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CJSC Christmas+

**Educational-methodological package
"School portable chemical-
ecological laboratory"
SPCEL**

ANALYZE – GENERALIZE – MAKE CONCLUSIONS

It is an original educational-methodological package developed specifically for the goals and objectives of the chemical and environmental practicum for student of 8th-11th grades under the registered trademark "CHRISTMAS" (certificates No. 404860, No. 570418).



Teacher packing of school portable chemical-ecological laboratory in open unfolded form



Student package of study guides



Student set for chemical and environmental practicum in open form



Chemical and ecological practicum. Teacher's book

Purpose and scope of application

School portable chemical-ecological laboratory SPCEL (hereinafter – product, laboratory, class-package) is an original educational and methodological package developed specifically for the goals and objectives of the chemical-ecological practicum under the registered trademark "CHRISTMAS" (certificates No. 404860, No. 570418).

School portable chemical-ecological laboratory is intended for pupils of 8th-11th grades in institutions of general, secondary specialized, vocational and additional education, implementing educational programs in chemistry (including in-depth study), ecology, biology, technology.

The use of the product when working with pupils of 8th-11th grades is provided in the conditions of their lesson and extracurricular activities. It can be used for laboratory demonstration, experimental and design research activities of pupils during practical work and solving experimental research problems.

School portable chemical-ecological laboratory is a collection of products and modules, each of which includes specially selected ready-to-use reagents, test systems, portable sample dosing devices, measuring plastic and glass ware, etc., placed in teacher packaging and in student sets. In addition, the product contains a set of documentation – a methodological guide, didactic and methodological guides for pupils, guides on related research topics, a passport for the product as a whole and its separate components, certificates, etc.

The class-package allows performing qualitative, semi-quantitative and quantitative determinations in relation to a variety of environmental topics related to the study of quality indicators of water samples and aqueous soil extracts by organoleptic, chemical and instrumental methods.

The product contents allow to use it as a whole and its constituent parts separately in the conditions of a school educational laboratory, a chemistry class, as well as in field (out-of-school, out-of-laboratory) conditions.

**We are always open
for cooperation!**

BEWARE OF IMITATIONS!

Technical data and characteristics

Table 1. Determined indicators, methods of analysis of water samples and characteristics when performing experimental tasks using school portable chemical-ecological laboratory of the class-package

Abbreviations in the table: VC – visual colorimetric; TM – titrimetric.

Determined indicator	Determined concentration range	Sample volume, ml	Analysis of soil extracts	Training class (tentative)
Ammonium (NH ₄ ⁺) (ammonium nitrogen)	0-1.0-2.6-5.0-7.0 mg/l (VC)	5	-	9
Protein	Qualitatively	1	-	10
Hydrogen exponent (pH)	4.5-5.0-5.5-6.0-6.5-7.0-7.5-8.0-8.5-9.0-10.0-11.0 units pH (VC)	5	+	8
Hydrocarbonate (HCO ₃ ⁻)	30-1200 mg/l	10	+	9
Total iron (sum of Fe ²⁺ and Fe ³⁺)	0-0.1-0.3-0.7-1.0-1.5 mg/l (VC)	10	-	9
Total hardness (sum of equivalents of Ca ²⁺ and Mg ²⁺ cations)	0.5-10 ° W (mmol/L equiv.) (TM)	10-250	+	9
Carbonate (CO ₃ ²⁻)	30-1200 mg/l (TM)	10	+	9
Oxygen, dissolved	1.0-15.0 mgO/l (TM)	100-200	-	11
Acidity (total and free)	2-100 mmol/l	50	-	11
Manganese	0-0.5-1.0-3.0-5.0-10 mg/l (VC)	10	-	11
Turbidity	0.6-30.2 mg/l 1-52 EMF	350	-	8
Nickel (Ni ²⁺)	0-0.2-0.5-1.0-2.0 mg/l (VC)	5	-	11
Nitrate (NO ₃ ⁻)	0-5.0-15-45-90 mg/l (VC)	3	+	9
Nitrite (NO ₂ ⁻)	0-0.02-0.1-0.5-2.0 mg/l (VC)	5	-	10
Anionic surfactants (surfactants-A)	0-0.5-1.0-2.0-5.0 mg/l (VC)	10	-	10
Transparency	60-1 cm	350	-	8
Sulfate (SO ₄ ²⁻)	30-300 mg/l and more (TM)	2.5	+	9
Carbohydrates (starch)	Qualitatively	3	-	10
Phosphates (ortho-), mg/l (total concentration of ions H ₂ PO ₄ ⁻ , HPO ₄ ²⁻ , PO ₄ ³⁻ and H ₃ PO ₄)	0-0.5-1.0-3.5-7.0 mg/l (VC)	10	-	11
Chloride (Cl ⁻)	10-1200 mg/l	1-50	+	11
Color	Qualitatively	10	-	8
Chromaticity	0-30-100-300-1000 deg. chromaticity (VC, film scale)	12-50	-	8

Calculation methods, using the results of analyzes obtained experimentally (not indicated in Table 1), determine: carbonate hardness (the sum of CO₃²⁻ and HCO₃⁻ ions), magnesium (Mg²⁺), sodium and potassium (Na⁺ + K⁺), dry residue.

Convenience and portability when performing analyzes are provided by: the use of reagents of an optimized composition for a simplified and accelerated dosage; minimizing water samples for analysis; the use of modern, convenient accessories, laboratory ware (including means for dosing solutions and samples), equipment.

The used methods are unified, consistent with the current regulatory documents and professional guidelines for water analysis. For some indicators, the methods are suitable for the analysis of seawater and soil extracts, as well as wastewater.

Used methods: titrimetric, colorimetric, visual, organoleptic, calculation.

The characteristics of aqueous soil extracts are determined by analyzing them using the methods used to analyze the respective components in water (for individual indicators).

Resource for definitions

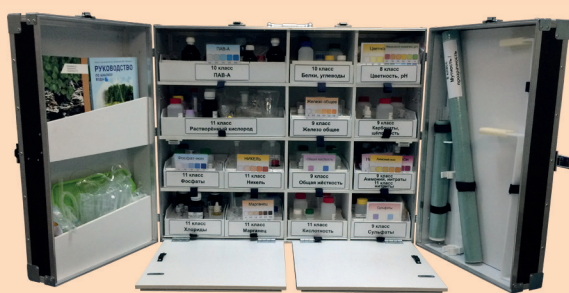
The consumables available in the laboratory (reagents, solutions, etc.) allow at least 100 determinations for each of the determined parameters.

To replace consumed or lost functionality chemical reagents and solutions from the laboratory, a replenishment package is supplied, calculated for 100 determinations for each determined indicator. The replenishment package is packed separately from the product and is not included in it (supplied with a separate order).

Design and packing



Folded teacher packing of school portable chemical-ecological laboratory



Unfolded teacher packing of school portable chemical-ecological laboratory

Teacher packing of laboratory is the main module of school portable chemical-ecological laboratory class-package and is a set of sectional analytical modules and the necessary auxiliary equipment. Sectional modules with methodological support and accompanying documentation are placed in a multi-section table packing of the “case-box” type, which, when open, forms a convenient operator's workplace and allows several students to work effectively with the laboratory at the same time.

It is opened and used in a laboratory (office), or (if necessary) in the field. The packing has a rigid waterproof case with hinged doors and folding tables (workstation) and is equipped with clasps and carrying handles. Pipettes and other utensils, as well as documentation are placed in the corresponding sections.

Each module in the teacher laboratory packing has the name of the corresponding indicator and is located in the section where everything necessary for the analysis of this indicator is present. The location of modular sections in a table type setting is shown in table 2.

Table 2. The layout of the sectional modules in the teacher packing of school portable chemical-ecological laboratory

Left cover door	Packing sections				Right cover door
Study guide, documentation	10th grade Surfactants-A		10th grade Proteins, carbohydrates	8th grade Color, pH	8th grade Turbidity Transparency General equipment (cookware, titration stands, etc.)
	11th grade Dissolved oxygen		9th grade Iron total	9th grade Carbonates, alkalinity	
A set of reagents for the preparation of model solutions	11th grade Phosphates	11th grade Nickel	9th grade Total hardness	9th grade Ammonium, nitrates 11th grade Nitrates	
Additional equipment (accessories, tools, etc.)	11th grade Chlorides	11th grade Manganese	11th grade Acidity	9th grade Sulphates	

Vials with reagents and solutions, cookware, equipment and other equipment for the laboratory are placed in waterproof cradles that can be easily removed from the packing and placed by the operator on folding tables.

The packing is equipped with stands-racks: two for titration and one for placing the cylinder when determining the turbidity. The racks are installed in a loop on the lower part of the table, forming a convenient operator's workplace with easy access to components and cookware. For the convenience of working with graduated pipettes, the use of titration installations with flexible pipette connections with dosing syringes fixed in racks is provided.

Teacher laboratory packing is supplemented by the modules provided in the ordered modification (see Table 3). The accessories are laid separately from the basic packing.



Student set for a chemical and environmental practicum



Student set of study guides

Student set for a chemical and environmental practicum is a simple container-type packing with a cradle and contains the accessories and cookware necessary for practical work, as well as educational aids for the student and accompanying documentation. One pupil set is designed for 2-4 students working at the same time.

Study guides



For teacher



Set of control measuring materials



For student

Product service life and shelf life of reagents and solutions

The suitability of the product for practical work is determined by the operability of the reagents, solutions, indicator papers, etc., included in the product and its constituent parts, the shelf life of which, as a rule, is at least 2 years, subject to the storage conditions of the reagents (solutions) and recommendations for preparation of solutions with a limited shelf life. Solutions with a limited shelf life are provided for by the consumer independently from the components available in the product (preparation technologies are described in the attached practicum).

The service life of the product is at least 4 years, taking into account the replenishment by the consumer of consumable reagents and solutions, preparing them independently or using a replenishment package (replenishment package of school portable chemical-ecological laboratory).

Contents and cost

Table 3. Descriptions, overall dimensions, weight and cost of school portable chemical-ecological laboratory class-package and its modules

Order No. / article	Product/module description	Packaging characteristics* (quantity, dimensions, weight)
8.600	School portable chemical-environmental laboratory (educational and methodological package, class-package), basic equipment (1 + 1), 20 indicators	1 pc – 8.600.1 1 pc – 8.600.2, weight – no more than 28 kg
8.600.1	Table teacher packaging of school portable chemical-environmental laboratory	1 pc – 750×600×260 mm, desktop packing in a “case-box”, weight – no more than 25 kg
8.600.2	Student set for chemical and environmental practicum (Pupil set of school portable chemical-environmental laboratory)	1 pc – 320×170×130 mm, in a corrugated cardboard box), weight no more than 3 kg
8.601	School portable chemical-environmental laboratory (educational and methodological package, class- package), complete set (1 + 14), 20 indicators	1 pc – 8.600.1 14 pcs – 8.600.2, weight – no more than 67 kg
Additionally, the delivery may include **)		
	Reagent and solution replenishment package (replenishment package of school portable chemical-environmental laboratory)	1 pc – 420×220×190 mm Weight – no more than 4 kg
	pH meter type pH-410	1 pc – 250×275×90 mm, weight 0.75 kg, in the manufacturer's packaging
	Conductivity meter DIST2	1 pc – 215×30×55 mm, weight 0.15 kg, in the manufacturer's packaging
6.195	“Free carbon dioxide” test kit	1 pc – 420×220×190 mm, weight 4.0 kg, in container-type packing
6.191	“Copper” test kit	1 pc – 180×180×140 mm, weight 0.8 kg, in a corrugated cardboard box

*) Data are approximate.

**) The product may include other test kits, as well as test systems for the analysis of water and aqueous media, indicator tubes for air analysis (that are not included in school portable chemical-ecological laboratory).

Delivery is carried out within a month from the date of payment for the order. If necessary, the terms of delivery are negotiated in a shorter time, as well as the conditions of transportation desirable for the customer.

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