

Digital laboratory for the chemistry classroom (student set) LABOTRIX SENSE CHEM L6

PRODUCT PASSPORT

Kyiv

2026

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1. General Information about the Product

- 1.1. **Product name** — Digital laboratory for the chemistry classroom (student set).
- 1.2. **Trademark** — Labotrix.
- 1.3. **Model** — Sense Chem L6; full trade designation — LABOTRIX SENSE CHEM L6.
- 1.4. **Manufacturer** — Labotrix Group Limited, China.
- 1.5. **Intended use:** set is intended for educational experiments, practical classes, and research projects of students in chemistry. It is used to measure the acidity of a solution, its specific conductivity, the parallel progression of temperature in two vessels, the change in gas pressure in a sealed vessel, and the degree of coloration (light absorption) of a solution. The set is designed for the work of one student group — individually or in a small group at one laboratory table; the teacher conducts the demonstration experiment in front of the whole class using their own teacher's laboratory set. The kit is used when studying the acid-base properties of substances, electrolytic dissociation, thermal effects of reactions, and colorimetric analysis of solutions. The laboratory combines hardware, multimedia content, and elements of generative artificial intelligence, which makes lessons inclusive and engaging for students of different preparation levels: working with the platform develops attention, logical and imaginative thinking, creative abilities, and collaboration skills, and students perform tasks individually or in groups, developing learning independence and interaction.
- 1.6. **Design features:** the set includes five types of wireless sensors, six devices in total (temperature sensor — two units, the rest — one each): each is equipped with a color liquid crystal display with a diagonal of at least 1.8 inches and shows the measurement result directly on its own housing. The devices are powered by a built-in battery recharged via USB and operate autonomously, without a data logger or external analog-to-digital converter. Several sensors simultaneously transmit measured values to a computer or mobile device, where a program with a Ukrainian-language interface displays tables and graphs and allows the results to be exported to a spreadsheet editor. The devices are stored and carried in a box with a foam insert.
- 1.7. **Digital learning support:** together with the product, the right of access to an online teaching support course is transferred; the course is hosted in a learning management system (LMS) and is designed for 70 academic hours of lessons. The course is compiled to match the current curricula of general secondary education institutions of Ukraine. The materials are grouped into research modules in the subjects of physics, biology, chemistry, STEM, and every topic contains a lesson plan, a list of the required equipment, an experiment scenario, a step-by-step laboratory work instruction with an explanation of the expected result, a video demonstration of working techniques, interactive exercises and tasks for independent study and for project work, suitable both for individual and for group work. All modules are compiled for this very equipment and have been tested on it, therefore the course works along the direct chain "equipment → methodology → learning outcomes". A language-model-based assistant with retrieval over the course knowledge base (Retrieval-

Augmented Generation) is built into the course: for the topic of the lesson it selects appropriate experiments, sets out the sequence of conducting the study in methodological terms, examines typical student errors and gives personal advice on how to get rid of them, changes the level of difficulty to match the preparation of a particular class and helps to draw up a report on the study and to organize the conclusions. The knowledge base of the assistant is localized and aligned with the Ukrainian curriculum. The license for the course and the accompanying software is valid for 12 months from the date on which access is transferred. The content of the course and the answers of the assistant are provided in Ukrainian, while the interface of the learning platform is multilingual: the Ukrainian localization is enabled by default, an English-language interface is available as an option.

- 1.8. **Processing of the measured data on the platform:** the sensors of the set transmit measurement results to the electronic platform automatically — the student does not copy the reading off the screen and does not enter numbers by hand. The built-in artificial intelligence agent works with this data set right away: it builds graphs and tables from it, processes the results obtained, shows the patterns that appeared during the experiment, compares the measured values with the reference values for this work and leads the student towards independently formulating a hypothesis, a conclusion and an interpretation, keeping the student within the defined "knowledge corridor" — it does not prompt a ready answer but narrows the search down to the correct direction. Work with the platform is arranged so that it is suitable both for individual performance and for work in a group.

2. Technical Specifications

- Brand — Labotrix
- Model — Sense Chem L6
- SKU — LTX-SENSE-CHEM-L6
- Product type — digital laboratory for chemical experiments, set for one student workstation
- Number of sensors in the set (pcs) — 6 (5 types; temperature sensor — 2 pcs)
- Types of sensors in the set — temperature sensor, water quality sensor (pH), conductivity sensor, gas pressure sensor (with syringe), colorimeter sensor
- Temperature sensor, 2 pcs — resolution 0.01 °C within the range from –50 to +200 °C
- Water quality sensor (pH) — resolution 0.01 pH within 0–14 pH
- Conductivity sensor — resolution 1 µS/cm within 0–20 000 µS/cm
- Gas pressure sensor with syringe — resolution 0.1 kPa within the range of 0–700 kPa
- Colorimeter sensor — resolution 0.01 % within 0–100 %
- Sensor display — color liquid crystal, diagonal not less than 1.8 inches
- Method of connection with a computer, a mobile device or a cloud service — wireless (Bluetooth), a wired connection via USB is additionally supported

- Autonomy of the sensors — measurement and data transmission without a datalogger and without an additional analog-to-digital converter
- Sensor power source — built-in battery; charging — with the charger included in the set, allowing 4 sensors to be charged simultaneously
- Software — display of the data in tables and graphs, export of the results to spreadsheet editors
- Software compatibility — with the operating system of the device used at the educational institution (Windows, macOS)
- Language of the interface of the data acquisition software — Ukrainian by default, English available as an option
- Digital learning support — online course in a learning management system (LMS)
- Course volume (academic hour) — 70
- Course subjects — physics, biology, chemistry, STEM
- Composition of the materials — research modules, experiment scenarios, step-by-step laboratory work instructions, video demonstrations, interactive exercises and tasks
- Compatibility of the materials with the equipment — full, along the chain "equipment → methodology → learning outcomes"
- Language-model-based assistant — built into the course, with retrieval over a localized knowledge base (Retrieval-Augmented Generation)
- Validity period of the license for the course and the software (month) — 12
- Language of the course and of the answers of the assistant — Ukrainian; interface of the platform — multilingual, the Ukrainian localization by default, an English-language interface available as an option
- Transfer of the results to the platform — automatic, without manual entry of numbers
- Processing of the measured data by the artificial intelligence agent — plotting of graphs and tables, analysis of the results, identification of the patterns of the experiment
- Comparison with reference values — provided for every laboratory work of the course
- Support in formulating the conclusions — within the defined "knowledge corridor", without a ready answer
- Language of marking and operating documentation — Ukrainian
- Product marking — trademark, model and a space for the inventory number
- Packaging — individual box of corrugated cardboard with the contents secured
- Documentation supplied — product passport with warranty card, operating manual and teaching guide for the teacher and for the student
- Operating conditions — premises of an educational institution, air temperature from +5 to +40 °C, relative humidity from 40 to 60 % without condensate
- Installation method — on the laboratory bench of the chemistry classroom, requires no additional fastening
- Care of the sensor surfaces — wiping with a dry or slightly damp cloth is permitted

- Work organization — set for one student workstation; the teacher conducts the demonstration experiment for the class using their own set
- User requirements — work with reagents is prepared by a teacher or laboratory assistant, students work under supervision
- Service life (year) — 5
- Warranty period (month) — 12

3. Package Contents

- Wireless temperature sensor — 2 pcs
- Wireless water quality sensor (pH) — 1 pcs
- Wireless conductivity sensor — 1 pcs
- Wireless gas pressure sensor (with syringe) — 1 pcs
- Wireless colorimeter sensor, with a set of light filters (red, green, blue) — 1 pcs
- Plastic cuvettes for the colorimeter — 3 pcs
- Box (case) with a foam insert liner for the sensors — 1 pcs
- Right of access to the online course with a language-model-based assistant (license) — 1 pcs
- Operating manual and teaching materials for experiments for teacher and for student — 1 set
- Software (download link) — 1 set
- Charger for the sensors (simultaneous charging of 4 sensors) — 1 pcs
- USB cable for connection to a computer — 1 pcs
- Product Passport and Warranty Card — 1 pcs
- Individual transport packaging — 1 pcs

Reagents and laboratory glassware for the experiments are not included in the set and are provided by the chemistry classroom. The system requires software installation before first use.

4. Safety Precautions

4.1. General requirements

- Before first use, read this passport and keep it together with the product.
- The set is intended for the work of one student or a small group of students under the guidance of a teacher or laboratory assistant familiar with the safety rules for working with chemical reagents.
- Students work with the set only under the supervision of a teacher, in accordance with sanitary and methodological requirements for educational experiments.
- Inspect the unpacked set for mechanical damage; the use of damaged sensors is prohibited.
- Keep the workstation clean and dry during and after the experiment.

4.2. Electrical safety

- Charge the sensors only with the charger included in the set and do not immerse them in water while charging.
- Do not leave charging sensors in the sun or near heat sources.
- The computer used with the set must be in proper working order and have grounded wiring.

- Check the integrity of the USB cable; do not allow a damaged cable to be used.

4.3. Work with chemical reagents

- During the experiment, wear safety goggles and clothing that covers the skin.
- Seal liquid reagents tightly immediately after use and store them in a cool, well-ventilated place.
- If a reagent gets on the skin or in the eyes, immediately flush the affected area with water for several minutes and consult a doctor.
- Do not smell or taste the reagents; follow the instructions for the safe handling of each substance.
- Immerse the colorimeter sensor only in the prepared cuvette with the sample, not directly into the vessel with the reagent.

4.4. It is strictly prohibited

- Wash the sensors in a dishwasher or under a powerful stream of water.
- Immerse the sensors in concentrated acids, alkalis, or organic solvents without appropriate protection.
- Disassemble the sensors — this leads to loss of sealing and warranty.
- Drop the sensors, strike them, or subject them to mechanical loads.
- Leave the powered-on sensors unattended during the course of a chemical reaction.

5. Preparation for Use

- 5.1. Unpack the set and check its completeness against section 3 of this passport; it is recommended to keep the packaging.
- 5.2. Inspect each sensor for the absence of housing cracks and damage to the electrode or probe.
- 5.3. Charge the sensors with the charger included in the set before first use (at least 4 sensors can be charged simultaneously).
- 5.4. Install the software on the computer or mobile device according to the instructions in the manual.
- 5.5. Prepare the workstation: obtain laboratory glassware and reagents for the experiment in the chemistry classroom; for colorimetry, use the cuvette and light filter from the set.
- 5.6. Before regular use of the pH sensor, calibrate it using the buffer solutions (pH 4, 7, 10) available in the chemistry classroom.
- 5.7. Study the teaching materials of the course in order to choose the experiment that corresponds to the topic of the lesson.

6. Operating Procedure

6.1. Preparation of the sensors and selection of the experiment

- Switch on the required sensors and make sure that the software has detected the connection with the computer or the mobile device.
- Select an experiment from the course teaching materials and prepare the reagents and glassware according to the protocol.

6.2. Temperature measurement

- Immerse the temperature sensor in the solution so that it does not touch the bottom of the vessel; if necessary, use two sensors to compare the temperature in two vessels simultaneously.
- Observe the temperature change in real time on the sensor's screen or in the program.

6.3. Measurement of pH and conductivity

- Immerse the electrode of the pH or conductivity sensor in the solution before adding the reagent and wait for the reading to stabilize.
- Between samples, rinse the electrode with clean water to avoid carrying over solution from the previous experiment.

6.4. Gas pressure measurement

- Connect the pressure sensor to the vessel through the syringe or adapter and make sure the connection is airtight.
- Observe the pressure change on the software graph during the reaction.

6.5. Colorimetry

- Fill the cuvette with a sample of the solution and install the required light filter in it according to the instructions in the teaching materials.
- Before measuring the sample, perform calibration using a clean solvent, then insert the cuvette with the sample into the colorimeter.

6.6. Finishing the work

- Turn off the sensors, carefully remove them from the vessels, and wipe them with a soft cloth.
- Export the obtained data in a format suitable for further processing (table or graph).

6.7. Work with the online course

- Obtain an account at the educational institution and activate the right of access to the course; the validity period of the license is counted from the date on which access is transferred.
- Select the topic of the lesson in the course list: every topic is accompanied by a plan, a list of equipment, an experiment scenario, a step-by-step instruction, a video demonstration and interactive tasks.
- Formulate a query to the assistant on the topic of the lesson — it will suggest appropriate experiments, set out the sequence of actions, examine typical errors and advise how to correct them.
- Set the level of difficulty of the tasks to match the preparation of the class; on the basis of the results of the work the assistant will help to draw up the report and to organize the conclusions.
- Start recording the sensor readings: the data arrive at the platform automatically, there is no need to copy them out manually.
- Open the graph or the table of the measured values and ask the agent to process the result: it will show the patterns, compare the data with the reference values of the work and lead the student to formulating a hypothesis and a conclusion.

7. Care, Maintenance and Troubleshooting

7.1. Cleaning

- After each experiment, rinse the sensors with distilled water and wipe them with a soft, lint-free cloth.
- Wash the colorimeter cuvette with clean water and dry it completely before the next use.
- Wipe the colorimeter's optical window only with a special optical wipe, to avoid scratching the coating.
- Do not use abrasive agents, alcohol, or aggressive solvents to clean the sensors.

7.2. Periodic inspection

- Monthly, check the temperature sensor readings against a reference thermometer in ice water and warm water.
- Calibrate the pH sensor at least once a week using buffer solutions (pH 4, 7, 10).
- Check the charge level of the sensor batteries; repair and replacement of faulty devices is performed only by an authorized service center.

7.3. Possible malfunctions and methods of their elimination

Symptom	Possible cause	User actions
The sensor does not connect to the computer	The battery is discharged; the wireless module is disabled on the computer	Charge the sensor with the charger included in the set; enable the computer's wireless module
Temperature readings are unstable	Sensor not immersed deeply enough; vessel wobbles on the table	Immerse the sensor deeper in the solution; secure the vessel with a stand
pH sensor does not calibrate	Electrode contaminated; buffer solution expired	Carefully rinse the electrode with distilled water; replace the buffer solution
Colorimeter shows a zero or unstable value	Light filter installed incorrectly; cuvette contaminated or not airtight	Check the filter installation; replace the cuvette with a clean one
The gas pressure sensor shows unstable values	Non-airtight connection between the syringe and the vessel	Check and tighten the connection, repeat the measurement
The data are not recorded in the software	Low free memory on the computer; weak USB contact	Free up space on the disk; reconnect the USB cable

8. Storage and Transportation Conditions

- Store the set in a dry closed room at a temperature not lower than +5 and not higher than +40 °C and relative air humidity not more than 80 % without condensation.
- Before long-term storage (more than a month), charge the sensor batteries and store them separately from the reagents.
- Protect the sensors from dust, direct sunlight, and vibration.

- Store the colorimeter sensor separately from abrasive objects that could scratch the optical window.
- Transport the set in rigid packaging that protects against impacts and moisture.
- The storage period before commissioning is unlimited provided that the stated requirements are observed.

9. Warranty Obligations

- 9.1. The warranty period of operation of the product is 12 months from the date of sale specified in the warranty card.
- 9.2. The manufacturer guarantees that the product conforms to the declared technical specifications provided that the transportation, storage and operating rules set out in this passport are observed.
- 9.3. During the warranty period, defects of the product that have arisen through the fault of the manufacturer are remedied free of charge. The method of remedy (repair, replacement of a component or replacement of the product) is determined by the service center.
- 9.4. Warranty service is provided on presentation of a correctly and completely filled-in warranty card and of a document confirming the fact and the date of purchase.
- 9.5. The warranty does not cover cases where the malfunction is caused by:
 - mechanical damage, in particular cracks, chips and deformation of the housing and of the components of the product;
 - violation of the operating, storage or transportation rules set out in this passport;
 - ingress of liquid or foreign objects into the product, and also the action of insects and animals;
 - independent disassembly, repair or modification of the product, in particular repair at unauthorized workshops;
 - use of the product other than for its intended purpose;
 - force majeure circumstances (fire, flood, earthquake, etc.).
- 9.6. The warranty does not cover the natural wear of the coating and of the appearance of the product, nor consumables.

10. Product Disposal

- The product must not be disposed of together with unsorted municipal waste. This is indicated by the marking in the form of a crossed-out container on the product or its packaging.
- After the end of the service life, hand the product over to a collection point for the corresponding waste or to an organization holding the appropriate permit.
- Hand over the packaging elements (cardboard, polymer materials) to the corresponding streams of recyclable materials.

Contacts

LABOTRIX GROUP LIMITED

Room 910, Isteeasia 1 No. 18 Fu'an Blvd, Pinghu Subdistrict,
Longgang District, Shenzhen City,
Guangdong Province, China 518111
Phone: +86 13925261264
E-mail: salesmanager@labotrix.com
Website: <https://labotrix.com/>

Address in Ukrainian:

LABOTRIX GROUP LIMITED

Room 910, Istilazia 1, Fuan Boulevard No. 18,
Pinghu Subdistrict, Longgang District,
Shenzhen, Guangdong Province, China 518111
Telephone: +86 13925261264
E-mail: salesmanager@labotrix.com
Website: <https://labotrix.com/>

Conditions of use and storage of the product

The product is intended for educational work in general secondary education institutions and is used only under the control and supervision of a teaching staff member; the recommended age of students — from 10 years, that is, students of grade 5 and of higher grades. Keep the product in a dry, clean and ventilated room at a temperature from +5 to +40 °C and relative air humidity up to 80 % without condensation, separately from heat sources and out of direct sunlight, moisture and dust. Use the product exclusively for its intended purpose and do not allow drops, impacts or other mechanical damage. If you notice damage, a crack or any malfunction, stop working with the product immediately and inform the teacher or the responsible person of the educational institution; repairing the product on your own is prohibited.

WARRANTY CARD

Name:	Digital laboratory for the chemistry classroom (student set)
Product model:	LABOTRIX SENSE CHEM L6
Serial number:	
Date of sale:	
Warranty period:	12 months from the date of sale
Trading organization:	
Signature of the seller:	

The goods have been received in working order, without visible damage, complete, and have been checked in my presence. I have no claims regarding the quality of the goods; I have read and agree to the operating and warranty service conditions.

Full name of the buyer _____

Telephone of the buyer _____ Signature of the buyer _____

Dear Customer!

Thank you for choosing Labotrix products. After-sales service of this product is provided in accordance with the regulations of the company and the legislation of the country of sale. So that we can serve you quickly and without unnecessary formalities, check that this warranty card is filled in correctly at the moment of purchase and keep it together with the payment document throughout the entire warranty period. When applying for repair, hand the product over to the seller or to the service center together with the filled-in card.

Procedure for applying

1. The right to free warranty service of the product is valid for 12 months from the date of sale specified in the warranty card. Within this period, components that have failed because of a manufacturing defect are repaired or replaced at no cost to the buyer.
2. Before applying, make sure that the malfunction is not caused by the reasons listed in section 9 of this passport and, if possible, use the table of possible malfunctions in subsection 7.3.
3. After the end of the 12-month warranty period, repairs are performed on a paid basis; the cost of the work and of the spare parts is determined depending on the nature of the malfunction.

Grounds for refusal of warranty service

The company reserves the right to refuse free service or to perform the work on a paid basis if at least one of the following circumstances is established:

- absence of the warranty card, its incomplete or corrected completion, and also the absence of a document confirming the purchase;
- non-conformity of the serial number of the product with the number specified in the card, or damage to the factory marking;
- traces of independent disassembly, repair or modification of the product;
- damage caused by violation of the operating rules, connection to an unsuitable power source or external mechanical impact;
- damage as a result of force majeure circumstances.

Service Records

Date of entry	Description of the malfunction	Work performed	Position, signature, full name of the responsible person