

## 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
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**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
<a href="#">Bachelor of Science in Chemistry</a>	4	A
<a href="#">Preparatory Course Master of Science in Chemistry(main subject Analytical and Environmental Chemistry)</a>	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
  - o Definition and relevance of analytical chemistry
  - o Qualitative and quantitative analysis
  - o Course of a chemical analysis
- Chemical equilibrium
  - o Introduction
  - o Ladder diagram
  - o A general approach for solving equilibrium problems
  - o Buffer solutions
  - o Activity
- Basic concepts and skills in analytical chemistry
  - o Expressing analysis results (units of concentration)
  - o Stoichiometric calculations
  - o Figures of merit: accuracy, precision, sensitivity, detection and quantification limit, selectivity and sensitivity, robustness
  - o Selecting an analytical method
- Data evaluation
  - o Measurement uncertainty and distribution of measurement results
  - o Statistical analysis of analytical data

- Sampling and sample pretreatment
- o The importance of adequate sampling
- o Sampling strategy
- o Simple methods for separation of analyte and interference
- Gravimetric methods
- o Precipitation gravimetry
- o Volatilization gravimetry
- o Particulate gravimetry
- Titrimetric (volumetric) methods
- o Introduction
- o Acid-base titrations
- o Complexation titrations
- o 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\\_\(Harvey\)](http://chem.libretexts.org/Textbook_Maps/Analytical_Chemistry_Textbook_Maps/Map%3A_Analytical_Chemistry_2.0_(Harvey))

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\\_\(Harvey\)](http://chem.libretexts.org/Textbook_Maps/Analytical_Chemistry_Textbook_Maps/Map%3A_Analytical_Chemistry_2.0_(Harvey))
- Analytical Chemistry, 7<sup>th</sup> edition, G.D. Christian, P.K. Dasgupta and K.A. Schug, Wiley, 2014.
- Quantitative Chemical Analysis, 9<sup>th</sup> 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.