GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Analytical Chemistry: Introduction (C003976)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0 **Study time 120 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	Dutch	Gent	seminar
			lecture

Lecturers in academic year 2024-2025

Vandenabeele, Peter	WE06	lecturer-in-charge
Kaczmarek, Anna	WE06	co-lecturer

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Bachelor of Science in Chemistry	4	A
Preparatory Course Master of Science in Chemistry(main subject Analytical and Environmental Chemistry)	4	A

Teaching languages

Dutch

Keywords

Chemical equilibrium, titrimetry (volumetry), gravimetry, sampling, data evaluation

Position of the course

The course Analytical Chemistry: Introduction is the first course within the educational curriculum analytical chemistry. The aim and importance of analytical chemistry is discussed. The course aims at a more profound insight into chemical equilibrium and provides the students with the tools for problem-solving in this context. Important basic concepts in analytical chemistry and their relevance are elucidated. The importance of adequate sampling is highlighted and a number of sampling and sample pretreatment approaches are covered. A profound insight into the wet-chemical analysis techniques titrimetry (or volumetry) and gravimetry is aimed at. Finally, tools are provided for data analysis based on statistics.

Contents

- Introduction
  - Definition and relevance of analytical chemistry
  - Qualitative and quantitative analysis
  - Course of a chemical analysis
- Chemical equilibrium
  - Introduction
  - Ladder diagram
  - A general approach for solving equilibrium problems
  - Buffer solutions
  - Activity
- Basic concepts and skills in analytical chemistry
  - Expressing analysis results (units of concentration)
  - Stoichiometric calculations
  - Figures of merit: accuracy, precision, sensitivity, detection and quantification limit, selectivity and sensitivity, robustness
  - Selecting an analytical method
- Data evaluation
  - Measurement uncertainty and distribution of measurement results
  - Statistical analysis of analytical data

- Sampling and sample pretreatment
  - The importance of adequate sampling
  - Sampling strategy
  - Simple methods for separation of analyte and interference
- Gravimetric methods
  - Precipitation gravimetry
  - Volatilization gravimetry
  - Particulate gravimetry
- Titrimetric (volumetric) methods
  - Introduction
  - Acid-base titrations
  - Complexation titrations
  - Redox titrations

Precipitation titrations

Initial competences

Having followed the courses "Chemistry: Structure of Matter" and "Chemistry II: Reactions or having obtained their competences via equivalent courses.

Final competences

1 The student has obtained insight into the aim and importance of analytical chemistry.
2 The student has obtained a more profound insight into chemical equilibrium and has enhanced skills for solving equilibrium problems.
3 The student is aware of the most important aspects of analysis methods (figures of merit) and analysis data (distribution, uncertainty).
4 The student has acquired a profound understanding of the basic principles and the capabilities and limitations of titrimetric (volumetric) and gravimetric methods.
5 The student is aware of the importance of adequate sampling and sample preparation prior to the analysis.
6 The student can use simple statistical methods for data analysis.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Independent work

Extra information on the teaching methods

This course unit assumes responsible use of generative artificial intelligence (GAI). Unpublished data nor the course notes should never be entered into GAI tools.

Study material

Type: Handbook

Name: Analytical Chemistry 2.1, D. Harvey, http://chem.libretexts.org/Textbook_Maps/Analytical_Chemistry_Textbook_Maps/Map%3A_Analytical_Chemistry_2.0_(H
Indicative price: Free or paid by faculty
Optional: no

References

- Analytical Chemistry 2.1, D. Harvey, http://chem.libretexts.org/Textbook_Maps/Analytical_Chemistry_Textbook_Maps/Map%3A_Analytical_Chemistry_2.0_(Harvey)
- Analytical Chemistry, 7th edition, G.D. Christian, P.K. Dasgupta and K.A. Schug, Wiley, 2014.
- Quantitative Chemical Analysis, 9th edition, D.C. Harris and C. Lucy, W.H. Freeman, 2015.

Course content-related study coaching

Questions can be posed via email, after lectures or during a personal meeting after making an appointment by e-mail.

Assessment moments

end-of-term assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Written assessment with multiple-choice questions, Written assessment with open-ended questions

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Theoretical part: written examination
Problem-solving part: written examination with open book

Calculation of the examination mark

The theoretical part and the problem-solving part each account for 50% of the total score. Students who are absent without any well-justified reason or who do not participate to both parts of the evaluation, do not pass the exam for this course unit.