

Course Specifications

From the academic year 2017-2018 up to and including the

Course size (nominal values; actual values may depend on programme)
Credits 6.0 Study time 180 h Contact hrs 52.5 h

Course offerings and teaching methods in academic year 2018-2019

| Offering | Language | Teaching Method | Hours |
|----------------|----------|------------------|---------|
| A (semester 2) | Dutch | lecture | 41.25 h |
| | | practicum | 11.25 h |
| | | seminar: coached | 5.0 h |
| | | exercises | |

Lecturers in academic year 2018-2019

Van Hecke, Kristof WE06 lecturer-in-charge

Offered in the following programmes in 2018-2019

| Programme | crdts | offering |
|---|-------|----------|
| Bachelor of Arts in Archaeology | 6 | A |
| Bachelor of Arts in Philosophy | 6 | A |
| Bachelor of Science in Physics and Astronomy | 6 | A |
| Preparatory Course Master of Science in Physics and Astronomy | 6 | A |

Teaching languages

Dutch

Keywords

Atom, ion, molecule, chemical bonding, kinetics, chemical equilibrium, acids and bases, chemical thermodynamics, organic chemistry

Position of the course

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 Chemical terminology (element, compound, atom, ion, molecule, chemical reaction).
- 2 Basic structure of matter: atoms and ions (Bohr model, elementary introduction to the wave-mechanical model, atomic orbitals, elektron configurations), chemical bonding (ionic, covalent and metallic bonding), molecules (sigma- and pi-bonding, molecular geometry, polarity).
- 3 Behavior of large collections of molecules: solid, liquid, gas- and solution phases (intermolecular forces of attraction, phase diagram of a pure substance).
- 4 Kinetics of chemical reactions and catalysis.
- 5 The driving force, the final state and the speed of chemical changes: chemical thermodynamics (changes in internal energy, enthalpy, entropy and Gibb's free energy accompanying chemical processes), chemical equilibrium (Le Châtelier's principle), chemical kinetics (reaction order, reaction mechanisms and catalysts)
- 6 Chemical reactions: metathesis reactions, acid-base reactions, redox reactions, properties of buffers.
- 7 Organic chemistry: structural functionalities, isomers, polymers.

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, the chemistry course starts from the elementary chemistry 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 application areas (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 Reporting written and orally of related chemical projects.
- 9 Pay attention to industrial aspects of chemistry.

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

Lecture, practicum, seminar: coached exercises

Extra information on the teaching methods

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

Learning materials and price

Dutch syllabus (price: \pm € 20-) - Academia Press Wetenschappelijke Uitgeverij (through study praeses WiNA)

Lectures slides (available through Minerva)

References

- English reference textbook ("Chemistry", R. Chang, K. Goldsby, 2012, ISBN 9780071317870)

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, ...

Evaluation methods

end-of-term evaluation

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

Written examination with open questions, oral examination, job performance assessment

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

Written examination with open questions, oral examination, job performance assessment

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

Open questions: insight test for the basic concepts (see Contents) by application oriented theory questions; test for acquisition of the basic concepts in chemical problem solving by integrative exercises.

Calculation of the examination mark

Oral exam: 7 points; Written exam: 10 points, Practical Exercises: 3 points