of one literature language in LeyLab)
- Can then be used in LeyLab and Document Center (school/institute licence)
- System requirements:
  Document Center:
  - PC with Windows 7 or higher; internet access during installation; local network for distribution to students
  LeyLab:
  - PC, tablet or smartphone with a current browser; internet access

ADDITIONAL STORAGE ACCESSORIES




You can find detailed information on additional storage accessories from page 228.

ECOLOGY

Ecology means more than the common use of the word "eco" would suggest. One of the aims of the Science Lab Set *Ecology (ECO)* is to observe and describe an ecosystem from as many perspectives as possible.

Students can measure the temperature and illuminance or compare soils from a forest and from the side of a road. Another area of experimental investigation will be biodiversity.

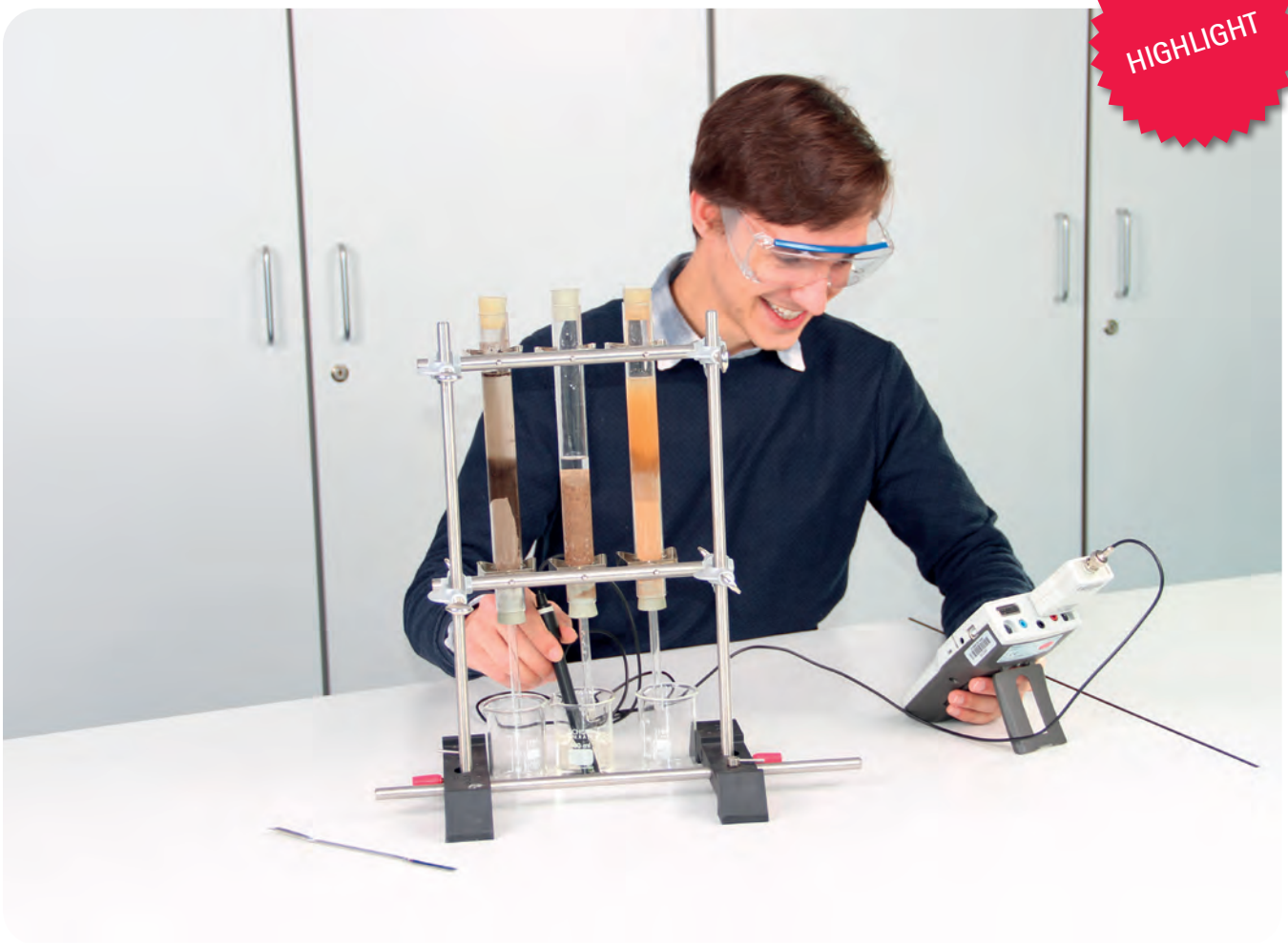
HIGHLIGHT

LB3.1.3.4 Observation of living organism in an infusion of hay

In this experiment, eukaryotic and prokaryotic single-cell and multi-cell organisms can be observed. In an infusion of hay, for example, bacteria, flagellated single-celled organisms, ciliates or rotifers can develop.
For this experiment you will need the sets **Science Lab Biology Basic BB (207 300S)** and **Science Lab Ecology ECO (207 331S)**.

Overview of topics and sets

EXPERIMENT TOPICS		REQUIRED SETS		NO. EXPERIMENTS	DETAILS
LB3.0	INTRODUCTION TO METHODS	Biology Basic BB	Ecology ECO	35	PAGE 206
LB3.1	ECOSYSTEMS				
LB3.2	ANALYSIS OF ECOSYSTEMS				
LB3.3	HUMANS AND THE ENVIRONMENT				
LB3.4	EVOLUTION	207 300S	207 331S		



LB3.2.2.3C pH value of soil samples

In this experiment, water flows through various soil samples. The pH values of the filtrates are determined using the Mobile-CASSY 2 WiFi. The students will find out that plants prefer specific soil properties and therefore can serve as a pH indicator.
For this experiment you will need the sets **Science Lab Biology Basic BB (207 300S)** and **Science Lab Ecology ECO (207 331S)**.

Further information about our curriculum-compliant topics and student experiments as well as the corresponding sets can be found on the following pages.

ECOLOGY ECO

OVERVIEW OF OUR CURRICULUM-COMPLIANT EXPERIMENTS

Sensors		
	LB3.0	**INTRODUCTION TO METHODS**
	LB3.0.0	Microscopy
	LB3.0.0.1	Structure and functionality of an optical microscope
	LB3.0.0.2	Making micro-preparations
	LB3.1	**ECOSYSTEMS**
	LB3.1.1	Abiotic factors
	LB3.1.1.1	Temperature-dependence of life processes
●	LB3.1.1.2C	Bergmann's rule (factor temperature) (with Mobile-CASSY 2 WiFi) DIGITAL
●	LB3.1.1.3C	Allen's rule (factor temperature) (with Mobile-CASSY 2 WiFi) DIGITAL
●	LB3.1.1.4C	Grouping as protection from cold (with Mobile-CASSY 2 WiFi) DIGITAL
	LB3.1.1.5	Insulating effect of body protection
	LB3.1.1.5C	Insulating effect of body protection (with Mobile-CASSY 2 WiFi) DIGITAL
	LB3.1.1.6	Comparison of leaf cross-sections: Sun leaf and shade leaf
	LB3.1.2	Biotic factors
	LB3.1.2.1	Interspecific competition in plants
	LB3.1.2.3	Symbiosis
	LB3.1.3	Biodiversity
	LB3.1.3.2	Analysis of ground fauna using sieves (Berlese funnels)
	LB3.1.3.4	Observation of living organisms in an infusion of hay
	LB3.1.4	Population ecology
	LB3.1.4.3	Food chain: Decomposers
	LB3.2	**ANALYSIS OF ECOSYSTEMS**
	LB3.2.1	Analysis of waterbodies on site
●●	LB3.2.1.2C	pH value of waterbodies (with Mobile-CASSY 2 WiFi) DIGITAL
●●	LB3.2.1.3C	Salt content of waterbodies (with Mobile-CASSY 2 WiFi) DIGITAL
	LB3.2.1.4	Chemical water parameters
●●●●	LB3.2.1.5C	Water protocol (with Mobile-CASSY 2 WiFi) DIGITAL
	LB3.2.1.6C	Temperature measurement in waterbodies (with Mobile-CASSY 2 WiFi) DIGITAL
	LB3.2.2	Forest and soil analysis
	LB3.2.2.1	Sedimentation of soil particles
	LB3.2.2.2	Soil and water
●●	LB3.2.2.3C	pH value of soil samples (with Mobile-CASSY 2 WiFi) DIGITAL
●●	LB3.2.2.4C	Humus formation and humus types (with Mobile-CASSY 2 WiFi) DIGITAL
●●	LB3.2.2.5C	Salt content of the soil (with Mobile-CASSY 2 WiFi) DIGITAL
●	LB3.2.2.6C	Abiotic factor: light intensity (with Mobile-CASSY 2 WiFi) DIGITAL
	LB3.2.2.7C	Temperature depending on location (with Mobile-CASSY 2 WiFi) DIGITAL
	LB3.2.2.8C	Diurnal variation measurements (with Mobile-CASSY 2 WiFi) DIGITAL
	LB3.3	**HUMANS AND THE ENVIRONMENT**
	LB3.3.1	Water pollution
	LB3.3.1.1	Foam - a substantial burden on the environment
	LB3.3.1.2	Eutrophication of waterbodies by phosphates
	LB3.3.1.4	Efficacy of gravel filters and activated charcoal filters
	LB3.3.2	Soil pollution
	LB3.3.2.1	Toxicity measurement of petrol with cress seeds
	LB3.3.2.2	Soil contamination with non-biological substances
	LB3.3.3	Air pollution
	LB3.3.3.1	Determination of emissions using the example of engine exhaust emissions
	LB3.4	**EVOLUTION**
	LB3.4.1	Adaptation to the environment
	LB3.4.1.1	Wing feathers of birds
	LB3.4.1.2	Examination of fish scales

For experiments marked with „C", the measurements are carried out **digitally** with the Mobile-CASSY 2 WiFi.

● Conductivity sensor
● Conductivity adapter S
● pH sensor, BNC
● pH adapter S
● NiCr-Ni adapter S, type K
● Lux sensor M

35 EXPERIMENTS

LB3.1.1.5C Insulating effect of body protection

OVERVIEW OF EQUIPMENT REQUIRED FOR PERFORMING EXPERIMENTS

LB3.0 TO LB3.4 ECOLOGY

BASIC SET	TOPIC SET	DIGITAL MEASURING DEVICE	LITERATURE	CHEMICALS
Biology Basic BB	Ecology ECO	Mobile-CASSY 2 WiFi	Science Lab Biology digital	Chemical Set ECO

Detailed information on the above listed and **additionally required products** are available on the following pages.

Science Lab Ecology ECO (Set)

Student experiment set of the student experiment system Science Lab in the field of biology. Set-up material for one working group in pre-formed tray. With the equipment set ECO, together with the Science Lab Biology Basic BB (207 300S), 35 experiments at school, college and university level for worldwide curriculums can be performed.
The students deal with the topics of ecosystems, exploring ecosystems, humans and the environment and evolution. While working out the curriculum required topics, they are also trained in communication and assessment skills. In combination with the Mobile-CASSY 2 WiFi (524 005W), there are additional evaluation options which enable the students digital learning.

Scope of delivery:

Count	Name
2	Stand rod 25 cm, with holes
1	Tape measure 2 m / 1 mm
1	Rubber rings, set of 8
6	Clip plug, large
3	Beaker Boro 3.3, 100 ml, squat
1	Tray, high
8	Test tube Fiolax 16 mm x 160 mm
2	Beaker Boro 3.3, 400 ml, squat
1	Funnel PP 75 mm Ø

Count	Name
3	Glass tube 80 x 8 mm Ø
3	Plastic tube 240 x 25 mm Ø
1	Sieve, plastic, 70 mm Ø
1	Magnifier 8x
1	Rubber stopper solid, 14...18 mm Ø
3	Rubber stopper solid, 19...24 mm Ø
3	Rubber stopper, one 7-mm hole, 19...24 mm Ø
207 331S	Science Lab Ecology ECO (Set)

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

leylab.de/207331S

OVERVIEW OF ADVANTAGES

- Contains microscopy experiments and basics for microscopy
- Student experiments for parallel display and comparison of several samples (set-up with stand rod with holes)
- Easy introduction to digital measurements and evaluation

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

Additionally required per student

Count	Cat.-No.	Name	Description
1	610 010	Laboratory safety goggles, Focomax	

Additionally required per working group

Count	Cat.-No.	Name	Description
1	207 300S	Science Lab Biology Basic BB (Set)	
1	656 017	Teclu burner, universal	
1	607 020	Safety gas hose with clamp 0.5 m	
1	MIK573886	Microscop EduLed FLQ	
1	524 005W	Mobile-CASSY 2 WiFi	for digital experiments
1	529 670	Conductivity sensor	
1	524 0671	Conductivity adapter S	
1	529 672	pH sensor, BNC	
1	524 0672	pH adapter S	
1	524 0673	NiCr-Ni adapter S, type K	
1	524 444	Lux sensor M	
2	666 1261	Temperature probe, Ni-Cr-Ni, fast, type K	Ecosystems (abiotic factors) experiments (LB3.1.1)
1	ADACB501	Compact scale 500 g : 0.1 g	

Additionally required per class

Count	Cat.-No.	Name	Description
1	520 73	LIT: LB Science Lab Biology, digital	
1	679 330	Chemicals Science Lab Ecology ECO	
1	MA90204	Universal indicator paper pH 1...14, roll	
1	MA91201	Test sticks total water hardness	
2	MA91313	Test sticks Nitrate/Nitrite	
1	MA91315	Test sticks Ammonium	
1	MA91320	Test sticks Phosphate	
1	674 4640	Buffer solution pH 4.00, 250 ml	Analysis of ecosystems experiments (LB3.2.1, LB3.2.2)
1	674 4670	Buffer solution pH 7.00, 250 ml	Analysis of ecosystems experiments (LB3.2.1, LB3.2.2)
1	666 8036	Drying oven UNB, 30 l	Analysis of ecosystems experiments (LB3.2.2)

Detailed information on **Mobile-CASSY 2 WiFi**, **sensors**, **literature packages** and **chemical sets** are available on the following pages.

STUDENT MEASURING DEVICE

DIGITAL CLASS / EDUCATION

Mobile-CASSY 2 WiFi

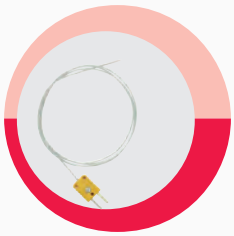
The universal student measuring device with WiFi for all measuring tasks in physics, chemistry and biology.

524 005W	Mobile-CASSY 2 WiFi	

You can find detailed information on the Mobile-CASSY 2 WiFi on page 228.

SENSORS

INCLUDED IN SCOPE OF DELIVERY



Temperature probe NiCr-Ni, type K

Included with the purchase of the Mobile-CASSY 2 WiFi (524 005W).

SENSORS

Conductivity sensor

Conductivity sensor using four-wire technology with integrated Pt temperature sensor for use with chemistry box (524 067), conductivity adapter S (524 0671) and CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836). Open design for rapid response to changes in conductivity.
When conducting measurements a minimum distance of 1 cm from the side of the, as well as a minimum immersion depth of 2 cm are to be maintained.

529 670	Conductivity sensor	

Conductivity adapter S

Used in conjunction with the conductivity sensor (529 670), this adapter enables conductivity and temperature to be measured with CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836).

524 0671	Conductivity adapter S	

pH sensor, BNC

pH glass electrode in plastic shaft and BNC plug for use with the chemistry box (524 067), pH adapter S (524 0672) and CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836). Low-maintenance pH electrode with solid electrolyte made of a conductive gel-like polymer.

529 672	pH sensor, BNC	

For storage 3 M Potassium chloride sol. is recommended (672 5250).

pH adapter S

Enables a pH electrode to be connected to CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836). Moreover, the voltage at the BNC socket can be measured at a very high resistance, e.g. for measuring electrochemical potentials.

524 0672	pH adapter S	

NiCr-Ni adapter S, type K

Enables connection of two NiCr-Ni (type K miniature flat connector) thermocouples for temperature and differential tempature measurements with CASSY (524 013, 524 006, 524 005W, 524 018) or the universal measuring instruments (531 835, 531 836, 531 837).

524 0673	NiCr-Ni adapter S, type K	

SENSORS

Lux sensor M

For measuring the illuminance of visible light with Mobile-CASSY 2 WiFi (524 005W). The lux sensor has a flat design so that it can, for example, be inserted directly into the holder for diaphragms and slides (459 33). With the lux sensor, measurements can be performed along and orthogonal to the optical axis. A printed millimetre scale is used to position the sensor on the optical axis and also enables the recording of intensity distributions of different diffraction objects (e.g. 469 731) without additional equipment.

524 444	Lux sensor M	

You can find detailed information on these and other sensors from page 229.

CHEMICALS

Chemicals Science Lab Ecology

Chemicals for carrying out student experiments in Science Lab Ecology. The chemical set contains 11 different chemicals which can be used to perform every experiment at least 10 times.

679 330	Chemicals Science Lab Ecology	

The individual chemicals from this set can be found in the chemicals overview which starts from page 220. There you will also find the relevant hazard symbols and classes as well as hazard warnings and safety instructions.

LITERATURE PACKAGES

Here you will find an overview of our literature packages. You can find detailed information on our literature on the internet at www.leybold-shop.com.

TOPIC
SUBJECT AREA

LIT: LB3 Ecology

Printed version available in ring file of ONE subject area

Detaile experiment instructions for Science Lab Set ECO (207 331S). Describes 35 experiments from the field of ecology.

Topics:
Microscopy; Abiotic factors; Biotic factors; Biodiversity; Population ecoloy; Analysis of waterbodies on site; Forest and soil analysis; Water pollution; Soil pollution; Air pollution; Adaptation to the environment

520 7331EN	LIT: LB3 Ecology	

SUBJECT

LIT: LB Science Lab Biology, digital

includes ALL subject areas

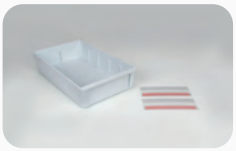
Comprehensive biology experiment instructions for the Science Lab.
Contains 139 experiments in the fields of human biology, botany, ecology and cell biology.
Includes all interactive experiment instructions (Lab Docs) as html file.

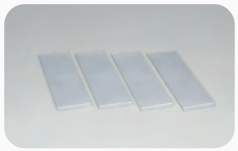
520 73	LIT: LB Science Lab Biology, digital	

Technical data of the digital version:

- Product key for literature (activation & selection of one literature language in LeyLab)
- Can then be used in LeyLab and Document Center (school/institute licence)
- System requirements:
  Document Center:
  - PC with Windows 7 or higher; internet access during installation; local network for distribution to students
  LeyLab:
  - PC, tablet or smartphone with a current browser; internet access

ADDITIONAL STORAGE ACCESSORIES




You can find detailed information on additional storage accessories from page 228.

CELL BIOLOGY

All living beings are made up of cells. The experiments from the Science Lab set *Cell Biology (CE)* therefore begins with the structure of single-cell and multi-cell organisms.

Furthermore, the inner life of the cell is of relevance in the classroom. Students can examine the functions of the cell membrane and enzymes as well.

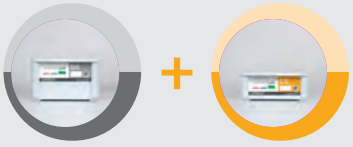
HIGHLIGHT

LB4.1.2.3 Comparison between an animal and a plant cell

Using high-quality micropreparations, the differences and similarities of animal and plant cells can be examined.
For this experiment you will need the sets **Science Lab Biology Basic BB (207 300S)** and **Science Lab Cell Biology CE (207 341S)**.

Further information about our curriculum-compliant topics and student experiments as well as the corresponding sets can be found on the following pages.

Overview of topics and sets

EXPERIMENT TOPICS		REQUIRED SETS		NO. EXPERIMENTS	DETAILS
LB4.0	INTRODUCTION TO THE METHODS	Biology Basic BB	Cell biology CE	19	PAGE 214
LB4.1	STRUCTURE OF THE CELL				
LB4.2	PROCESSES IN THE CELL	207 300S	207 341S		

LB4.2.3.3 Temperature-dependent enzyme effect using the example of catalase

In this experiment, the temperature dependence of the catalase enzyme is examined. To do this, the splitting of hydrogen peroxide using catalase is carried out at different temperatures. A temperature-dependent development of gas can be observed.
For this experiment you will need the sets **Science Lab Biology Basic BB (207 300S)** and **Science Lab Cell Biology CE (207 341S)**.

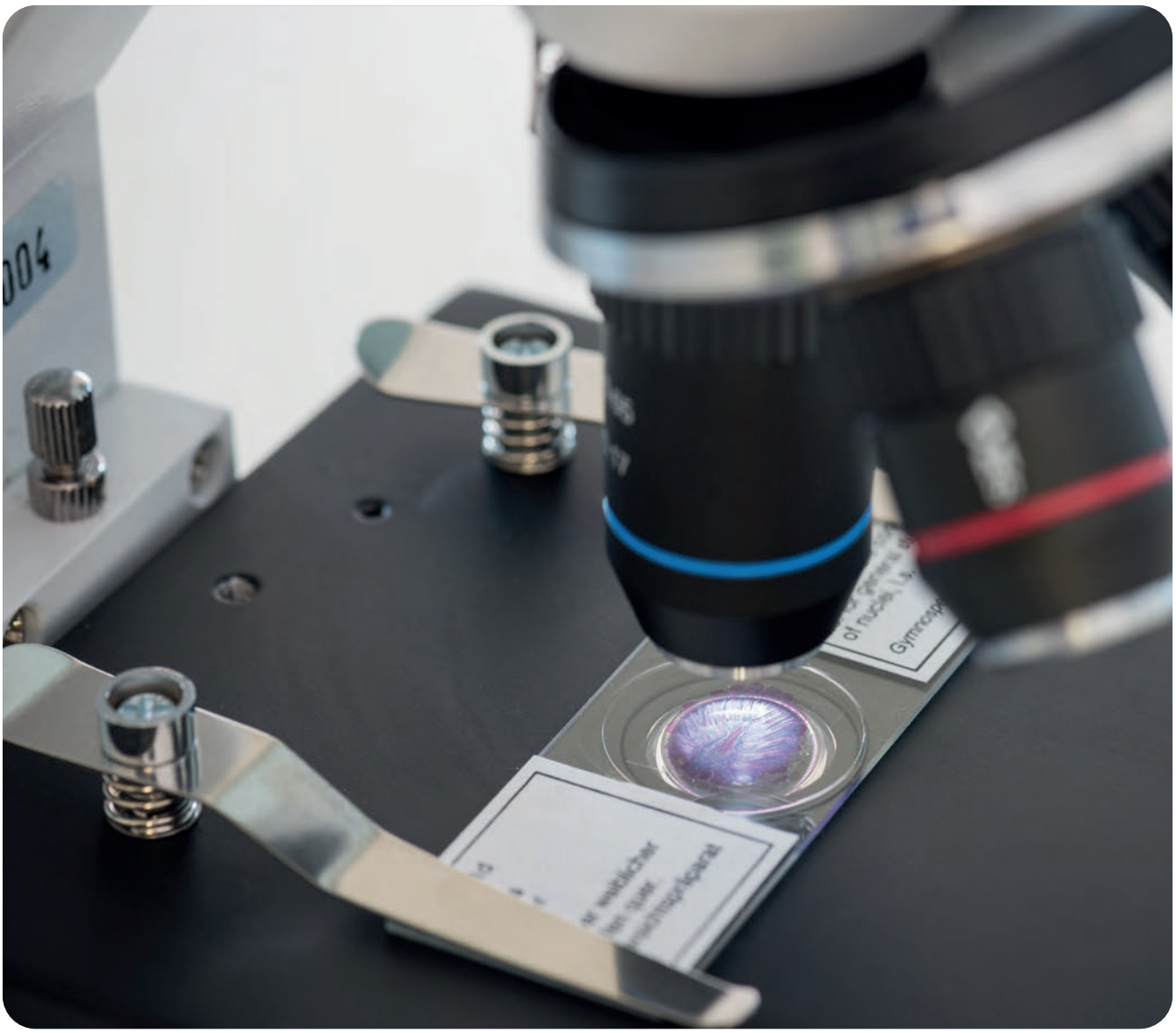
CELL BIOLOGY CE

OVERVIEW OF OUR CURRICULUM-COMPLIANT EXPERIMENTS

Sensors		
	LB4.0	**INTRODUCTION TO METHODS**
	LB4.0.0	Microscopy
	LB4.0.0.1	Structure and functionality of an optical microscope
	LB4.0.0.2	Making micro-preparations
	LB4.1	**STRUCTURE OF THE CELL**
	LB4.1.1	Single-cell organisms
	LB4.1.1.1	Microscopy of yeast cells
	LB4.1.1.2	Microscopy of mould
	LB4.1.1.3	Live/dead staining of yeast cells
	LB4.1.2	Multi-cell organisms
	LB4.1.2.1	Plant cell: Structure of an onion cell
	LB4.1.2.2	Animal cell: Cells of the oral mucosa, uncoloured
	LB4.1.2.3	Comparison between an animal and a plant cell
	LB4.1.2.4	Colouration of an onion skin
	LB4.2	**PROCESSES IN THE CELL**
	LB4.2.1	The cell membrane
	LB4.2.1.1	Plasmolysis and deplasmolysis
	LB4.2.1.2	Diffusion and osmosis
	LB4.2.2	Cell cycle
	LB4.2.2.1	Prepare mitosis stages of an onion root
	LB4.2.3	Enzymes
	LB4.2.3.1	Effect of the enzyme catalase on yeast
●●	LB4.2.3.2C	Urea splitting by urease and inhibition (with Mobile-CASSY 2 WiFi) DIGITAL
	LB4.2.3.3	Temperature-dependent enzyme effect using the example of catalase
	LB4.2.3.3C	Enzyme effect and temperature using the example of catalase (with Mobile-CASSY 2 WiFi) DIGITAL
●●	LB4.2.3.4C	Temperature-dependent urea splitting by urease (with Mobile-CASSY 2 WiFi) DIGITAL
	LB4.2.3.5	Enzyme activity dependent on pH value
	LB4.2.4	Transport processes
	LB4.2.4.1	Cytoplasmic streaming in waterweed

19 EXPERIMENTS

For experiments marked with „C", the measurements are carried out **digitally** with the Mobile-CASSY 2 WiFi. ● Conductivity sensor ● Conductivity adapter S



OVERVIEW OF EQUIPMENT REQUIRED FOR PERFORMING EXPERIMENTS

LB4.0 TO LB4.2 CELL BIOLOGY

BASIC SET	TOPIC SET	DIGITAL MEASURING DEVICE	LITERATURE	CHEMICALS
Biology Basic CB	Cell biology CE	Mobile-CASSY 2 WiFi	Science Lab Biology digital	Chemical Set CE

Detailed information on the above listed and **additionally required products** are available on the following pages.

Science Lab Cellular Biology CE (Set)

Student experiment set of the student experiment system Science Lab in the field of biology. Set-up material for one working group in pre-formed tray.
With the equipment set CE, together with the Science Lab Biology Basic BB (207 300S), 19 experiments at school, college and university level for worldwide curriculums can be performed.
The students deal with the topics cell structure and cell processes. While working out the curriculum required topics, they are also trained in communication and assessment skills. In combination with the Mobile-CASSY 2 WiFi (524 005W), there are additional evaluation options which enable the students digital learning.

Scope of delivery:

Count	Name
3	Beaker Boro 3.3, 100 ml, squat
1	Tray, high
6	Test tube Fiolax 16 mm x 160 mm
1	Beaker Boro 3.3, 400 ml, squat
1	Funnel PP 75 mm Ø
2	Graduated pipette 10 ml

Count	Name
1	Pipetting aid
1	Pestle 88 mm
1	Mortar porcelain 70 mm Ø
6	Rubber stopper solid, 14...18 mm Ø
1	Microscopic specimens set
207 341S	Science Lab Cellular Biology CE (Set)

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

leylab.de/207341S

OVERVIEW OF ADVANTAGES

- Focus on enzymatic experiments
- First steps in digital measurements and evaluation

STUDENT MEASURING DEVICE

DIGITAL CLASS / EDUCATION

Mobile-CASSY 2 WiFi

The universal student measuring device with WiFi for all measuring tasks in physics, chemistry and biology.

524 005W	Mobile-CASSY 2 WiFi	

You can find detailed information on the Mobile-CASSY 2 WiFi on page 228.

ADDITIONALLY REQUIRED TO PERFORM ALL EXPERIMENTS

Additionally required per student

Count	Cat.-No.	Name	Description
1	610 010	Laboratory safety goggles, Focomax	

Additionally required per working group

Count	Cat.-No.	Name	Description
1	207 300S	Science Lab Biology Basic BB (Set)	
1	MIK573886	Microscope EduLed FLQ	
1	656 017	Teclu burner, universal	
1	607 020	Safety gas hose with clamp 0.5 m	
1	524 005W	Mobile-CASSY 2 WiFi	for digital experiments
1	529 670	Conductivity sensor	
1	524 0671	Conductivity adapter S	
1	668 8471	Magnetic stirrer with hot plate	
1	666 851	Stirring magnet 25 mm x 6 mm Ø, circular	Enzymes experiments (LB4.2.3)

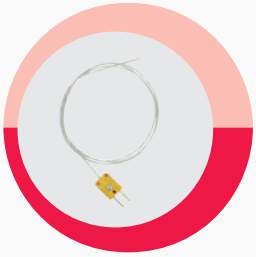
Additionally required per class

Count	Cat.-No.	Name	Description
1	520 73	LIT: LB Science Lab Biology, digital	
1	679 360	Chemicals Science Lab Cell Biology	
1	675 3410	Water, pure, 5 l	
1	MA90204	Universal indicator paper pH 1...14, roll	

Detailed information on **Mobile-CASSY 2 WiFi**, **sensors**, **literature packages** and **chemical sets** are available on the following pages.

SENSORS

INCLUDED IN SCOPE OF DELIVERY



Temperature probe NiCr-Ni, type K

Included with the purchase of the Mobile-CASSY 2 WiFi (524 005W).

SENSORS

Conductivity sensor ●

Conductivity sensor using four-wire technology with integrated Pt temperature sensor for use with chemistry box (524 067), conductivity adapter S (524 0671) and CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836). Open design for rapid response to changes in conductivity.
When conducting measurements a minimum distance of 1 cm from the side of the, as well as a minimum immersion depth of 2 cm are to be maintained.

529 670	Conductivity sensor	

Conductivity adapter S ●

Used in conjunction with the conductivity sensor (529 670), this adapter enables conductivity and temperature to be measured with CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836).

524 0671	Conductivity adapter S	

You can find detailed information on these and other sensors from page 229.

LB4.1.2.4 Colouration of an onion skin

CHEMICALS

Chemicals Science Lab Cell Biology

Chemicals for carrying out student experiments in Science Lab Cell Biology CE. The chemical set contains 15 different chemicals which can be used to perform every experiment at least 10 times.

679 360	Chemicals Science Lab Cell Biology	

The individual chemicals from this set can be found in the chemicals overview which starts from page 220. There you will also find the relevant hazard symbols and classes as well as hazard warnings and safety instructions.

LITERATURE PACKAGES

Here you will find an overview of our literature packages.
You can find detailed information on our literature on the internet at www.leybold-shop.com.

TOPIC
SUBJECT AREA

LIT: LB4 Cell Biology

Detailed experiment instructions for the Science Lab set Cell Biology CE (207 341S). Describes 19 experiments from the field of cell biology.

Topics:
Microscopy; Single-cell orgnisms; Multi-cell organisms; The cell membrane; Cell Cycle; Enzymes; Transport processes

520 7341EN	LIT: LB4 Cell Biology	

SUBJECT

LIT: LB Science Lab Biology, digital

Comprehensive biology experiment instructions for the Science Lab.
Contains 139 experiments in the fields of human biology, botany, ecology and cell biology.

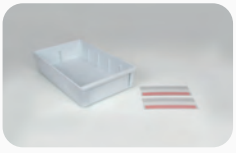
Includes all interactive experiment instructions (Lab Docs) as html file.

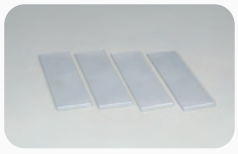
520 73	LIT: LB Science Lab Biology, digital	

Technical data of the digital version:

- Product key for literature (activation & selection of one literature language in LeyLab)
- Can then be used in LeyLab and Document Center (school/institute licence)
- System requirements:
  Document Center:
  - PC with Windows 7 or higher; internet access during installation; local network for distribution to students
  LeyLab:
  - PC, tablet or smartphone with a current browser; internet access

ADDITIONAL STORAGE ACCESSORIES




You can find detailed information on additional storage accessories from page 228.

CHEMICALS

The following overview shows which chemicals are required for the individual topics. They are sorted by article no.

		CHEMISTRY					BIOLOGY							
ART.-NO.	NAME	AC	OC	PC	TC	BC	HU	BO	ECO	CE	GHS - PICTOGRAMS (GLOBALLY HARMONISED SYSTEM OF CLASSIFI			
661 082	Stopcock grease, 60 g	x									-			
670 0400	Acetone, 250 ml	x	x			x		x			GHS02		GHS07	
670 0430	Acetone, 500 ml				x						GHS02		GHS07	
670 2010	Activated charcoal, granulated, 250 g								x		-			
670 2020	Activated charcoal, granulated, 500 g	x									-			
670 2390	Aluminium, sheets, 50 g	x		x							-			
670 2500	Aluminium, grit, 100 g	x									-			
670 3110	Formic acid, 98 %-100 %, 250ml		x								GHS02		GHS05	
670 3600	Ammonia solution, 25 %, 250 ml	x		x							GHS05		GHS07	
670 3650	Ammonia solution, diluted, 2 mol/l, 500 ml	x	x	x	x				x		GHS05			
670 3900	Ammonium carbonate, 100 g									x	GHS07			
670 3910	Ammonium carbonate, 500 g	x									GHS07			
670 4000	Ammonium chloride, 100 g			x							GHS07			
670 4010	Ammonium chloride, 250 g	x									GHS07			
670 4900	Ammonium sulfate, 250 g					x					-			
670 5200	Ammonium thiocyanate, 50 g			x							GHS07			
670 6870	Azur-eosin-meth. sol, 100 ml									x	GHS02		GHS07	
670 7200	Barium chloride, 100 g	x									GHS06			
670 7300	Barium chloride solution, 10 %, 100 ml	x									GHS07			
670 7410	Barium hydroxide, 250 g			x							GHS05		GHS07	
670 8200	Petroleum ether, 90...110 °C, 250 ml	x									GHS02		GHS07	
670 8210	Petroleum ether, 100...140 °C, 500 ml	x	x			x			x		GHS02		GHS08	
670 8300	Benzoic acid, 50 g		x			x					GHS07			
671 0340	Bromide/Bromate solution, 250 ml				x						-			
671 0350	Bromide/Bromate solution, 500 ml		x								-			
671 0800	Bromothymol blue solution, 0.1%, 50 ml	x		x							-			
671 1010	1-Butanol, 1 l		x								GHS02		GHS05	
671 1210	2-Butanol, 1 l		x								GHS02		GHS07	
671 1300	Tertiary butanol, 100 ml		x								GHS02		GHS05	
671 2000	Calcium, granules, 25 g	x									GHS02			
671 2200	Calcium carbide, pieces, 100g		x								GHS02		GHS05	
671 2310	Calcium carbonate, precipitated, 500 g	x			x						-			
671 2400	Calcium chloride, granulated, 100 g	x									GHS07			
671 2900	Calcium hydroxide, 50 g	x	x		x						GHS05		GHS07	
671 2950	Calcium hydroxide solution, 250 ml							x			GHS05			
671 2960	Calcium hydroxide solution (lime water), 1 l						x				GHS05			
671 3200	Calcium oxide, powder, 100 g					x					GHS05			
671 4100	Cetyl alcohol, 50 g		x								-			
671 4910	Schulze's solution, 50 ml					x					GHS05		GHS07	
671 5600	Citric acid monohydrate, 100 g		x		x						GHS07			
671 5700	Cyclohexane, 250 ml		x								GHS02		GHS08	
671 5910	Cyclohexene, 100 ml		x								GHS02		GHS08	
671 8250	Iron powder, coarse, 250 g	x									-			
671 8300	Iron powder, reduced, 50 g	x									-			
671 8410	Iron wool, 200 g	x	x								-			
671 8700	Iron(III) chloride-6-hydrate, 50 g	x	x	x							GHS05		GHS07	
671 9000	Iron(III) oxide, 100 g	x									-			
671 9100	Iron(II) sulfate-7-hydrate, 100 g	x		x							GHS07			
671 9310	Eosine, yellow, 25 g									x	GHS05			
671 9500	Acetic acid, 99 %-100 %, 250 ml		x								GHS02		GHS05	
671 9550	Acetic acid, dil., (approx. 2 mol/l), 500 ml	x	x		x	x					GHS05			
671 9560	Acetic acid, 0.1 mol/l, 500 ml			x							-			
671 9570	Acetic acid, 0.1 mol/l, 1 l	x									-			
671 9630	Ethyl acetate, 250 ml			x							GHS02		GHS07	
671 9640	Acetic ethylester, 500 ml		x								GHS02		GHS07	
671 9700	Ethanol, absolute, 250 ml		x								GHS02		GHS07	

For explanation and detailed information on hazard warnings, precautionary statements and GHS pictograms please consult the CLP regulation. Also please always observe the regulations that apply to your country.

CATION AND LABELLING OF CHEMICALS)					HAZARD STATEMENTS	PRECAUTIONARY STATEMENTS	SIGNAL WORDS
					-	-	-
					H225 H319 EUH066 H336	P210 P233 P305+P351+P338	Danger
					H225 H319 EUH066 H336	P210 P233 P305+P351+P338	Danger
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					H226 H314	P260 P280 P301+P330+P331 P305+P351+P338 P309+P310	Danger
		GHS09			H314 H335 H400	P280 P273 P301+P330+P331 P305+P351+P338 P309 P310	Danger
					H315 H318	P280 P305+P351+P338 P332+P313 P309+P310	Danger
					H302	-	Warning
					H302	-	Warning
					H302 H319	P305+P351+P338	Warning
					H302 H319	P305+P351+P338	Warning
					-	-	-
					H302 EUH032 H312 H332 H412	P273 P302+P352	Warning
					H225 H319	P210 P280 P305+P351+P338 P337+P313	Danger
					H332 H301	P301+P310	Danger
					H302	P301+P312	Warning
					H332 H302 H314	P280 P301+P330+P331 P305+P351+P338 P309+P310	Danger
		GHS08		GHS09	H225 H304 H315 H336 H411	P101 P102 P103 P210 P260 P262 P243 P301+P330+P331 P403+P233	Danger
		GHS07		GHS09	H225 H304 H315 H336 H411	P210 P273 P302+P352 P301+P310 P331	Danger
					H302 H319	P305+P351+P338	Warning
					-	-	-
					-	-	-
					-	-	-
		GHS07			H226 H302 H318 H315 H335 H336	P280 P302+P352 P305+P351+P338 P313	Danger
					H226 H319 H335 H336	P210 P261 P280 P303+P361+P353 P305+P351+P338 P403+P233	Warning
		GHS07			H226 H315 H318 H335 H336	P210 P302+P352 P304+P340 P305+P351+P338	Danger
					H261	P402+P404	Danger
					H261 H318	P280 P262 P305+P351+P338 P310 P370+P378 P404	Danger
					-	-	-
					H319	P305+P351+P338	Warning
					H315 H318 H335	P260 P280 P302+P352 P304+P340 P305+P351+P338 P313	Danger
					H315 H318	P280 P302+P352 P305+P351+P338	Danger
					H315 H318	P280 P302+P352 P305+P351+P338	Danger
					H318	P260 P280 P305+P351+P338	Danger
					-	-	-
		GHS09			H302 H314 H400 H410	P280 P273 P303+P361+P353 P305+P351+P338 P310 P501	Danger
					H319	P305+P351+P338	Warning
		GHS07		GHS09	H225 H304 H410 H315 H336	P210 P240 P273 P301+P310 P331 P403+P235	Danger
		GHS07		GHS09	H225 H302 H304 H411	P210 P262 P273	Danger
					-	-	-
					-	-	-
					-	-	-
					H302 H315 H318	P280 P302+P352 P305+P351+P338 P313	Danger
					-	-	-
					H302 H315 H319	P302+P352 P305+P351+P338	Warning
					H318	P280d P305+P351+P338 P310	Danger
					H226 H314 H290	P280 P301+P330+P331 P307+P310 P305+P351+P338	Danger
					H315 H319 H290	P280 P305+P351+P338 P332+P313 P337+P313 P302+P352	Warning
					-	-	-
					-	-	-
					H225 H319 EUH066 H336	P210 P240 P305+P351+P338	Danger
					H225 H319 EUH066 H336	P210 P240 P305+P351+P338	Danger
					H225 H319	P210 P280 P305+P351+P338 P337+P313	Danger

		CHEMISTRY					BIOLOGY								
ART.-NO.	NAME	AC	OC	PC	TC	BC	HU	BO	ECO	CE	GHS - PICTOGRAMS (GLOBALLY HARMONISED SYSTEM OF CLASSIFI			
671 9720	Ethanol, denaturated, 1 l	x	x	x		x				x		GHS02		GHS07
671 9740	Ethanol, denaturated, 250 ml				x							GHS02		GHS07
671 9800	Ethylene glycol, 250 ml		x									GHS07		
671 9900	Fehling's solution I, 100 ml					x	x					GHS09		
672 0000	Fehling's solution II, 100 ml					x	x					GHS05		
672 0700	D(-)-Fructose, 50 g					x					-			
672 0970	Gypsum, burned, pure, 500 g				x						-			
672 0980	Gypsum, burned, pure, 1 kg							x			-			
672 1000	Glass wool, 10 g				x				x		-			
672 1010	Glass wool, 100 g	x									-			
672 1100	D(+)-Glucose, 100 g	x	x								-			
672 1110	D(+)-Glucose, 250 g						x				-			
672 1120	D(+)-Glucose, 1 kg					x					-			
672 1190	Glycerine, 99 %, 50 ml	x									-			
672 1200	Glycerol, 99 %, 100 ml		x		x	x			x		-			
672 1300	Glycine (Glycocoll), 50 g	x									-			
672 1700	Urea, 100 g		x							x	-			
672 1800	n-Heptane, 50 ml		x									GHS02		GHS08
672 1810	n-Heptane, 250 ml	x										GHS02		GHS08
672 2490	Charcoal, small pieces, 500 g				x						-			
672 2520	Wooden turnings, 100 St.	x	x	x	x	x					-			
672 3290	Immersion oil, 5 ml								x			GHS07		GHS09
672 3400	Indigo carmine, 10 g							x			-			
672 3700	Iodine, 25 g	x										GHS07		GHS08
672 3900	Lugol's solution, 100 ml							x				GHS08		
672 3911	Lugol's solution, 1 l		x									GHS08		
672 3920	Lugol's solution, 50 ml			x		x	x					GHS08		
672 4900	Potassium bromide, 50 g				x							GHS07		
672 4930	Potassium bromide solution, approx. 1 M, 250 ml			x							-			
672 5000	Potassium carbonate, 100 g			x								GHS07		
686 666	Potassium chloride, 50 g						x				-			
672 5200	Potassium chloride, 100 g	x	x	x							-			
672 6000	Potassium ferrocyanide (II), 50 g	x									-			
672 6100	Potassium ferrocyanide (III), 50 g	x		x							-			
672 6320	Potassium hydrogen tartrate, 250 g		x								-			
672 6400	Potassium hydroxide, 250 g	x										GHS05		GHS07
672 6500	Potassium iodate, 25 g	x										GHS03		GHS05
672 6600	Potassium iodide, 25 g				x						-			
672 6630	Potassium iodide, 250 g	x									-			
672 6670	Potassium iodide solution, approx. 1 M, 250 ml			x							-			
672 6710	Potassium sodium tartrate, 250 g					x					-			
672 6800	Potassium nitrate, 100 g						x					GHS03		
672 6810	Potassium nitrate, 250 g	x		x								GHS03		
672 6850	Potassium nitrate solution, approx. 1 mol/l, 250 ml							x			-			
672 7000	Potassium permanganate, 100 g		x									GHS03		GHS07
672 7400	Potassium thiocyanate, 100 g			x								GHS07		
672 7580	Carbolic fuchsin solution, 100 ml								x			GHS05		GHS08
672 7660	Carmine acetic acid, 50 ml									x		GHS07		
672 8600	Copper, sheets, 50 g			x	x						-			
672 8620	Copper, sheets, 250 g	x									-			
672 8800	Copper, powder, 50 g	x		x								GHS09		
672 9100	Copper(II) chloride, 50 g			x								GHS07		GHS09
672 9500	Copper(II) oxide, powder, 50 g	x			x							GHS07		GHS09
672 9510	Copper(II) oxide, powder, 100 g		x									GHS07		GHS09
672 9600	Copper(II) sulfate-5-hydrate, 100 g		x	x		x				x		GHS07		GHS09
672 9630	Copper(II) sulfate-5-hydrate, 500 g	x										GHS07		GHS09
672 9650	Copper(II) sulfate solution 1 %, 50 ml							x						
672 9660	Copper(II) sulfate solution, 1 mol/l (15 %), 500 ml	x		x		x						GHS07		GHS09
673 0130	Lavender oil, 10 ml						x					GHS07		GHS08
673 0210	Linseed oil, 250 ml				x						-			

CATION AND LABELLING OF CHEMICALS)					HAZARD STATEMENTS	PRECAUTIONARY STATEMENTS	SIGNAL WORDS
					H225 H319	P210 P280 P305+P351+P338 P337+P313	Danger
					H225 H319	P210 P280 P305+P351+P338 P337+P313	Danger
					H302	-	Warning
					H411	P273 P391	-
					H314	P280 P303+P361+P353 P305+P351+P338 P310	Danger
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
	GHS07		GHS09		H225 H304 H315 H336 H410	P210 P273 P301+P310 P331 P302+P352 P403+P235	Danger
	GHS07		GHS09		H225 H304 H315 H336 H410	P210 P273 P301+P310 P331 P302+P352 P403+P235	Danger
					-	-	-
					-	-	-
					H302 H411	P273	Warning
					-	-	-
	GHS09				H302 H312 H332 H315 H319 H335 H372 H400	P261 P302+P352 P304+P340 P305+P351+P338 P314 P273	Danger
					H373	P260 P314	Warning
					H373	P260 P314	Warning
					H373	P260 P314	Warning
					H319	P305+P351+P338 P337+P313	Warning
					-	-	-
					H315 H319	P302+P352 P305+P351+P338	Warning
					-	-	-
					-	-	-
					H412	P273	-
					EUH032	-	-
					-	-	-
					H314 H302 H290	P280 P301+P330+P331 P305+P351+P338 P309+P310	Danger
					H272 H318	P221 P280 P305+P351+P338	Danger
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					H272	P210	Warning
					H272	P210	Warning
					-	-	-
	GHS09				H272 H302 H410	P210 P273	Danger
					H302 EUH032 H312 H332 H412	P273 P302+P352	Warning
					H315 H318 H341	P280 P302+P352 P305+P351+P338 P310	Danger
					H315 H319	P280 P302+P352 P305+P351+P338 P337+P313	Warning
					-	-	-
					-	-	-
					H400	P273 P391 P501	Warning
					H302 H410	P273	Warning
					H302 H410	P260 P273	Warning
					H302 H410	P260 P273	Warning
					H302 H319 H315 H410	P273 P302+P352 P305+P351+P338	Warning
					H302 H319 H315 H410	P273 P302+P352 P305+P351+P338	Warning
					H315 H304	P301+P310 P331 O280 P302+P352	Danger
					H319 H315 H410	P273 P305+P351+P338 P302+P352	Warning
					-	-	-

		CHEMISTRY					BIOLOGY								
ART.-NO.	NAME	AC	OC	PC	TC	BC	HU	BO	ECO	CE	GHS - PICTOGRAMS (GLOBALLY HARMONISED SYSTEM OF CLASSIFI			
673 0500	Lithium chloride, 25 g	x	x								GHS07			
673 0840	Magnesia rods, 25 pieces	x			x	x					-			
673 1000	Magnesium, ribbon, 25 g	x		x							GHS02			
673 1100	Magnesium, powder, 50 g	x									GHS02			
673 1150	Magnesium, turnings, 50 g		x	x							GHS02			
673 1230	Magnesium chloride solution, approx. 1 M, 250 ml			x							-			
673 1500	Magnesium oxide, 50 g	x									-			
673 2200	Manganese(IV) oxide, 100 g			x						x	GHS03		GHS07	
673 2210	Manganese(IV) oxide, 500 g	x									GHS03		GHS07	
673 2500	Marble, pcs., 250 g				x						-			
673 2720	Methanol, 1 l		x								GHS02		GHS06	
673 2920	Methylene blue solution, 100 ml					x				x	GHS02		GHS07	
673 3050	Methylene orange solution, 0.1 %, 100 ml	x									-			
673 4510	2-Naphthol, 100 g				x						GHS07		GHS09	
673 5000	Sodium acetate-3-hydrate, 50 g	x									-			
673 5590	Sodium carbonate-10-hydrate, 500 g	x									GHS07			
673 5600	Natrium carbonate, anhydrous, 100 g	x		x							GHS07			
673 5610	Sodium carbonate, anhydrous, 250 g				x	x					GHS07			
673 5690	Sodium chloride, 2,5 kg				x						-			
673 5700	Sodium chloride, 250 g			x		x	x			x	-			
673 5720	Sodium chloride, 1 kg	x	x								-			
673 5740	Sodium chloride solution, approx. 1 M, 500 ml			x							-			
673 6300	Sodium dithionite, 25 g							x			GHS02		GHS07	
673 6310	Sodium dithionite, 250 g				x						GHS02		GHS07	
673 6600	Sodium bicarbonate, 250 g		x					x			-			
673 6610	Sodium bicarbonate, 500 g		x								-			
673 6780	Sodium hydrogen sulfite solution, 40%, 250 ml		x								GHS07			
673 6800	Sodium hydroxide, pellets, 100 g		x		x						GHS05			
673 6810	Sodium hydroxide, pellets, 250 g			x							GHS05			
673 6830	Sodium hydroxide, pellets, 500 g	x									GHS05			
673 7100	Sodium nitrite, 50 g				x						GHS03		GHS06	
673 7410	Trisodium phosphate dodecahydrate, 250 g								x		GHS07			
673 7600	Sodium sulfate-10-hydrate, 100 g	x									-			
673 8000	Sodium thiosulfate-5-hydrate, 100 g			x							-			
673 8010	Sodium thiosulfate-5-hydrate, 250 g	x									-			
673 8380	Sodium hydroxide solution, 32%, 250 ml	x									GHS05			
673 8400	Sodium hydroxide solution, diluted, aprox. 2 M, 500 ml		x	x	x	x					GHS05			
673 8410	Sodium hydroxide solution, 0.1 mol/l, 500 ml		x								GHS05			
673 8411	Sodium hydroxide solution, 0.1 mol/l, 1 l	x		x							GHS05			
673 8420	Sodium hydroxide solution, 1 mol/l, 500 ml		x		x	x	x			x	GHS05			
673 8421	Sodium hydroxide solution, 1 mol/l, 1 l	x		x							GHS05			
673 8600	Clove oil, 10 ml						x				GHS07		GHS08	
673 9390	2-Nitrobenzaldehyde, 5 g				x						GHS07			
674 0000	Oleic acid, 50 ml				x						-			
674 0100	Olive oil, 100 ml							x			-			
674 0620	Pancreatin, 25 g						x				GHS07		GHS08	
674 0700	Paraffine, hard, 100 g	x	x								-			
674 0800	Paraffine, thick, 100 ml	x									-			
674 0810	Paraffine, thick, 250 ml		x								-			
674 1200	1-Pentanol, 100 ml		x								GHS02		GHS07	
674 1420	Pepsin for biochemistry, 25 g						x				GHS08		GHS07	
674 2000	Bead catalyst, 500 g		x								-			
674 2200	Petroleum ether, 40...70 °C, 250 ml		x	x				x			GHS02		GHS08	
674 2500	Phenolphthaleine solution, 100 ml	x		x			x				GHS02		GHS08	
674 3440	Phosphoric acid, 10 %, 100 ml	x									GHS07			
674 3950	Culture medium (agar) for fungi, for 1 l						x				-			
674 4050	Plate-count agar, for 1 l						x				-			
674 4320	1-Propanol, 1 l		x								GHS02		GHS05	
674 4410	2-Propanol, 1 l		x								GHS02		GHS07	
674 4450	Propanal, 100 ml		x								GHS02		GHS07	

CATION AND LABELLING OF CHEMICALS)					HAZARD STATEMENTS	PRECAUTIONARY STATEMENTS	SIGNAL WORDS
					H302 H315 H319	P302+P352 P305+P351+P338	Warning
					-	-	-
					H228	P370+P378	Warning
					H260 H250	P210 P370+P378 P402+P404	Danger
					H228 H261 H252	P210 P402+P404	Danger
					-	-	-
					-	P260	-
					H272 H302 H332	P221	Danger
					H272 H302 H332	P221	Danger
					-	-	-
		GHS08			H225 H301 H311 H331 H370	P210 P233 P280 P302+P352 P309+P310	Danger
					H226 H319	P210 P280 P305+P351+P338 P337+P313	Warning
					-	-	-
					H332 H302 H400	P273	Warning
					-	-	-
					H319	P280 P305+P351+P338	Warning
					H319	P260 P305+P351+P338	Warning
					H319	P260 P305+P351+P338	Warning
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					H251 H302 EUH031	P370+P378	Danger
					H251 H302 EUH031	P370+P378	Danger
					-	-	-
					-	-	-
					H302 EUH031	P262	Warning
					H314 H290	P280 P301+P330+P331 P309+P310 P305+P351+P338	Danger
					H314 H290	P280 P301+P330+P331 P309+P310 P305+P351+P338	Danger
					H314 H290	P280 P301+P330+P331 P309+P310 P305+P351+P338	Danger
		GHS09			H272 H301 H400	P273 P309+P310	Danger
					H319 H315	P302+P352 P305+P351+P338	Warning
					-	-	-
					-	-	-
					-	-	-
					H314 H290	P280 P303+P361+P353 P305+P351+P338 P310 P301+P330+P331	Danger
					H314 H290	P280 P303+P361+P353 P305+P351+P338 P310 P301+P330+P331	Danger
					H290	P234 P390	Warning
					H290	P234 P390	Warning
					H314 H290	P280 P301+P330+P331 P305+P351+P338 P309+P310	Danger
					H314 H290	P280 P301+P330+P331 P305+P351+P338 P309+P310	Danger
					H302 H312 H304 H317 H319 H412	P280 P301+P310 P305+P351+P338 P331	Danger
					H302 H315 H319 H335	P261 P305+P351+P338	Warning
					-	-	-
					-	-	-
					H315 H319 H335 H317 H334	P280 P302+P352 P304+P341 P342+P311 P305+P351+P338	Danger
					-	-	-
					-	-	-
					-	-	-
					H226 H332 H335 H315	P302+P352	Warning
					H315 H319 H335 H334	P302+P352 P304+P341 P305+P351+P338 P342+P311	Danger
					-	-	-
		GHS07		GHS09	H225 H304 H315 H336 H411 EUH066	P210 P240 P273 P301+P310 P331 P403+P235	Danger
					H225 H350 H341	P210 P233 P281 P308+P313	Danger
					H315 H319	P280 P302+P352 P305+P351+P338 P313	Warning
					-	-	-
					-	-	-
		GHS07			H225 H318 H336	P210 P233 P280 P305+P351+P338 P313	Danger
					H225 H319 H336	P210 P233 P305+P351+P338	Danger
					H225 H315 H319 H335	P210 P233 P302+P352 P304+P340 P305+P351+P338	Danger

		CHEMISTRY					BIOLOGY								
ART.-NO.	NAME	AC	OC	PC	TC	BC	HU	BO	ECO	CE	GHS – PICTOGRAMS (GLOBALLY HARMONISED SYSTEM OF CLASSIFI			
674 4510	Propionic acid, 250 ml		x								GHS05			
674 4950	Quartz sand, 100 g				x						-			
674 5830	Rose oil, artificial, 10 ml						x				GHS05		GHS07	
674 5700	Resorcin, 50 g					x					GHS07		GHS09	
674 6050	D(+)-Sucrose, 100 g	x	x	x		x			x	x	-			
674 6060	D(+)-Sucrose, 250 g						x				-			
674 6650	Nitric acid, diluted, approx. 2 mol/l, 500 ml	x									GHS05			
674 6750	Hydrochloric acid, conc., 25 %, 250 ml	x	x	x		x					GHS05		GHS07	
674 6800	Hydrochloric acid, 10 %, 500 ml				x	x					GHS05		GHS07	
674 6810	Hydrochloric acid, 10 %, 1 l	x									GHS05		GHS07	
674 6900	Hydrochloric acid, 1 mol/l, 500 ml					x	x	x		x	GHS05			
674 6910	Hydrochloric acid, 1 mol/l, 1 l	x		x							GHS05			
674 6920	Hydrochloric acid, approx. 2 mol/l, 500ml	x		x							GHS05			
674 6960	Hydrochloric acid, 0.1 mol/l, 1 l	x		x							GHS05			
674 6700	Hydrochloric acid, fuming, 37 %, 250 ml		x								GHS05		GHS07	
674 7350	Schiffs's reagent, 250 ml		x								GHS05			
674 7610	Sulfur, sublimed, 500 g	x		x							GHS07			
674 7850	Sulfuric acid, 95–98 %, 250 ml		x								GHS05			
674 7891	Sulfuric acid, 35 %, 1 l			x							GHS05			
674 7900	Sulfuric acid, 5 mol/l, 100 ml	x									GHS05			
674 7920	Sulfuric acid, diluted, approx. 2 N, 500 ml	x	x	x	x						GHS05			
674 7950	Sulfuric acid, 0.5 mol/l, 1l			x			x				GHS05			
674 8200	Sea sand, purified, 250 g		x		x			x			-			
674 8210	Sea sand, purified, 1 kg	x									-			
674 8211	Sea sand, purified, 500 g								x		-			
674 8610	Silver nitrate, 25 g			x							GHS03		GHS05	
674 8710	Silver nitrate solution, 5 %, 100 ml	x			x						GHS05		GHS09	
674 8800	Silver nitrate solution, 0,1 mol/l, 250 ml		x								GHS07		GHS09	
674 8810	Silver nitrate solution, 0,1 mol/l, 1 l			x							GHS07		GHS09	
674 9050	Silicone oil, 100 ml				x						-			
674 9100	Sorbic acid, 25 g					x					GHS07			
674 9200	Starch, soluble, 100 g						x				-			
674 9210	Starch, soluble, 250 g				x						-			
674 9220	Starch, soluble, 50 g	x	x	x		x					-			
674 9520	Polystyrene (Styropor P), 100 g	x									-			
674 9680	Sudan black, 1 g					x	x				-			
674 9710	Sulphanilic acid, 50 g				x						GHS07			
675 0200	Tannin, 50 g					x					-			
675 1600	Thymolphthalein solution, 0.1 %, 50 ml	x									GHS02		GHS07	
675 1650	Tillman's reagent, 50 ml					x					-			
675 2530	L(-)-Tyrosine, 25 g					x					-			
675 2570	Universal Indicator, 100ml	x									GHS02		GHS07	
675 2800	Urease (1 U/mg), 1 g									x	-			
675 3100	Vaseline, 50 g							x			-			
675 3270	Vitamin C, 50 g					x					-			
675 3500	Hydrogen peroxide, 30 %, 250 ml	x		x						x	GHS05		GHS07	
675 3510	Hydrogen peroxide, 30 %, 1 l						x				GHS05		GHS07	
675 3520	Hydrogen peroxide, 5 %, 50 ml		x								GHS07			
675 3550	Cotton wad, 200 g	x	x	x		x		x	x		-			
675 3600	L(+)-Tartaric acid, 100 g		x								GHS07			
675 4700	Cellulose acetate, 100 g		x								-			
675 4800	Zinc, granulated, 100 g	x									-			
675 4900	Zinc, powder, 100 g	x		x							GHS09			
675 4901	Zinc, powder, 25 g				x						GHS09			
675 5000	Zinc, sticks, 100 g	x									-			
675 5110	Zinc chloride, dry, 250 g		x								GHS05		GHS07	
675 5220	Zinc iodide solution, 50 %, 50 g			x							GHS07			
675 5300	Zinc oxide, 50 g	x									GHS09			
675 5510	Zinc sulfate solution, approx. 1 M, 500 ml			x							GHS07			
675 5700	Tin, foil, 100 x 0.10 mm, 50 g	x			x						-			

CATION AND LABELLING OF CHEMICALS)					HAZARD STATEMENTS	PRECAUTIONARY STATEMENTS	SIGNAL WORDS
					H314	P280 P301+P330+P331 P305+P351+P338 P309+P310	Danger
					-	-	-
		GHS09			H318 H317 H315 H411	P280 P305+P351+P338 P333+P313 P302+P352	Danger
					H302 H315 H319 H400	P273 P302+P352 P305+P351+P338	Warning
					-	-	-
					-	-	-
					H314 H290	P280 P305+P351+P338 P309+P310 P301+P330+P331	Danger
					H314 H335 H290	P280 P301+P330+P331 P309+P310 P305+P351+P338	Danger
					H315 H319 H335 H290	P280 P261 P304+P340 P305+P351+P338 P312 P403+P233	Warning
					H315 H319 H335 H290	P280 P261 P304+P340 P305+P351+P338 P312 P403+P233	Warning
					H290	P390	Warning
					H290	P390	Warning
					H290	P390	Warning
					H290	P390	Warning
					H314 H335 H290	P280 P301+P330+P331 P309+P310 P305+P351+P338	Danger
					H290	P234 P262	Warning
					H315	P302+P352	Warning
					H314 H290	P280 P301+P330+P331 P309 P310 P305+P351+P338	Danger
					H290 H314	P260 P280 P301+P330+P331 P305+P351+P338 P310	Danger
					H290 H314	P280 P301+P330+P331 P309 P310 P305+P351+P338	Danger
					H290 H315 H319	P280 P305+P351+P338 P337+P313 P302+P352	Warning
					H290	-	Warning
					-	-	-
					-	-	-
					-	-	-
		GHS09			H272 H314 H410	P273 P280 P301+P330+P331 P305+P351+P338 P309+P310	Danger
					H314 H410	P280 P273 P302+P352 P305+P351+P338 P332+P313 P337+P313	Danger
					H315 H319 H410	P280 P273 P302+P352 P305+P351+P338 P332+P313 P337+P313	Warning
					H315 H319 H410	P280 P273 P302+P352 P305+P351+P338 P332+P313 P337+P313	Warning
					-	-	-
					H315 H319 H335	P302+P352 P305+P351+P338	Warning
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					-	-	-
					H315 H319 H317	P280 P302+P352 P305+P351+P338	Warning
					-	-	-
					H226 H319	P210 P280 P305+P351+P338 P337+P313	Warning
					-	-	-
					-	-	-
					H225 H319	P210 P280 P305+P351+P338 P337+P313	Danger
					-	-	-
					-	-	-
					-	-	-
					H302 H318	P280 P305+P351+P338 P313	Danger
					H302 H318	P280 P305+P351+P338 P313	Danger
					H319	P280 P305+P351+P338 P337+P313	Warning
					-	-	-
					H319	P305+P351+P338	Warning
					-	-	-
					-	-	-
					H410	P273	Warning
					H410	P273	Warning
					-	-	-
		GHS09			H302 H314 H335 H410	P273 P280 P301+P330+P331 P305+P351+P338 P309+P310	Danger
					H315 H319	P302+P352 P305+P351+P338	Warning
					H410	P273	Warning
					H319 H412	P273 P305+P351+P338	Warning
					-	-	-

Mobile-CASSY 2 WiFi

Measuring device for student experiments and demonstrations in the natural sciences:

- Large measured value display switches on automatically after start-up or when a sensor is attached (no boot time and no further keys to press)
- 4 mm safety sockets for *U*, *I*, *P* and *E* as well as Type K socket for NiCr-Ni temperature probe integrated
- For all CASSY sensors and sensors M
- The touch wheel – with a turn of the wheel quickly change to the appropriate screen or the appropriate list entry
- Measurement time, measurement interval, trigger and pre-trigger (advance) are adjustable
- Graphs of measured values with freely selectable coordinate axes and selectable evaluation methods (e.g. zoom and straight line fitting)
- Measured values and screen shots can be saved on an integrated micro SD card and copied onto a USB stick
- Full support from CASSY Lab 2 (524 220), via USB lead for teaching by demonstration with the projector
- Support leg allows easy viewing angle.
- WiFi integrated.

Technical data:

- Graphics display: 9 cm (3.5"), colour QVGA (adjustable up to 400 cd/m²)
- Inputs: 3 (can be used simultaneously)
- Input A: *U* or CASSY sensor or sensor M
- Input B: *I* or CASSY sensor or sensor M
- Input ϑ: temperature
- Measuring range *U*: ±0.1/±0.3/±1/±3/±10/±30 V
- Measuring range *I*: ±0.03/±0.1/±0.3/±1/±3 A
- Measuring range ϑ: -200 ... +200 °C / -200 ... +1200 °C
- Sensor connections: each 2 for CASSY sensors and sensors M
- Sampling rate: max. 500,000 values/second
- Operation: large capacitive touch wheel (42 mm)
- Resolution: 12 bit
- Time resolution of the timer inputs: 20 ns
- Loudspeaker: integrated for key tones and GM counter tube (can be disabled as required)
- Data storage device: integrated micro SD card for more than a thousand measurement files and screen shots, optionally also via a USB stick
- WiFi: 802.11 b/g/n as access point or client (WPA/WPA2)
- VNC server: integrated
- Battery capacity: 14 watt-hours (AA size, replaceable)
- Battery life: 8 h during operation, several years on standby
- Kensington lock: as anti-theft protection
- Dimensions: 175 mm x 95 mm x 40 mm

Scope of delivery:

- Mobile-CASSY 2 WiFi
- Battery charger
- NiCr-Ni temperature sensor
- Quick start guide

524 005W	Mobile-CASSY 2 WiFi

Additionally recommended:

Count	Cat.-No.	Name
1	524 0034	Charging adapter for 4 Mobile-CASSY 2 WiFi
1	524 0039	Storage tray Mobile-CASSY 2 WiFi

Charging adapter for 4 Mobile-CASSY 2 WiFi

For the simultaneous charging of up to 4 Mobile-CASSY 2 WiFi (524 005W) with just one plug-in power supply.

Technical data:

- Charging time: unchanged compared to single charging
- Connection: hollow socket for 12 VAC plug-in connector (incl. in the scope of delivery of every Mobile-CASSY 2 WiFi)
- Fuse: 1.1 A (self-resetting)
- Dimensions: 195 mm x 17 mm x 36 mm
- Weight: 70 g

524 0034	Charging adapter for 4 Mobile-CASSY 2 WiFi

Storage tray Mobile-CASSY 2 WiFi

For safe storage of up to 8 Mobile-CASSY 2 WiFi (524 005W). Together with two adapters (524 0034) all 8 Mobile-CASSY 2 WiFi can be simultaneously charged in the storage tray.

Technical data:

- Dimensions: 27 cm x 45 cm x 16.5 cm

Scope of delivery:

- Storage tray with foam inlay

524 0039	Storage tray Mobile-CASSY 2 WiFi

Recommended accessories: 2 charging adapters (524 0034)

Pressure sensor S, ±70 hPa

For measuring very small pressure differences with CASSY (524 013, 524 006, 524 018, 524 005W) or the universal measuring instruments (531 835, 531 836, 531 837), e.g. at flow experiments in the wind tunnel (373 12) or the Venturi tube (from 373 091). Connection to the experiment via two hose nozzles (4 mm diam.). Incl. PVC tubing (667 192) and two connectors with nipple (604 520).

Technical data:

- Measuring ranges: ±0.7/±2.1/±7/±21/±70 hPa
- Resolution: 0.05% of the measuring range
- Dimensions: 70 mm x 50 mm x 25 mm
- Weight: 75 g

524 066	Pressure sensor S, ±70 hPa

Force sensor M, ±50 N

For measuring force components up to ±50 N (e.g. spring pendulum or centrifugal force components) with Mobile-CASSY 2 WiFi (524 005W). Its rigid design enables the measurement of force components in any position of the force sensor.

Technical data:

- Measurement ranges: ±5/±50 N
- Resolution: 0.1 % of the measurement range
- Compensation (Tare): ±50 N in every measurement range
- Fixing: with securing bolts on stand equipment
- Connection: Mini-DIN
- Connection cable length: 0.3 m

524 434	Force sensor M, ±50 N

Light barrier M

Cascadable photoelectric barrier for measuring period durations, travelling time, paths and velocities on the student track or during free fall with Mobile-CASSY 2 WiFi (524 005W).

Technical data:

- Time resolution: 100 ns
- Path resolution: 5 mm when utilising the spoked wheels
- Cascading: up to 5 photoelectric barriers (e.g. for travelling time measuring or up to 5 sequential relocity measurements on one track)
- Fixing: locking in place under the student track (460 81/460 82) or via M6 threads
- Connection cable length: 1 m
- Connection: Mini-DIN
- Supply voltage: 5 V DC via Mini-DIN
- Dimensions: 120 mm x 115 mm x 30 mm
- Weight: 180 g

524 431	Light barrier M

Recommended accessories:

- Spoked wheel (524 4322)
  For fixing on a light barrier M for continuous path and velocity measuring.
- Start jig, trolley (524 4323)
  For fixing on a light barrier M for automatic start of the time measuring when starting the movement on a track (instead of a holding magnet).
- Start jig, ball (524 4324)
  For fixing on a light barrier M for automatic start of the time measuring when starting a free fall of a ball (instead of a holding magnet).

Microphone M

For measuring sound level, frequency and the voltage of acoustic signals with Mobile-CASSY 2 WiFi (524 005W).

Technical data:

- Measuring variables: Voltage, frequency, sound level
- Frequency range: 50 ... 20,000 Hz
- Sound level ranges: 40 ... 100 dB, 60 ... 120 dB (also automatically)
- Sampling rate: maximum 500,000 values/s
- Connection: Mini-DIN
- Connection cable length: 1.2 m

524 442	Microphone M

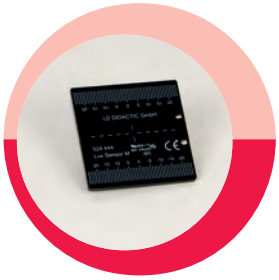
Magnetic field sensor M, ±100 mT

For measuring the tangential or axial magnetic flux density up to ±100 mT with Mobile-CASSY 2 WiFi (524 005W).

Technical data:

- Measurement ranges: ±10/±100 mT
- Resolution: 0.05 % of the measurement range
- Measurement direction: switchable between axial and tangential
- Connection: Mini-DIN
- Connection cable length: 1.2 m

524 436	Magnetic field sensor M, ±100 mT



Lux sensor M

For measuring the illuminance of visible light with Mobile-CASSY 2 WiFi (524 005W). The lux sensor has a flat design so that it can, for example, be inserted directly into the holder for diaphragms and slides (459 33). With the lux sensor, measurements can be performed along and orthogonal to the optical axis. A printed millimetre scale is used to position the sensor on the optical axis and also enables the recording of intensity distributions of different diffraction objects (e.g. 469 731) without additional equipment.

Technical data:

- Measuring ranges: 0...100 lx, 0...1 klx, 0...10 klx, 0...100 klx
- Dimensions of the sensor: 0.4 mm x 0.4 mm
- Spectral sensitivity: 480 ... 650 nm
- Dimensions: 50 mm x 50 mm x 2.4 mm
- Connection: Mini-DIN
- Length of connecting cable: 1.20 m

524 444	Lux sensor M

GM adapter M

For measuring radioactive radiation with a Geiger-Müller counter tube (559 01 or 559 012) with Mobile-CASSY 2 WiFi (524 005W).

Technical data:

- Counter tube voltage: 200 ... 650 V (adjustable)
- Counter tube input: Coaxial socket
- Connection: Mini-DIN
- Connection cable length: 0.3 m

524 440	GM adapter M

Relay M

The Relay M is an actuator for the Mobile-CASSY 2 WiFi (524 005W). It facilitates controlling an experiment on the basis of the input quantities of the Mobile-CASSY 2 WiFi. This allows for the retrofitting of an output X or Y as an addition to the inputs A and B. The simultaneous use of the 4mm socket remains possible.

Technical data:

Output: changeover relay with LED (max. 30 V/2 A)
Trigger: 2 independet triggers for switching on and off
Deadtime: Δt selectable as „off" or 1/5/10/30 s
Connection: Mini-DIN
Length of the connecting cable: 0.30 m

524 446	Relay M

Conductivity sensor

Conductivity sensor using four-wire technology with integrated Pt temperature sensor for use with chemistry box (524 067), conductivity adapter S (524 0671) and CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836). Open design for rapid response to changes in conductivity.
When conducting measurements a minimum distance of 1 cm from the side of the, as well as a minimum immersion depth of 2 cm are to be maintained.

Technical data:

- Cell constant 0.58 cm^{-1}
- Measuring range: 0 ... 1 S/cm
- Temperature range: -25 ... +100 °C
- Connections: 6-pole DIN socket
- Dimensions: 160 mm x 16 mm diam.
- Weight: 75 g

529 670	Conductivity sensor

Conductivity adapter S

Used in conjunction with the conductivity sensor (529 670), this adapter enables conductivity and temperature to be measured with CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836).

Technical data:

- Measuring ranges: Conductivity (with sensor 529 670): 10/30/100/300 µS/cm, 1/3/10/30/100/300 mS/cm, 1 S/cm
- Resolution 0.005 µS/cm in the smallest measuring range
- Temperature measurement and compensation: -25 ... +100 °C
- Connections: 8-pole DIN socket for conductivity sensor with temperature measurement
- Dimensions: 50 mm x 25 mm x 60 mm
- Weight: 0.1 kg

524 0671	Conductivity adapter S

Additionally required:

Count	Cat.-No.	Name
1	529 670	Conductivity sensor

pH adapter S

Enables a pH electrode to be connected to CASSY (524 013, 524 006, 524 005W, 524 018) or the universal chemistry measuring instrument (531 836). Moreover, the voltage at the BNC socket can be measured at a very high resistance, e.g. for measuring electrochemical potentials.

Technical data:

- Measuring ranges pH: 0 ... 14 pH
- Resolution pH: 0.01 pH
- Measuring ranges potential: ±1/±2 V
- Input resistance: > 10^{13} Ω
- Connection: BNC socket
- Dimensions: 50 mm x 25 mm x 60 mm
- Weight: 0.1 kg

524 0672	pH adapter S

Additionally recommended:

Count	Cat.-No.	Name
1	529 672	pH sensor, BNC
1	667 416	Single-rod redox probe BNC
1	667 4172	pH sensor with plastic shaft, BNC
1	667 4242	pH probe with glass shaft, BNC

pH probes with BNC connection

- Measuring range: 0 ... 14 pH
- Resolution: 0.01 pH
- Suitable for: 524 067 and 524 0672

Cat.-No.	Designation
529 672	pH sensor, BNC
667 4172	pH sensor with plastic shaft, BNC
667 4242	pH probe with glass shaft, BNC

Electrochemistry box M

Mobile power supply for experiments as well as voltage und current measuring device in conjunction with the Mobile-CASSY 2 WiFi (524 005W). For power supply upt to 300mA as well as the intuitive, parallel measurement of the voltage up to ±20 V and the current up to ±2 A.

Technical data:

- 1 Output: 4 mm safety sockets
- Current: 0 to 300mA (30 ranges), power limited to 1.5 W
- 2 Inputs (current and voltage measurement): 4 mm safety sockets, differential
- Current measuring range: up to ±2 A, self-resetting fuse
- Resolution: 0,1 mA
- Voltage measuring range: up to ±20 V, input resistance 1 MΩ
- Resolution: 1 mV
- Connection: Mini-DIN
- Connection cable length: 1.20 m

524 450	Electrochemistry box M	

Pulse sensor S

For measurement of the pulse frequency with the aid of an infrared sensor which is attached to the ear lobe or finger tip, whereby the sensitivity is adjusted automatically. The individual pulse beats are indicated by a LED. The pulse sensor is electrically isolated from CASSY (524 013, 524 006, 524 005W, 524 018).

524 0471	Pulse sensor S

Blood pressure sensor S

For blood pressure measurements using the oscillometric method with Sensor-CASSY 2 (524 013) or Pocket-CASSY (524 006, 524 018) without stethoscope and microphone. The pressure variations which are caused by the pulse waves are transmitted by the arm collar and measured together with the falling pressure in the arm collar. Alternative for use with the Mobile-CASSY 2 WiFi (524 005W) after the auscultatoric method (designed by Korotkov). The characteristic noise phenomena are listened to with a stethoscope (additionally required). The universal biology measuring instrument (531 837) gives an audible sound for the pressure variations.

Technical data:

- Pressure range: 375 mm Hg (500 hPa)

524 0501	Blood pressure sensor S

Spirometer box

For pneumotachographic measurement of various pulmonary volumes, the flow-volume curve and the forced expiratory volume per second with CASSY (524 013, 524 006, 524 005W, 524 018).
Technical data:

- Measuring range: -14.0 ... +14.0 l/s
- Accuracy of measurement: ±2.5%

Scope of delivery:

- 1 Spirometer box
- 1 Adapter
- 30 Bacteria filter
- 30 Mouth pieces

524 056	Spirometer box

Reaction test adapter S

For measuring reaction times, controlled by a hand or foot button, and for determining nerve conductor speed. Signalling accomplished as selected, either via three-colour LEDs (hand key) or acoustic signal (foot button) or software.

524 0461	Reaction test adapter S

Additionally required:

Count	Cat.-No.	Name
1	662 148	Hand-held button
1	662 149	Foot switch

NiCr-Ni adapter S, type K

Enables connection of two NiCr-Ni (type K miniature flat connector) thermocouples for temperature and differential temperature measurements with CASSY (524 013, 524 006, 524 005W, 524 018) or the universal measuring instruments (531 835, 531 836, 531 837).

Technical data:

- Max. measuring ranges (dependent on sensor): -200 ... +200 °C/-200 ... +1200 °C
- Resolution: 0.1 K/1 K
- Differential temperature measuring ranges: -20 ... +20 °C/-200 ... +200 °C
- Resolution: 0.01 K/0.1 K
- Dimensions: 50 mm x 25 mm x 60 mm
- Weight: 0.1 kg

524 0673	NiCr-Ni adapter S, type K

Additionally recommended:

Count	Cat.-No.	Name
1	529 676	Temperature probe, NiCr-Ni, 1.5 mm, type K
1	666 1261	Temperature probe, NiCr-Ni, fast, type K
1	666 1263	Temperature probe, NiCr-Ni, 3 mm, type K
1	666 1264	Temperature probe, NiCr-Ni, for surface measurement, type K

USB power bank 2200 mAh

Power bank with 2200 mAh suitable for LED lamp (459 094), triple LED lamp (459 098) and laser class 1, red (459 097). The 5V DC USB plug-in power supply unit (459 095) can be used to charge the power bank.

459 099	USB power bank 2200 mAh

Variable transformer 2...24 V/ 5 A

Power supply unit for electrical and simple electronic experiments. Output voltage adjustable in steps; overload protected with circuit breakers. All outputs galvanically isolated from the mains, floating. Particularly suited for student experiments at all age levels thanks to safe separation in accordance with BG/GUV-SI 8040 (conforms to German RiSU).

Technical data:

- Output voltages: 2-24 V AC and DC, in steps of 2 V
- DC voltage: bridge rectification
- Load capacity: 5 A, aggregated
- Connector: two 4 mm connector pairs for AC and DC
- DC and AC part may be used simultaneously, but are not galvanically isolated
- Electrical isolation: Isolating transformer in accordance with DIN EN 61558-2-6, (compliant to german RiSU)
- Input voltage: 230 V, 50/60 Hz
- Dimensions: 203 mm x 225 mm x 117 mm
- Weight: 2.8 kg

521 353	Variable transformer 2...24 V/ 5 A

AC/DC power supply 0...24 V / 5 A

Power supply unit with high load capacity for continiously adjustable DC and AC voltage and digital display. All outputs are overload protected by circuit breakers and are therefore particularly suited for practical experiments. All outputs galvanically isolated from the mains, floating. From a safety standpoint, particularly suited for student experiments at all age levels thanks to safe separation in accordance with BG/GUV-SI 8040 (conforms to german RiSU).

Technical data:

- Output voltages: 0-24 V AC and DC, continiously adjustable
- DC voltage: bridge rectification, smoothed
- Load capacity: 5 A, aggregated
- Display: switchable between AC and DC
- Connector: two 4 mm connector pairs for AC and DC
- DC and AC may be used simultaneously, but are not galvanically isolated
- Electrical isolation: Isolating transformer in accordance with DIN EN 61558-2-6, (compliant to german RiSU)
- Input voltage: 230 V, 50/60 Hz
- Dimensions: 256 mm x 225 mm x 117 mm
- Weight: 6 kg

521 391	AC/DC power supply 0...24 V / 5 A

Variable low-voltage transformer 1...12 V / 6 A

Power supply unit for electrical and simple electronic experiments. Output voltage adjustable in steps; overload protected with circuit breakers. All outputs galvanically isolated from the mains, floating. Particularly suited for student experiments at all ages due to safe separation in accordance with BG/GUV-SI 8040 (conforms to german RiSU).

Technical data:

- Output voltages: 1-12 V AC and DC, in steps of 1 V
- DC voltage: bridge rectification
- Load capacity: 6 A, aggregated
- Connector: two 4 mm connector pairs for AC and DC
- DC and AC part may be used simultaneously, but are not galvanically isolated
- Electrical isolation: Isolating transformer in accordance with DIN EN 61558-2-6, (compliant to german RiSU)
- Input voltage: 230 V, 50/60 Hz
- Dimensions: 203 mm x 225 mm x 117 mm
- Weight: 2.8 kg

521 352	Variable low-voltage transformer 1...12 V / 6 A

AC/DC power supply PRO 0...12 V/3 A

Standard student power supply with continously adjustable and regulated DC output voltage, AC voltage adjustable in steps, and digital display; AC and DC outputs galvanically isolated, reliable overload protection and circuit protection by electronic current limitation (DC) and circuit breaker (AC). All outputs galvanically isolated from the mains, floating. Particularly suited for student experiments at all age levels thanks to safe separation in accordance with BG/GUV-SI 8040 (conforms to german RiSU).

Technical data:

- Output voltages: 0 ... 12 V DC, continiously adjustable, stabilised 2/4/6/12 V AC
- Output current: max. 3A
- Residual ripple DC: < 100 mV
- Notification
- Overload protection: DC electronic, AC with resettable circuit breaker
- Connections: 4 mm safety sockets
- Connection voltage: 230 V, 50/60 Hz
- Electrical isolation: Isolating transformer in accordance with DIN EN 61558-2-6, (compliant to german RiSU)
- Dimensions: 203 mm x 225 mm x 117 mm
- Weight: 3 kg

521 487	AC/DC power supply PRO 0...12 V/3 A

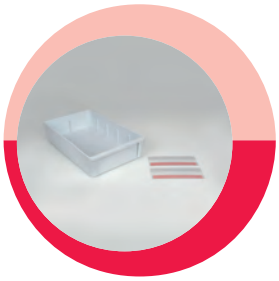
AC/DC power supply 0...12 V/3 A

Simple student power supply with continously adjustable and regulated DC output voltage, AC voltage adjustable in steps; AC and DC outputs galvanically isolated, reliable overload protection and circuit protection by electronic current limitation (DC) and circuit breaker (AC). All outputs galvanically isolated from the mains, floating. Particularly suited for student experiments at all age levels thanks to safe separation in accordance with BG/GUV-SI 8040 (conforms to german RiSU).

Technical data:

- Output voltages: 0...12 V DC, continiously adjustable, stabilised 2/4/6/12 V AC
- Output current: max. 3A
- Residual ripple DC: < 100 mV
- Overload protection: DC electronic, AC with resettable circuit breaker
- Connections: 4 mm safety sockets
- Connection voltage: 230 V, 50/60 Hz
- Electrical isolation: Isolating transformer in accordance with DIN EN 61558-2-6, (compliant to german RiSU)
- Dimensions: 203 mm x 225 mm x 117 mm
- Weight: 3 kg

521 491	AC/DC power supply 0...12 V/3 A



Tray, low

For storage of equipment and materials, especially for student experiment materials. High load capacity and the possibility of free labeling by „supplied" label holder. Stackable with or without lid 647 003. Possibility of multifunctional subdivision by separate fold divider (647 004, 647 005, 647 006).

Technical data:

- Material: styrene-butadiene (SB)
- Dimensions: 450 mm x 270 mm x 108 mm
- Stackable
- High load capacity
- Multifunctional subdivision possibility

647 001	Tray, low

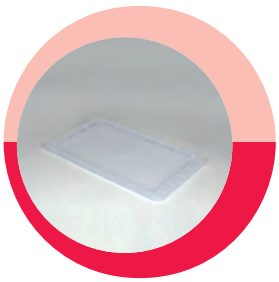
Tray, high

For storage of equipment and materials, especially for student experiment materials. High load capacity and the possibility of free labeling by „supplied" label holder. Stackable with or without lid 647 003. Possibility of multifunctional subdivision by separate fold divider (647 004, 647 005, 647 006).

Technical data:

- Material: styrene-butadiene (SB)
- Dimensions: 450 mm x 270 mm x 162 mm
- Stackable
- High load capacity
- Multifunctional subdivision possibility

647 002	Tray, high



Lid for tray

To cover the trays 647 001and 647 002. Stackability of the trays remains even with lid.

Technical data:

- Material: Polypropylene (PP)
- Dimensions (outside): 455 mm x 275 mm x 18 mm

647 003	Lid for tray

Label holder, set of 8 pieces

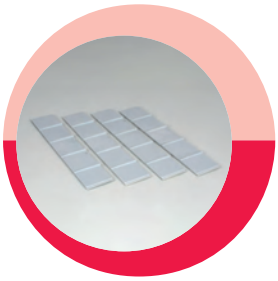
For holding the labels of the trays 647001 (low) and 647002 (high). Suitable for the labeling of 4 complete trays.

Technical data:

- Dimensions: 210 mm x 77 mm
- Quantity: 8 pieces

647 007	Label holder, set of 8 pieces

Fold devider, long, set of 4 pieces



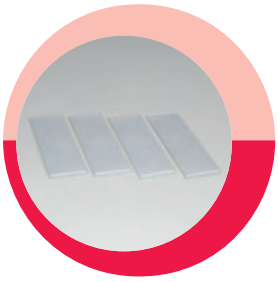
For subdivision of the trays 647 001 and 647 002. Each tray can be divided into 2 sections longitudinally with one fold divider.

Technical data:

- Material: styrene-butadiene (SB)
- Dimensions: 401 mm x 70 mm
- Quantity: 4 pieces

647 004	Fold devider, long, set of 4 pieces

Fold devider, medium, set of 4 pieces



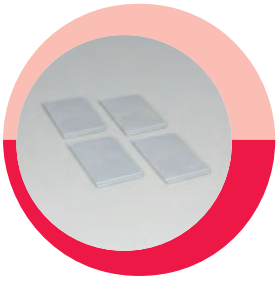
For subdivision of the trays 647 001 and 647 002. Each tray can be divided up to 5 sections transversely with the fold dividers.

Technical data:

- Material: styrene-butadiene (SB)
- Dimensions: 246 mm x 70 mm
- Quantity: 4 pieces

647 005	Fold devider, medium, set of 4 pieces

Fold devider, short, set of 4 pieces



For subdivision of the trays 647 001 and 647 002. In combination with the fold divider, long (647 004), each tray can be divided up to 10 sections longitudinally and transverseley with the fold dividers.

Technical data:

- Material: styrene-butadiene (SB)
- Dimensions: 120 mm x 70 mm
- Quantity: 4 pieces

647 006	Fold devider, short, set of 4 pieces

Additionally required:

Count	Cat.-No.	Name
1	647 004	Fold devider, long, set of 4 pieces

Student experiments

for school and university

NATURAL SCIENCES

FUNDAMENTAL

LP1.1.3.2 Hydrostatic pressure

LC1.1.1.2C Boiling point

LB3.2.2.8C Diurnal variation measurements

PHYSICS

CHEMISTRY

BIOLOGY

PROFESSIONAL

LP5.3.2.2 Complementary crossed gratings (Babinet's principle)

LC2.1.2.1 Detection of hydrogen and carbon

LB3.2.2.3C ph value of soil samples

PROFESSIONAL

NATURAL SCIENCES FUNDAMENTAL

For further questions or an offer please contact us:

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LP6.2.7.1C The influence of a magnet on beta radiation