

Appendix Master degree programme Chemistry

Appendix I Learning outcomes of the degree programme (art. 3.1)

The objectives of the master's degree programme Chemistry are:

- to prepare students for an independent professional career; in this context this means being able to carry out fundamental or applied scientific research, as well as applying state of the art scientific knowledge in a wide variety of new practical situations,
- to make students develop skills, knowledge and insight in a specialization area of the field of study, with a focus on insight in and approach to scientific problems,
- to make students develop the ability to clearly and concisely communicate the acquired knowledge to others.

The objectives of the programme result in the following learning outcomes

A. General academic skills for the master's degree programme Chemistry

The graduate

- A1. is able to keep up with and make use of professional literature in relevant subfields,
- A2. is able to make himself/herself familiar with a subfield of the own discipline within a reasonable time span,
- A3. is able to formulate a research plan based on a problem description in a subfield of the own discipline,
- A4. is able to analyze, interpret using state of the art information, and draw conclusions from research results,
- A5. is able to operate effectively in a position in which knowledge and research skills within the field of the own discipline are required,
- A6. is able to perform in a multidisciplinary team, transfer knowledge to others, give oral presentations, write a report or internationally accessible scientific article, and take part in a scientific discussion,
- A7. is able to design, conduct and evaluate experiments and the necessary checks and balances independently,
- A8. is able to relate his/her own results and conclusions to results already available in the literature,
- A9. has sufficient understanding of the role of the own discipline in society to come to a well-considered choice and practice of profession,
- A10. has an understanding of the role of their own discipline in a sustainable society.

B. Specific academic knowledge and skills for the master's degree programme Chemistry.

The graduate has advanced knowledge of aspects of one of the following fields of knowledge:

- Advanced Materials: synthesis, characterization and properties of materials; the relation between chemical and physical properties of materials on the one hand and the nature of the chemical bonding, and molecular and crystal symmetry on the other hand.

- Catalysis and Green Chemistry: reactions and interactions of molecules and the application of this insight in synthetic chemistry and catalysis as well as knowledge about sustainable chemistry.
- Chemical Biology: behavior and design of biochemical systems and their functional properties. Synthetic biology as well as protein engineering.

The graduate:

- B1. is able to judge whether the properties of created products and possible side or waste products can result in undesired side effects in the short or long term,
- B2. is able to work at academic level on a research problem in an area of chemistry, which is not his/her own main field of study,
- B3. (Science, business and policy-specialization) is prepared for a professional career in management and policy.

Appendix II Tracks/Specializations of the degree programme (art. 3.5)

The degree programme has the following tracks:

- Advanced Materials
- Catalysis and Green Chemistry
- Chemical Biology
- Science, Business and Policy
- Within the degree programme qualified students can follow the Erasmus Mundus programme Theoretical Chemistry and Computational Modelling (TCCM). For this programme the Erasmus Mundus TCCM regulations, as laid down in the consortium agreement of the programme, the student agreement and the SGA agreement with the EACEA, apply.

Appendix III Content of degree programme (art. 3.6)

The programme comprises 120 ECTS; of which it comprises 60 ECTS in courses (compulsory courses, track courses and electives), a research project of 40 ECTS and a second research project of 20 ECTS.

Compulsory course units for Master Chemistry:

Practicals are defined as laboratory practicals

Course unit	ECTS	Practical	Entry requirements
Reaction Mechanisms	5		
Structure Determination with Spectroscopic Methods	5		
Colloquium	5		
Final Exam	5		
Master Research Project*	40	x	
Second research project**	20 or 25	x	completion of Master Research Project Chemistry (WMCH19003), and Scientific Integrity (WMCH16008)

*The 40 ECTS Master Research project is not part of the Science, Business and Policy track and also not part of the Erasmus Mundus Theoretical Chemistry and Computational Modelling track. These tracks have track-specific Research Projects.

**The second research project is 20 ECTS and could be extended, before the start of the project, to 25 ECTS (at the expense of an elective course) after approval of the Board of Examiners. The second research project should be performed in a different research group in comparison to the master research project.

The second research project is not part of the Science, Business and Policy track and also not part of the Erasmus Mundus Theoretical Chemistry and Computational Modelling track.

Advanced Materials track

Course unit	ECTS	Practical	Entry requirements
Cross-disciplinary Materials Science	5		
Three of these five courses have to be chosen:			
- Structure at Macro, Micro and Nano Scale	5		
- Characterisation of Materials	5	x	
- Supramolecular Chemistry	5		
- Bioinspired Designer Materials	5		
- Physical Methods for Chemical Analysis	5	x	
Electives in Chemistry	20	See course units	

Catalysis and Green Chemistry track

Course unit	ECTS	Practical	Entry requirements
Biocatalysis and Green Chemistry	5		
Chemical Catalysis	5		
Sustainability for Engineers	5		
Organic Synthesis: Methods and Strategy 1	5		
Electives in Chemistry	20	See course units	

Chemical Biology track

Course unit	ECTS	Practical	Entry requirements
Advances in Chemical Biology	5		
Synthetic Biology & Systems Chemistry	5		
Advanced Protein Crystallography	5		
Protein and Enzyme Engineering	5	x	
Electives in Chemistry	20	See course	

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Science, Business and Policy track

Course unit	ECTS	Practical	Entry requirements
Research Project in Chemistry	30	x	
Introduction Science and Policy	10		
Introduction Science and Business	10		
Internship Business and Policy	40	x	
Electives in Chemistry	10	See course unit	

Erasmus Mundus programme Theoretical Chemistry and Computational Modelling (TCCM)

The first year of the programme is arranged locally at the home university of the student, and must comply with the Erasmus Mundus TCCM regulations. The first year for those students whose home university is the University of Groningen consists of the Compulsory course units for Master Chemistry plus the following course units:

Course unit	ECTS	Practical	Entry requirements
Research Project TCCM	30	x	
Intensive Course TCCM	30		
Molecular Quantum Mechanics 1	5		
Molecular Quantum Mechanics 2	5		Molecular Quantum Mechanics 1
Selected topics in Theoretical Chemistry	5		
Molecular Dynamics	5	x	
Electives	20	See course units	

Appendix IV Electives (art. 3.7)

The elective courses are specializing and can be selected from the entire master degree program in Chemistry. In order to provide a guideline for the student that wants to specialize in a particular field, package choices have been defined (vide infra). The student can request the board of examiners to be allowed to select a particular course outside the master in Chemistry programme. Students are allowed to add 5 ECTS from the electives to their second research project.

Course unit	ECTS	Practical	Entry requirements

Bio-based Products	5		
Biomaterials 2	5		
Interfacial Engineering	5		
Polymer Lab course 3	5	x	
Photovoltaics Science and Energy	5		
Polymer Products	5		
Stereochemistry	5		
Design of Industrial Catalysts	5	x	
Organometallic Chemistry	5		
Product Focused Process Design	5		
Science Communication Skills	5		
Astrochemistry	5		
Computational Chemistry	5	x	
Functional Properties	5		
Modern Laser Microscopy	5		
Organic Synthesis: Methods and Strategy 2	5		
Polymer Physics	5	x	

In the first year of the programme, 10 ECTS out of the total of 60 ECTS credits may be required to levelling courses for those students who, on the advice of their local tutor and after approval of the Board of Examiners, need to upgrade their level in different fields within the Faculty of Science and Engineering.

Elective courses complete the total number of ECTS of the first year of the programme to 60 ECTS.

Appendix V Entry requirements and compulsory order of examinations (art. 4.4)

Entry requirements are mentioned in tables appendices III and IV.

Appendix VI Admission to the degree programme and different specializations (art. 2.1.1 + art. 2.2)

1. Admission requirements for admission to the selective master's degree in Chemistry

Applicants have to fulfil the following admission requirements:

- an academic Bachelor's degree in Chemistry (or an equivalent degree)
- sufficient English proficiency

Test	Score
IELTS (Academic)	6.5 - no less than 6.0 on each section
TOEFL IBT (internet-based test)	92 - no less than 21 on each section
TOEFL CBT (computer-based test)	237 - no less than 21 on each section
TOEFL PBT (paper-based test)	580 - no less than 55 on each section
Cambridge English	CAE or CPE Certificate
English language test - University of Groningen Language Centre	Minimum section scores C2 or C1 (one B2 allowed)
VWO	pass

This requirement is also fulfilled in case the applicant:

- is a native speaker and completed secondary education in any one of the following countries: Australia, Canada, Ireland, New Zealand, UK or USA;
- has completed a full-time bachelor's degree programme (nominal duration of at least three years) in one of the following countries: Australia, Canada, Ireland, New Zealand, UK or USA;
- has an International Baccalaureate;
- has a European Baccalaureate diploma.

2. Application Procedure for selective master degree programmes

All candidates have to register in Studielink and upload the following documents before 1 May (start 1 September):

- ID card or passport
- Diploma of relevant Bachelor's degree programme (if not possible, provide reason)
- List of grades
- Proof of English language proficiency
- CV
- Motivation letter
- List of subjects/courses (to be) followed
- Brief description of 5 key subjects/courses
- A academic writing sample (1500-2000 words) of the academic Bachelor's degree in the context of the programme.

After candidates have completed their registration in Studielink, applications will be processed in the following way:

For holders of a Dutch BSc diploma:

1. Education Support Centre compiles the individual selection file
2. Education Support Centre submits the individual selection file to the Admissions Board of the individual programme

For holders of a non-Dutch BSc diploma:

1. Admissions Office compiles the individual selection file
2. Admissions Office validates individual Bachelor's degree diploma
3. Admissions Office submits the individual selection file to the ESC
4. ESC submits the individual selection file to Admissions Board of the individual programme

3. Selection procedure

In order to select the best-suited and motivated students, the Admission Board require a complete selection file from all candidates. The Admission Board of the individual programmes will review all individual applicants based on their selection file. All candidates who meet the selection criteria 'academic performance' and 'motivation' (as specified by the different programmes) will be admitted to the selection procedure. A maximum of 50 students applies.

At least two members of the Admissions Board score the selection criteria. Scoring is on a 9-point scale from 1 to 5 (1 = insufficient to 5 = excellent). If the scores on the academic performance and/or the motivation deviate 1 point or more, the members of the admissions board that gave scores have to confer, after which they score a second time. This outcome constitutes the final score. Candidates with minimally a sufficient average score of 3 for each criterion, and an average overall score of at least 3.5 are selected.

1. Academic performance (60%)

The score on academic performance is the result of the score on relevance (70%) and proficiency (30%).

- **Relevance and affiliation/fit** of the followed bachelor programme to the master programme (list of subjects/courses followed and grades obtained; brief description of the content of 3-5 key subjects/courses demonstrating the knowledge and skill(s) acquired by the student 1).

- **Proficiency** in completing an academic assignment in the context of the programme and in individually producing a written report on this. The report has to reflect the student's ability to produce a well-structured and concise report. It also has to show that the student is in principle developing a critical attitude and is capable of critical thinking. The assignment handed in is free of choice, should be between 1500-2000 words and can be a report on a practicum, experiment, field-work, a literature review, a summary of the bachelor thesis, etc.2)

1 Key subjects/courses, the nature of the knowledge and relevant skill(s) are defined by the deputy director in consultation with the programme committee, and are approved by the director of the Graduate School.

2 If the student has not made an individually written report during the bachelor programme he/she should contact the selection committee to receive an assignment on the basis of which a written report can be prepared.

2. Motivation (40%)

The candidate has to provide a motivation letter (500 words) demonstrating a suitable stance and talent to follow the programme. The letter should address the following specific questions/issues:

- 1. Why did you choose this specific master's degree programme?*
- 2. How did the bachelor's degree programme, extracurricular activities, and/or other experiences prepare you for this specific master programme?*
- 3. In case it took you longer than nominal to acquire the bachelor degree, please briefly explain the cause(s) of the delay.*
- 4. How does this master' degree programme prepare you for your future career and/or serves your ambitions?*
- 5. Free space to mention anything you feel is relevant and is not addressed by the questions above.*

4. Timeline for the application and selection procedure

The application procedure for the start on 1 September 2020 will open on 1 October 2019 and will close on 1 May 2020. In October 2019, the details of the entire application procedure will be published on the *Admission and Application* website for the individual Master's degree programme.

After registration in Studielink, all candidates will receive an email with an overview of the application procedure, the deadlines and instructions on how to proceed.

After candidates have successfully submitted all necessary documents the Education Support Centre (for holders of a Dutch BSc diploma,) or the Admissions Office (for holders of a non-Dutch BSc diploma) will send the candidate a confirmation of receipt.

The Board of Admissions has the authority to place a maximum of 5 candidates before the 1 May deadline. The top candidates (50 - the number of already placed candidates) will be offered placements between 15 May and 1 June (start 1 September).

Candidates who are not selected can lodge a written appeal against this decision within four weeks of the date of sending, with the Board of Appeal for Examinations, P.O. Box 72, 9700 AB Groningen, the Netherlands.

Students who are offered a place have to accept or decline the placement within four weeks after receiving the offer. If the student does not accept the placement within four weeks, this placement expires and the placement will be offered to a candidate on the waiting list. If a student declines their placement, that placement will be offered to a candidate on the waiting list.

There will be one round of offering placements to candidates on the waiting list.

Appendix VII Transitional provisions (art. 7.1)

For cohort 2019-2020 and earlier

Course	May be replaced with	Reason

Appendix VIII Application deadlines for admission (art. 2.6.1 en 2.6.3)

Programmes starting on 1 September

Programme	Deadline of Application	Deadline of decision
Behavioural and Cognitive Neurosciences	1 May 2020	1 June 2020
Biology	1 May 2020	1 June 2020
Biomedical Engineering	1 May 2020	1 June 2020
Biomedical Sciences	1 May 2020	1 June 2020
Biomolecular Sciences	1 May 2020	1 June 2020
Chemistry	1 May 2020	1 June 2020
Ecology and Evolution	1 May 2020	1 June 2020
Energy and Environmental Sciences	1 May 2020	1 June 2020
Human-Machine Communication	1 May 2020	1 June 2020
Marine Biology	1 May 2020	1 June 2020
Medical Pharmaceutical Sciences	1 May 2020	1 June 2020
Nanoscience: for non-EU/EEA students	1 February 2020	1 June 2020
Nanoscience: for EU/EEA students	1 May 2020	1 June 2020

Programmes starting on 1 September and 1 February

Programme	Deadline of Application for 1 September	Deadline of decision for 1 September	Deadline of Application for 1 February	Deadline of decision for 1 February
Applied Mathematics	1 May 2020	1 June 2020	15 October 2020	15 November 2020
Applied Physics	1 May 2020	1 June	15 October	15 November

		2020	2020	2020
Artificial Intelligence	1 May 2020	1 June 2020	15 October 2020	15 November 2020
Astronomy	1 May 2020	1 June 2020	15 October 2020	15 November 2020
Chemical Engineering	1 May 2020	1 June 2020	15 October 2020	15 November 2020
Computing Science	1 May 2020	1 June 2020	15 October 2020	15 November 2020
Farmacie	1 May 2020	1 June 2020	15 October 2020	15 November 2020
Industrial Engineering and Management	1 May 2020	1 June 2020	15 October 2020	15 November 2020
Mathematics	1 May 2020	1 June 2020	15 October 2020	15 November 2020
Physics	1 May 2020	1 June 2020	15 October 2020	15 November 2020