

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 become familiar with a subfield of their own discipline within a reasonable time span,
- A3. is able to formulate a research plan based on a problem description in a subfield of their own discipline,
- A4. is able to analyze, interpret using state of the art information, and draw conclusions from research data,
- 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 work 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 controls independently,
- A8. is able to relate their own results and conclusions to data already available in the literature,
- A9. has sufficient understanding of the role of their own discipline in society to come to a well-considered choice and practice of their 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 and the nature of the chemical bonding, and molecular structure on.
- Catalysis and Green Chemistry: reactions and interactions of molecules and the application of this insight in synthetic chemistry and catalysis as well as knowledge of sustainable chemistry.
- Chemical Biology: behavior and design of biochemical systems and their functional properties. Synthesis in biology as well as protein engineering.

The graduate:

- B1. is able to judge whether the properties of products prepared and possible side or waste products can result in undesired side effects in the short or long term,
- B2. is able to work at an academic level on a research problem in an area of chemistry, which is not their 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; 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		
Scientific Integrity	0		
Colloquium	5		completion of Master Research Project Chemistry
Final Exam	5		completion of Master Research Project Chemistry
Master Research Project*	40	x	Completion of Reaction Mechanisms (WMCH006-05), Structure Determination with Spectroscopic Methods (WMCH008-05) and Scientific Integrity (WMCH16008)
Second research project**	20 or 25	x	completion of Master Research Project Chemistry (WMCH19003),

*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 and topic in comparison to the master research project.

The second research project is not part of the Science, Business and Policy track.

The second research project is not part of the Erasmus Mundus Theoretical Chemistry and Computational Modelling track.

Advanced Materials track

Course unit	ECTS	Practical	Entry requirements
<i>Four of these five courses have to be chosen:</i>			
Structure at Macro, Micro and Nano Scale	5		
Bioinspired Designer Materials	5	x	
Physical Methods for Chemical Analysis	5	x	
Supramolecular Chemistry	5		
Sustainable Electric Energy Storage	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		
Organic Synthesis: Methods and Strategy 1	5		
Chemical Catalysis	5		
Sustainability for Engineers	5		
Electives in Chemistry	20	See course units	

Chemical Biology track

Course unit	ECTS	Practical	Entry requirements
<i>Four of these five courses have to be chosen:</i>			
Protein and Enzyme Engineering	5	x	
Biocatalysis and Green Chemistry	5		
Advances in Chemical Biology	5		
Synthetic Biology & Systems Chemistry	5		
Organic Synthesis: Methods and Strategy 1	5		
Electives in Chemistry	20	See course units	

Science, Business and Policy track

Course unit	ECTS	Practical	Entry requirements
Research Project in Chemistry	30	x	
Introduction Science and Business	10		
Introduction Science and Policy	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 Dynamics	5		
Molecular Quantum Mechanics 1	5		
Molecular Quantum Mechanics 2	5		Molecular Quantum Mechanics 1
Topics in chemistry with Python	5		
Electives	20	See course units	

Students who wish to follow an open program must submit their program for approval including confirmation of the programs coherence and sufficient coverage of the *Eindtermen* of the Masters Chemistry program.

Students who wish to follow an open program must submit their program for approval at the Board of Examiners, within the first 6 months of their MSc-registration to the Programme Director for preparation of the application to the Board of Examiners.

The Board of Examiners will grant the request for an open degree programme where the proposed program:

- covers the Learning Outcomes of the Masters Chemistry program sufficiently
- shows a clear overall coherence.

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, a package of electives have been defined in the table below. 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		
skills in Science Communication	5		
Advanced Protein Crystallography	5	x	
Functional Properties	5		
Photovoltaics Science and Energy	5		
Polymer Products	5		
Stereochemistry	5		
Characterisation of materials	5	x	Cannot be taken in combination with Structure at the macro, micro and nanoscale
Design of Industrial Catalysts	5		
Organometallic Chemistry	5		
Product Focused Process Design	5		
Astrochemistry	5		
Computational Chemistry	5		
Biophysical Imaging & Manipulation Techniques.	5	x	
Organic Synthesis: Methods and Strategy 2	5		
Polymer Lab course 3	5	x	
Polymer Physics	5	x	

In the first year of the programme, 10 ECTS out of the total of 60 ECTS credits may be required for 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 (using the template)
- List of subjects/courses (to be) followed (using the template)
- For non-UG students: clear description of content/learning objectives of all required courses
- An 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' (as specified by the different programmes) will be admitted to the selection procedure. A maximum of 50 students will be accepted into the program.

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, all members of the admissions board will review the application, after which they score a second time. This outcome constitutes the final score. Candidates with an average score of 3 or greater for academic performance are added to the waiting list. The final score will be the average of academic performance or their averaged academic performance and motivation score, whichever of the two is higher. Students will be ranked based on this score.

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 shall be between 1500-2000 words and contain figures, citations and a bibliography. A template and suggested source materials are provided by the admissions board

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

2. Motivation (40%)

The candidate has to provide a motivation letter (ca. 300-500 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 2022 will open on 1 October 2021 and will close on 1 May 2022. In October 2021, 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 offer places to a maximum of 5 candidates before the 1 May deadline. The top candidates (50 less the number of candidates placed already) will be offered places 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 place within four weeks after receiving the offer. If the student does not accept the place within four weeks, this placement expires and the placement will be offered to a candidate on the waiting list. If a student declines their place, that place will be offered to a candidate on the waiting list. Students who accept the offer need to be enrolled before September 1; if students are not enrolled before September 1 their place expires and the place will be offered to a candidate on the waiting list. There will be one round of offering places to candidates on the waiting list.

Appendix VII Transitional provisions (art. 7.1)

For cohort 2020-2021 and earlier

Course	May be replaced with	Reason
Cross disciplinary Materials Science	a course from the core program	The course is no longer offered and learning objectives are met in other core courses and projects

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 2021	1 June 2021
Biology	1 May 2021	1 June 2021
Biomedical Engineering	1 May 2021	1 June 2021
Biomedical Sciences	1 May 2021	1 June 2021
Biomolecular Sciences	1 May 2021	1 June 2021
Chemistry	1 May 2021	1 June 2021
Ecology and Evolution	1 May 2021	1 June 2021
Energy and Environmental Sciences	1 May 2021	1 June 2021
Human-Machine Communication	1 May 2021	1 June 2021
Marine Biology	1 May 2021	1 June 2021
Medical Pharmaceutical Sciences	1 May 2021	1 June 2021
Nanoscience: for non-EU/EEA students	1 February 2021	1 June 2021
Nanoscience: for EU/EEA students	1 May 2021	1 June 2021

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 2021	1 June 2021	15 October 2021	15 November 2021
Applied Physics	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Artificial Intelligence	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Astronomy	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Chemical Engineering	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Computing Science	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Farmacie	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Industrial Engineering and Management	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Mathematics	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Physics	1 May 2021	1 June 2021	15 October 2021	15 November 2021