

Ganna Maslak, Lyudmila Khmelnikova

**METHODICAL MANUAL
ON ANALYTICAL CHEMISTRY
for preparation
FOR "KROK 1. PHARMACY"**

DNIPRO STATE MEDICAL UNIVERSITY

**METHODICAL MANUAL
ON ANALYTICAL CHEMISTRY
for preparation
FOR "KROK 1. PHARMACY"
*(field of knowledge 22 health care specialty
«Pharmacy. Industrial pharmacy»,
second master's level)***

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The methodical guide is intended to prepare students for "KROK-1. Pharmacy", test papers, exams, tests in analytical chemistry according to the program of the educational discipline of training pharmacists of the educational and qualification level "master", which contains the necessary list of knowledge, abilities and skills taking into account international requirements for the credit-transfer system of international regulatory documents and standards, which regulate the professional activity and training of masters of pharmacy.

The immediate need for such a methodical guide for students is due to the limited time students have to study the discipline and the wide implementation of a test form of students' knowledge control.

The methodological manual is an integral part of the methodological complex for students and teachers, which consists of the educational manual "Analytical, physical and colloidal chemistry and metrology" (according to the Ministry of Health of Ukraine, authors Olena Podpletina, Lyudmila Khmelnikova), methodological developments for teachers, students, independent work students from the discipline "Analytical Chemistry".

The methodical guide can serve as a means of preparation and control of students' educational achievements and contribute to the optimization of the learning process.

Specific test tasks by discipline will help students to actively assimilate and summarize information from the discipline, systematize knowledge, stimulate the formation of logical thinking, and make it possible to organize self-testing of knowledge in the process of performing laboratory work.

The methodical manual reflects the importance of analytical chemistry as a theoretical base of special disciplines: pharmaceutical, biological, toxicological chemistry, drug technology, etc., and the patterns associated with the use of certain physicochemical phenomena in pharmaceutical and medical are clarified. biological practice.

When considering quantitative laws and regularities, physical units and their designations according to the international system (SI) are used.

The methodical manual is composed of appropriately structured modules, blocks of content modules and lesson topics.

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TOPIC 1. QUALITATIVE ANALYSIS

Theoretical foundations

The main indicators of the analytical reaction.

1. The sensitivity of the reaction is characterized by:

a. detectable minimum - the minimum mass of a substance (ion) that can be determined in the minimum volume of the solution (V_{\min}); sometimes denoted by the letter γ ($l\gamma = 1 \mu\text{g} = 10^{-6} \text{g}$);

b. minimum (limit) concentration (ρ_{\min}) - the minimum mass concentration of the solution (g/ml), at which the reaction has a positive result: $\rho_{\min} = 1 / V_{\min}$;

c. the limiting dilution (W) is the value inverse of the minimum concentration

$W = 1 / \rho_{\min}$; ratio of types of sensitivity: $W = 1 / \rho_{\min}$; $\rho_{\min} = 1 / W = m / V_{\min} \cdot 10^6$;

$m = V_{\min} 10^6 / W = \rho_{\min} \cdot V_{\min} 10^6$.

2. Specific reactions – reactions by which a substance (ion) can be identified in the presence of other substances (ions).

3. Selective (selective) reactions - reactions that give the same external effect with several ions; the smaller the number of ions for that reaction, the more selective the reactions.

4. A group reagent is a reagent that reacts equally with a group of ions and can be used to separate such a group of ions from other ions.

5. Fractional analysis - analysis for the detection of ions using specific reactions in separate portions of the analyzed solution in any sequence.

6. The systematic course of the analysis is based on a certain sequence of analytical reactions, as a result of which each ion is detected after the detection and selection of other ions that interfere with their determination.

The most detailed information about qualitative analysis methods is given in the following tables.

Table 1

Acid-base classification of cations

Group	Cations	Group reagent	Characteristics of the group
I	Na⁺, K⁺, NH₄⁺	Missing	Chlorides, sulfates and hydroxides dissolve in water
II	Ag⁺, Pb²⁺, Hg₂²⁺	HCl	Chlorides do not dissolve in water
III	Ba²⁺, Sr²⁺, Ca²⁺	H ₂ SO ₄ + C ₂ H ₅ OH	Sulfates do not dissolve in water
IV	Al³⁺, Zn²⁺, Cr³⁺, Sn(II), Sn(IV), As(I II), As(V)	Excess concentrated NaOH+3% H ₂ O ₂	Hydroxides do not dissolve in water, but dissolve in an excess of alkali
V	Fe²⁺, Fe³⁺, Mg²⁺, Mn²⁺, Bi³⁺, Sb(III), Sb(V)	Excess concentrated NH ₃ ·H ₂ O	Hydroxides do not dissolve in water, excess alkali and ammonia
VI	Co²⁺, Ni²⁺, Cd²⁺, Cu²⁺, Hg²⁺	Excess concentrated NH ₃ ·H ₂ O	Hydroxides do not dissolve in water, an excess of alkali, but dissolve in an excess of ammonia.

Table 2

Cation detection reactions

Cations	1 analytical group
Reagents, analytical action	