

Physics set "Mechanics, Molecular Physics and Thermodynamics"

# LABOTRIX MECHANO P2

PRODUCT PASSPORT

Kyiv

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## 1. Basic product information

- 1.1. Product name — Physics set "Mechanics, Molecular Physics and Thermodynamics."
- 1.2. Trademark — Labotrix.
- 1.3. Model — Mechano P2; full trade name — LABOTRIX MECHANO P2.
- 1.4. Manufacturer — Labotrix Group Limited, China.
- 1.5. Intended use: A set of equipment for studying classical mechanics, molecular structure of matter and thermal processes in high school physics. The set is used during demonstrations in physics lessons and for laboratory research, allowing students to study kinematics, dynamics, properties of liquids and gases, and thermal phenomena. The equipment is designed for group and individual experiments in STEM science classrooms, suitable for both teacher demonstration and student independent laboratory work.
- 1.6. Design features: The set includes both classic measuring instruments and specialized equipment for conducting experiments. All components are made of durable materials, the scales have clear contrasting printing. The devices are designed for safe use by students under the supervision of a teacher and do not require power.
- 1.7. Digital learning support: The product includes access to an online teaching support course hosted in a learning management system (LMS) and designed for 70 academic hours of classes. The course is designed to meet the current curricula of secondary education institutions in Ukraine. The materials are grouped into research modules in the disciplines of physics, biology, chemistry, STEM, and each topic contains a lesson plan, a list of necessary supplies, an experiment scenario, step-by-step instructions for laboratory work with an explanation of the expected result, a video demonstration of work methods, interactive exercises and tasks for independent study, suitable for both individual and group work. All modules are designed for this equipment and tested on it, so the course works in a direct chain of "equipment → methodology → learning results". The course has a built-in assistant based on a language model with a search through the course knowledge base (Retrieval-Augmented Generation): based on the topic of the lesson, it selects relevant experiments, methodically describes the sequence of conducting the research, analyzes typical student errors and gives personal advice on how to get rid of them, changes the level of complexity to prepare for a specific class, and helps to write a research report and organize the conclusions. The assistant's knowledge base is localized and aligned with the Ukrainian curriculum. The license for the course and accompanying software is valid for 12 months from the date of transfer of access; the content, interface, and answers of the assistant are provided exclusively in Ukrainian.

## 2. Technical specifications

- Brand — Labotrix

- Model — Mechano P2
- The article number is LTX-MECHANO-P2
- Set type — physics laboratory kit (mechanics and thermodynamics)
- Scope of application - education in general secondary education institutions
- Thematic coverage of the set - motion and interaction of bodies, structure and properties of matter at the molecular level, thermal phenomena and gas laws
- Number of main components — 50 or more
- Component materials - metal, wood, plastic, heat-resistant glass
- Instrument scales - clear contrasting divisions visible from the back rows of the class
- Operating temperature range (degrees Celsius) - from +10 to +35
- Demonstration ruler with scale (centimeter) — 100
- Student metal ruler (centimeter) — 30
- Graduated cylinder (milliliter) — 50 and 100
- Thermometer (range, degrees Celsius) — from -10 to +100
- Beaker (milliliter) — 100
- Demonstration dynamometer (newton) — 2
- Dynamometer (newton) — 5
- Weights with two hooks (grams) — 50 and 100, 3 pcs. of each denomination
- Universal tripod — 1 pc.
- Clamp for the laboratory stand — 2 pcs
- Boss head for the laboratory stand — 3 pcs
- Springs of different stiffness (units) — 2
- Type-setting weights (with variable mass, grams) — from 50 to 500
- Glass and plastic dishes - several units
- Power — not required
- 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, of the interface and of the answers of the assistant — Ukrainian
- Service life (year) — 5
- Warranty period (month) — 12
- 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
- Ready to use - supplied assembled in the box, no pre-setting required
- Work organization - suitable for classroom demonstration and for a student's individual workstation
- User requirements - the teacher prepares the lesson, students work with the devices under supervision

### 3. Equipment

- Universal physical tripod — 1 pc.
- Clamp for the laboratory stand — 2 pcs
- Boss head for the laboratory stand — 3 pcs
- Caliper — 1 pc.
- Set of weights (weights from 50 g to 500 g) — 1 set.
- Weight with two hooks, 50 g — 3 pcs.
- Weight with two hooks, 100 g — 3 pcs.
- Triple block — 1 pc.
- Springs of different stiffness (demonstration hard and soft) — 2 pcs.
- A set of bodies of equal mass — 1 set.
- Set of bodies for calorimetry and equal volume — 1 set.
- Set of irregularly shaped bodies — 1 set.
- Low laboratory beaker with scale and pouring spout, heat-resistant, glass, 100 ml — 1 pcs
- Low laboratory beaker with scale and pouring spout, heat-resistant, glass, 250 ml — 1 pcs
- Measuring cylinder with spout and plastic base, glass, 50 ml — 1 pc.
- Measuring cylinder with spout and plastic base, glass, 100 ml — 1 pcs
- Beaker, glass, 100 ml — 1 pc.
- Stopwatch — 1 pc.
- Metal ball, steel — 1 pc.
- Metal ball with hook, aluminum — 1 pc.
- Kapron cord — 1 pc.
- Electronic scales, portable — 1 pcs
- Gutter, 10 cm — 1 pc.
- Gutter, 50 cm — 1 pc.
- Metal protractor — 1 pc.
- Disc for studying rotational motion — 1 pc.
- Wooden bar with rubber pad and three holes for weights — 1 pc.
- Laboratory thermometer from  $-10^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  — 1 pc.
- Test tube with stopper — 1 pc.
- Test tube with cork and sand — 1 pc.
- Hydrometer — 1 pc.
- Rubber harness — 1 pc.
- Sodium salt sachet — 1 pc.

- Capillary tube — 1 pc.
- Clamp — 2 pcs.
- Device for testing Boyle-Mariotte's law — 1 pc.
- Petri dish, d=90 mm, h=20 mm — 1 pcs
- Calorimeter — 1 pc.
- Cylindrical separating funnel, chemically resistant, graduated, glass, 60 ml — 1 pcs
- Hanging glass with load — 1 pc.
- Pouring glass, plastic, 250 ml — 1 pc.
- Glass, plastic, 50 ml — 1 pc.
- Demonstration dynamometer, 2 N — 1 pc.
- Dynamometer, 5 N — 1 pc.
- Student metal ruler, 30 cm — 2 pcs.
- Demonstration ruler with scale, 100 cm — 1 pcs
- Lever — 1 pc.
- Foam insert — 1 pcs
- Storage box (plastic container for sets) — 1 pcs
- Plasticine - 2 blocks
- Ball, plastic — 1 pc.
- Filter paper — 1 package
- Paper napkins — 1 package
- Product Passport and Warranty Card — 1 pcs
- Individual transport packaging — 1 pcs
- Right of access to the online course with a language-model-based assistant (license) — 1 pcs

All components are placed in a specialized rigid container (lodgement). The kit includes a methodological guide with a description of the experiments and recommendations for the teacher. The product does not require assembly before use.

## 4. Safety measures

### 4.1. General requirements

- Before first use, carefully read this passport and methodological recommendations, and keep them with the product and the purchase document.
- The kit is used under the guidance of a teacher or other adult who has been instructed in occupational safety.
- Students work with devices only under adult supervision.
- Before starting work, check all devices for damage, cracks, loose connections and deformations.

### 4.2. Safety when working with hot water and temperature measuring devices

- Boiling water and dishes with hot liquids cause burns. Do not touch hot objects with bare hands.

- Use tongs or a pad to hold hot dishes.
- Do not leave heated water unattended.
- Do not use a laboratory thermometer to measure human body temperature.

#### **4.3. Working with glassware and liquids**

- Glassware is easily broken. Be careful not to drop flasks and test tubes.
- Chips and cracks in the glass can cause cuts. If you find damaged cookware, put it aside immediately.
- When pouring liquid into a container, hold it at eye level so you can see the level.
- When working with liquids, secure the container in a stand to prevent it from falling and spilling.

#### **4.4. It is strictly forbidden**

- Use devices without adult supervision or exceed permitted measurement limits.
- Do not drop, drop, or subject devices to strong shocks or vibrations.
- Intentionally destroy kit components or disassemble devices without permission.
- Leave hot water and heated appliances unattended in areas accessible to young children.
- Use appliances with blocked ventilation holes- this prevents hot steam from escaping and can cause burns.
- Use any chemicals to clean glassware other than warm water and a soft cloth.

### **5. Preparation for work**

- 5.1. Unpack the kit and place all components on a large table. Make sure all devices are present and undamaged.
- 5.2. Wipe all devices with a dry, soft cloth to remove dust and packaging residue.
- 5.3. Check the instrument scales for clarity and legibility. The scales should be visible from a distance.
- 5.4. The tripod stand should be on a flat, solid surface; make sure it does not wobble when installing the instruments.
- 5.5. Before working with the thermometer and hot water, make sure that the thermometer bulb is not cracked.
- 5.6. If necessary, secure the devices in the tripod using couplings and feet, following the diagrams provided in the methodological manual.

### **6. Procedure**

#### **6.1. General preparation for the experiment**

Before each experiment, make sure that the components you need are present and working. According to the methodical manual, determine the division value of each device.

## 6.2. Conducting laboratory work on mechanics

When studying mechanics, use a dynamometer to measure forces, a tripod with springs to study elastic deformations, and weights to study the mass and weight of bodies.

## 6.3. Conducting experiments in molecular physics and thermodynamics

For experiments with temperature and heat, use a thermometer, a measuring cup, and a container for hot water. The water should not be boiling; the optimal temperature is from +50 °C to +80 °C.

## 6.4. Work with measuring length and volume

Place the ruler horizontally; measure the object from the zero mark. When measuring the volume in a beaker, look horizontally at the level of the liquid.

## 6.5. Completion of work

Unplug and cool hot cookware. Assemble all components and place them in the container in the order indicated on the packaging diagram. Close the container.

## 6.6. Working with an 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.

## 7. Care, maintenance and possible malfunctions

### 7.1. Cleaning

- Wipe the external surfaces of the devices with a dry soft cloth or hydrophilic sponge.
- Glassware is washed with warm water and a neutral detergent, then rinsed with distilled water.
- Clean the instrument scales only with a dry cloth; do not use alcohol, solvents or abrasive materials.
- Metal parts (couplings, feet) can be wiped with a damp cloth.

## 7.2. Periodic control

- Once a month, check that all mechanical connections are firmly secured and that couplings and feet are not loose.
- Check the scales for clarity of printing; if the printing is erased, contact the seller or service center.
- The devices do not require lubrication, calibration or other operations performed by the user. Service is carried out only by an authorized center.

## 7.3. Possible malfunctions and ways to eliminate them

| Symptom                                            | Possible cause                                                  | User actions                                                                                                                        |
|----------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| The thermometer scale is not visible               | Condensation on the thermometer glass; contamination            | Wipe the glass with a soft, dry cloth; if necessary, leave the device in a dry, ventilated place until the condensation evaporates. |
| The device is unstable on the table.               | The tripod is not horizontal; the table surface is uneven.      | Place the tripod on a flat, hard surface, straighten the tripod legs                                                                |
| The dynamometer shows incorrect values             | The device is damaged; the mechanism is broken.                 | Stop using; contact a service center.                                                                                               |
| Tripod couplings are untwisting                    | Screws are loose due to frequent use                            | Tighten the screws with a wrench, but do not overtighten.                                                                           |
| Dishes are cloudy or hazy                          | Chemical residue or limescale                                   | Soak in a weak vinegar solution for 2–3 hours, then wash with warm water                                                            |
| The spring does not return to its initial position | The spring has lost its elasticity after repeated deformations. | Replace the spring; a new one can be purchased separately                                                                           |
| The weights are rusting.                           | Exposure to humidity; contact with water                        | Wipe the weights with a dry cloth, store in a dry place in a plastic bag.                                                           |

## 8. Storage and transportation conditions

- Store the kit in a rigid container in a dry, closed room at a temperature not lower than +5 °C and not higher than +40 °C and a relative humidity not higher than 80% without condensation.

- Protect the set from direct sunlight, rain, vibrations and mechanical shock.
- Do not place heavy objects on the container.
- When transporting, use the original packaging or a similar rigid box.
- Transport by any type of closed transport, avoiding shocks.
- The storage period before commissioning is unlimited provided that the stated requirements are observed.

## **9. Warranty obligations**

- 9.1. The warranty period of the product is 12 months from the date of sale specified in the warranty card.
- 9.2. The manufacturer guarantees that the product complies with the declared technical characteristics, provided that the rules for transportation, storage and operation set out in this passport are followed.
- 9.3. During the warranty period, product defects that have arisen due to the manufacturer's fault will be eliminated free of charge. The method of elimination (repair, component replacement or product replacement) is determined by the service center.
- 9.4. Warranty service is provided upon receipt of a correctly and completely filled out warranty card and a document confirming the fact and date of purchase.
- 9.5. The warranty does not apply to 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 apply to natural wear and tear of the coating and appearance of the product, as well as to 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

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## **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

|                          |                                                               |
|--------------------------|---------------------------------------------------------------|
| Product name:            | Physics set "Mechanics, Molecular Physics and Thermodynamics" |
| Product model:           | LABOTRIX MECHANO P2                                           |
| 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

Buyer's phone number Buyer's signature

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 for the product is valid for 12 months from the date of sale specified in the warranty card. Within this period, components that have failed due to a manufacturing defect are repaired or replaced without payment from the buyer.
2. Before contacting, 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 section 7.3.
3. After the 12-month warranty period, repairs are carried out for a fee; the cost of work and 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 |
|---------------|--------------------------------|----------------|----------------------------------------------------------|
|               |                                |                |                                                          |
|               |                                |                |                                                          |
|               |                                |                |                                                          |
|               |                                |                |                                                          |
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|               |                                |                |                                                          |