GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Chemistry (C004205)

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

Credits 5.0 **Study time 150 h**

Course offerings and teaching methods in academic year 2024-2025

A (semester 1)	Dutch	Gent	lecture
			independent work
			practical
			seminar

Lecturers in academic year 2024-2025

Hens, Zeger	WE06	lecturer-in-charge

Offered in the following programmes in 2024-2025	**crdts**	**offering**
Bachelor of Arts in Moral Sciences	5	A
Bachelor of Arts in Philosophy	5	A
Bachelor of Science in Physics and Astronomy	5	A

Teaching languages

Dutch

Keywords

Atom, ion, molecule, chemical bonding, organic compounds, kinetics, chemical equilibrium, acids and bases, chemical thermodynamics, electrochemistry.

Position of the course

This course unit belongs to the learning pathway Interdisciplinarity & Broadening" in the Bachelor program Physics and Astronomy.
To acquire a general overview of and the necessary insight in the basic concepts of the structure and the reactivity of matter (see Contents), which is needed as basic knowledge for the future physicist and as a prerequisite for more specialized physics courses (solid-state physics, atom and molecule physics). Because of the logic composition of chemistry, the course is well suited to attribute to the development of scientific skills such as analytical reasoning, ability to critical reflection and problem solving capability.

Contents

1 The nature of matter: atomic theory and Avogadro's number, elements and compound, substances and mixtures, de formula-unit.
2 Structure of matter: atoms and ions (atomic structure, orbitals, electron configuration), the chemical bond (2-electron bond, sigma and pi bonds, polarity).
3 Molecular structure: hybrid orbitals, hydrides, organic compounds.
4 Behavior of substances and mixtures: solid, liquid, gas and solution phases, intermolecular interaction, bonding in solids (ionic, covalent, metallic and molecular substances).
5 Equilibrium: chemical thermodynamics (internal energy, enthalpy, entropy and Gibbs free energy), thermodynamic tables, physical equilibrium and phase diagrams of pure substances, chemical equilibrium (mass action, principle of Le Châtelier).
6 Chemical reactions - types: acid-base reactions, redox reactions, properties of buffer solutions.
7 Chemical reactions - rate: kinetics of chemical reactions (rate equation,

activation energy), reaction mechanism, catalysis.
8 Electrochemistry: ionic solutions, galvanic cells, batteries

Initial competences

The chemical education from secondary school of starting physics students is usually sufficient, but rather superficial and lacking general insight. As a consequence, this chemistry course starts at an elementary level.

Final competences

1 Understanding of the fundamental concepts of the composition of matter, standard techniques and models of chemistry and the ability to apply these within relevant areas of application (by specific, simple examples).
2 Development of scientific attitude: efficient selection of data, schemes, and processing of these in a structured manner.
3 Autonomous understanding and processing of chemical literature on a Bachelor level (also in scientific English).
4 Knowledge of chemical methodology and analytical reasoning for scheduling complex processes, finishing and correcting these.
5 Showing accuracy, physical/chemical intuition, creativity and critical reflection.
6 Application of the correct chemical terminology (also in English).
7 Scheduling complex assignments as a team.
8 Written and orally reporting on chemistry-related projects.

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, Practical, Independent work

Extra information on the teaching methods

Lectures, seminars and practical exercises, ELO (https://Ufora.UGent.be) for additional documentation, FAQ's.

Study material

Type: Syllabus

Name: Syllabus
Indicative price: € 20
Optional: no
Language : Dutch

Type: Slides

Name: Lectures slides
Indicative price: Free or paid by faculty
Optional: no
Additional information: available through Ufora

References

- English reference textbook ("Chemistry", R. Chang, K. Goldsby, 2016, ISBN13: 9780078021510)

Course content-related study coaching

- Seminars to develop the chemical problem solving skills
- Individual learning assistance by lecturer or assistant
- Interactive assistance by ELO: frequently asked questions, fora, ...

Assessment moments

end-of-term and continuous assessment

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

Written assessment with open-ended questions

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

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Professional practice, Assignment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Theory: evaluation of insight in the main concepts through (1) application-oriented and (2) open questions.
Exercises: evaluation of ability to apply the main concepts in practical problems, including concepts thaught during practicals.

Calculation of the examination mark

Written exam: 18 points
Practicals: 2 points