

Ordinance for ‘Analytical Chemistry I’
in English program

LABORATORY PRACTICES

Laboratory practices from ‘Analytical chemistry I’ in the English program will be performed **in person** for 5 hours per week in the laboratories O230 and O222. In case of any change of teaching process associated with unpredictable circumstances, e.g. pandemic outbreak, an amendment to this ordinance will be issued.

Particular tasks from the practices will be given to the students individually. Preliminary **knowledge is tested in written and oral form before each practice**. Only students with the required knowledge are allowed to attend practices. **The students with insufficient theoretical knowledge (insufficient points from the test and/or inability to answer the teacher’s question during the practice) have to leave the practice without any possibility of substitution. Four of such absences will automatically lead to interruption of the teaching process for the student in this module.**

The students are required to attend all forms of educational activities in this module, without any absences. The absence of students from practices is accepted only due to medical reasons. **A student is required to inform a teacher about an absence ideally before the practice and send a copy (photo/scan) of paper from a doctor** (translated to the Slovak or English language) **within 3 days after the practice**. Justified absence has to be additionally substituted according to instructions of the teacher. Absence exceeding 1/4 of the total teaching process is not accepted.

If necessary, the consultations during the semester (not in the exam period) can be given to students according to the teacher's agreement.

During practices, the students will need the text and exercise book, chemical tables, and calculator.

Additional literature/sources for theoretical study:

1. **P. Mikuš, V. Mikušová, Analytical Chemistry: Chemical Analysis, VEDA, 2022**
2. **D.G. Watson**, Pharmaceutical analysis, A textbook for pharmacy students and pharmaceutical chemists, Elsevier, Churchill Livingstone, London 2005.
3. **web pages** with appropriate keywords and their combinations

Bratislava, 09.02.2026

prof. RNDr. Peter Mikuš, PhD.
Head of Department

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Conditions for successful passing of practices and exams

1. Student is required to be theoretically prepared.

Evaluation of knowledge includes written testing at the beginning of each practical (**max. 4 points**). **In case of poor knowledge, the student is not allowed to continue the practice and no compensation is possible.** Four of such absences lead to interruption of the teaching process for the student in this module. In such case, the student has to enroll himself/herself for this module next academic year.

2. Student is required to perform the practical tasks given by a teacher and to complete and bring a hand-written report from the practice of the week to the teacher. The performance of the student in the practice will be also evaluated by the individually given tasks and a hand-written report – **max. 6 points**.

Practices are successfully passed only if the total score obtained at the end of the semester is at least 60% (max. 10 points for each practical – written test + results from the given tasks + hand-written protocol). Alike, if the obtained score will be lower than 60% the student is not allowed to take the final exam and has to enroll himself/herself for this module next academic year. Any other repetition of this module is not possible and the student has to definitely leave the faculty.

3. Final examination.

The final examination is performed in a written form. The exam is a set of questions that are answered in a hand-written form by the student in a given time interval (60 min). Exams are divided into regular term, first and second reparation. If the obtained score in the second reparation will be lower than 60% the student will not pass the module and can enroll himself/herself for this module next academic year.

The final grade will be given based on an average of the total score percentage from the laboratory practices and the percentage obtained from the final exam.

CLASSIFICATION SYSTEM:

A: 100 - 96%, B: 95 - 90%, C: 89 - 80%, D: 79 - 70%, E: 69 - 60%, FX: <60%

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LABORATORY PRACTICES

Practices: Wednesday 7:30 – 11:55

Room: O230 and O222

Teachers: Assoc. Prof. PharmDr. Katarína Maráková, PhD., RNDr. Svetlana Dokupilová PhD.

Qualitative Chemical Analysis

16.02. – 20.02.2026

Organization of practical exercises, working techniques and procedures in qualitative inorganic analysis, safety in the analytical laboratory, chemical reactions.

23.02. – 27.02.2026

Group and selective reactions of cations Ag^+ , Hg^{2+} , Hg_2^{2+} , Pb^{2+} , Cu^{2+} , Bi^{3+} , Fe^{2+} , Fe^{3+} , Ni^{2+} , proof in unknown samples.

02.03. – 06.03.2026

Analysis of samples containing a) alkaline earth ions Ba^{2+} , Ca^{2+} , Mg^{2+} and b) Al^{3+} , Zn^{2+} in presence of heavy metal ions.

09.03. – 13.03.2026

Group and selective reactions of anions SO_4^{2-} , CO_3^{2-} , AsO_3^{3-} , AsO_4^{3-} , PO_4^{3-} , Cl^- , Br^- , I^- , NO_3^- , NO_2^- , their proof in unknown samples.

16.03. – 20.03.2026

Analysis of cations and anions in one mixture.

23.03. – 25.03.2026

Organic analysis. Orientation tests, elemental analysis - determination of C, H, N, S, O, halogens. Analysis of oxo – compounds (the solubility class, proof of a functional group). Analysis and proof of amides and amines (the solubility class, proof of a functional group).

Quantitative Chemical Analysis

30.03. – 03.04.2026 + 06.04. – 10.04.2026

Introduction to quantitative analysis. Calculations in quantitative analysis

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13.04. – 17.04.2026

Chelatometry: preparation of the Chelatone III titrant solution, determination of its concentration onto primary standard, determination of Mg^{2+} and Ca^{2+} in water samples, and determination of Zn^{2+} and Bi^{3+} besides each other, calculations.

20.04. – 24.04.2026

Acidimetry: preparation of the NaOH titrant, preparation of the HCl titrant, determination of its concentration onto secondary standard (standard solution NaOH), back titration of water-insoluble carbonates.

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27.04. – 01.05.2026

Permanganometry: preparation of the KMnO_4 titrant solution, determination of its concentration on the primary standard $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O}$, determination of oxalates.

04.05. – 08.05.2026

Iodometry: preparation of the $\text{Na}_2\text{S}_2\text{O}_3$ titrant solution and potassium iodide, standardization with KIO_3 , determination of chromate and dichromate salts, and determination of cupric ions.

11.05. – 15.05.2026

Gravimetry: principles, determination of Ca^{2+} as CaCO_3

18.05. – 22.05.2026

Individually given sample.

Bratislava, 09.02.2026

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LECTURES

Lectures: Tuesday 13:00-14:40

Room: O101

Teachers: Assoc. Prof. PharmDr. Katarína Maráková, PhD., RNDr. Svetlana Dokupilová PhD.,

17.02.2026 Introduction in qualitative chemical analysis.

Group and selective reactions of cations Ag^+ , Hg^{2+} , Hg_2^{2+} , Pb^{2+} , Cu^{2+} , Bi^{3+} , Fe^{2+} , Fe^{3+} , Ni^{2+}

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

24.02.2026 Group and selective reactions of cations Al^{3+} , Zn^{2+} , Ba^{2+} , Ca^{2+} , Mg^{2+} Analysis of samples containing Al^{3+} , Zn^{2+} , Ba^{2+} , Ca^{2+} , Mg^{2+} in presence of heavy metal ions, describing of appropriate sample preparation procedure

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

03.03.2026 Group and selective reactions of anions SO_4^{2-} , CO_3^{2-} , AsO_3^{3-} , AsO_4^{3-} , PO_4^{3-} , Cl^- , Br^- , I^- , NO_3^- , NO_2^- . Principle of analysis cations and anions in one mixture.

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

10.03.2026 Organic analysis. Orientation tests, elemental analysis, determination of C, H, N, S, O, halogens. Classification of organic compounds according to their solubility.

RNDr. Svetlana Dokupilová PhD.

17.03.2026 Analysis of oxo – compounds. Elemental analysis, the solubility class. Identification of organic compound.

RNDr. Svetlana Dokupilová PhD.

24.03.2026 Analysis and proof of amides, amines. Elemental analysis, the solubility class. Identification of organic compound.

RNDr. Svetlana Dokupilová PhD.

31.03.2026 Introduction into the quantitative analysis: methods, techniques, calculations for quantitative determination.

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

14.04.2026 Complexometric titrations: **chelatology**, stability constants of chelates, determination of cations in water samples (direct titrations).

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

21.04.2026 Acid-base titrations: **Alkalimetric** titrations: determination of acids (direct titrations). **Acidimetric** titrations: principles and equilibria of titration of water-insoluble carbonates (back titrations)

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

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28.04.2026 Oxidimetric titrations: **permanganometry**, autoindication, determination of anions and cations (direct titrations), **iodometry**, determination of anions and cations (indirect titrations).

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

05.05.2026 Titrations based on the creation of precipitate: **argentometry**, determination of anions by Volhard’s method (back titrations)

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

12.05.2026 **Gravimetry**: principles, determination of metals

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

19.05.2026 Practical utilization of chemical analytical methods in pharmacy.

Assoc. Prof. PharmDr. Katarína Maráková, PhD.

Bratislava, 09.02.2026

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