

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 pertinent fields of knowledge through a coherent* program for example:

- 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.
- Reactions and interactions of molecules and the application of this insight in synthetic chemistry and catalysis as well as knowledge of sustainable chemistry.
- 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.

*a coherent program is defined as one which leads to specialisation in a pertinent field of chemistry in the opinion of the board of examiners

Appendix II Tracks/Specializations of the degree programme (art. 3.6)

The degree programme is comprised of the following tracks:

- Research. Recommended specialisations are described in Appendix III in addition to the open program.
- 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. 3.8)

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, Structure Determination with Spectroscopic Methods and Scientific Integrity
Second research project**	20 or 25	x	completion of Master Research Project Chemistry

*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.

Tracks and Specialisations

The program has 3 tracks:

- Science, Business and Policy track
- Erasmus Mundus programme Theoretical Chemistry and Computational Modelling track
- Research track

Students of the Research track are recommended to follow one of the specialisations listed below.

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 track (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	

Research Track: Recommended specialisations:

- 1. Catalysis in Chemistry**
 Chemical Catalysis
 Biocatalysis and Green Chemistry
 Organic Chemistry: Methods and Strategy 1
 Organometallic Chemistry
- 2. Advanced Synthesis**
 Stereochemistry
 Organic Chemistry: Methods and Strategy 1
 Organic Chemistry: Methods and Strategy 2
 Chemical Catalysis
- 3. Synthesis & Chemical Biology**
 Advances in Chemical Biology
 Synthetic Biology and System Chemistry
 Organic Chemistry: Methods and Strategy 1
 Organic Chemistry: Methods and Strategy 2
- 4. Supramolecular Chemistry**
 Supramolecular Chemistry
 Bioinspired Materials
 Stereochemistry
 Organic Chemistry: Methods and Strategy 1

- 5. Polymer Chemistry**
 Bio-inspired Designer Materials
 Polymer Physics
 Polymer Products
 Polymer lab 3

- 6. Organometallic Chemistry**
 Organometallic Chemistry
 Physical Methods in Chemical Analysis
 Chemical Catalysis
 Computational Chemistry or MQM 1

- 7. Theoretical Chemistry and Modelling**
 Molecular Quantum chemistry 1
 Molecular Quantum chemistry 2
 Computational Chemistry
 Topics in Chemistry with Python

- 8. Solid State materials and Sustainable energy**
 Structure at Macro, Meso and Nanoscale
 Functional Properties
 Physical Methods for Chemical Analysis
 Sustainable Electric Energy Storage

- 9. Chemical Biology**
 Biocatalysis and Green Chemistry
 Synthetic Biology & Systems Chemistry
 Advances in Chemical Biology
 Organic Chemistry: Methods and Strategy 1

- 10. Protein Biochemistry**
 Molecular Dynamics
 Protein and enzyme engineering
 Biocatalysis and Green Chemistry
 Synthetic Biology & Systems Chemistry

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

Students who wish to follow an open program must contact the Programme Director within the first 6 months of their MSc registration, to prepare an application for their program which has to be submitted for approval 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. 3.9.1)

An additional 20 ECTS of courses should be selected from the course list below. Students are allowed to add 5 ECTS from the electives to their second research project. The student can request the board of examiners to be allowed to select a particular course outside the master in Chemistry programme.

Course unit	ECTS	Practical	Entry requirements
Bio-based Products	5		
Biomaterials 2	5		
Interfacial Engineering	5		
Molecular Dynamics	5		
Photochem. and Photoredox catalysis	5		
Protein and Enzyme Engineering	5	x	
skills in Science Communication	5		
Advanced Protein Crystallography	5	x	
Biocatalysis & Green Chemistry	5		
Bioinspired Designer Materials	5	x	
Functional Properties	5		
Molecular Quantum Mechanics 1	5		
Photovoltaics science and energy	5		
Physical Methods for Chemical Analysis	5	x	
Polymer Products	5		
Stereochemistry	5		
Structure at Macro, Meso, Nano Scale	5		
Advances in Chemical Biology	5		
Characterisation of Materials	5	x	Cannot be taken in combination with Structure at the macro, micro and nanoscale
Chemical Catalysis	5		
Design of Industrial Catalysts	5		
Molecular Quantum Mechanics 2	5		
Organic Synthesis: Methods and Strategy 1	5		
Organometallic Chemistry	5		
Product Focussed Process Design	5		
Topics in Chemistry with Python	5		
Supramolecular Chemistry	5		
Sustainable Electric Energy Storage	5	x	
Synthetic Biology & Systems chemistry	5		
Astrochemistry	5		
Biophysical Imaging & Manipulation Techn.	5	x	
Computational Chemistry	5		
Organic Synthesis: Methods and Strategy 2	5		
Polymer Physics	5	x	
Practical Physical Chemistry of Polymers	5	x	

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 (art. 2.1A.1 + art. 2.1B.1)

1. 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):

- Copy of ID card or passport
- Proof of English language proficiency
- Curriculum Vitae
- Official transcript of records
- Diploma of relevant Bachelor's degree programme (if not possible, provide reason)
- List of subjects/courses yet to be followed including course descriptions
- For non-UG students: clear description of content/learning objectives of all required courses
- List of extracurricular activities
- Complete Checklist

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

For holders of a Dutch BSc diploma:

- Education Support Centre compiles the individual selection file
- 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 SSE
4. ESC submits the individual selection file to Admissions Board of the individual programme

2. Selection procedure

In order to select the appropriately suited and motivated students, the Admission Board requires 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 that have an appropriate background will be considered admissible and further considered for the selection procedure described below.

At least two members of the Admissions Board score the selection criteria. If the scores on the academic performance, extracurricular activities 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 a total score of 5 or greater will be admitted to the program.

2.1. Admissibility

The appropriateness of the background level will be assessed by the Board of Admissions and must be of sufficient basis for participation in the MSc Chemistry program. The Board of Admissions considers.

- **Relevance and affiliation/fit** of the bachelor programme followed to the master programme (list of subjects/courses followed and grades obtained; brief description of the content of key subjects/courses demonstrating the knowledge and skill(s) acquired by the student¹).

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.

- **Dutch BSc Chemistry degree**

Applicants are automatically considered 'admissible' if they hold a BSc Chemistry degree from the University of Groningen, if they have followed successfully the UG chemistry pre-Master program, if they hold a BSc degree in chemistry from the University of Leiden, University of Utrecht, University of Amsterdam, the Free University Amsterdam (VU), or the Radboud University - Nijmegen.

- **University of Groningen BSc LST degree**

Applicants with a BSc LST degree from the University of Groningen are admissible to the MSc Chemistry, when they have completed the below mentioned courses (all required):

- Electrochemical Technology (WBCE021 -05)
- Synthesis 2 lab course (WBCH008-05)
- Physical Chemistry 2 (WBCH015-05)
- Soft Molecular Materials (WBCH017 -05)
- Track practical OMIC (WBCH032-05)
- (Bio)Catalysis (WBCH019-05)
- Physical Organic and photochemistry (WBCH027 -05)
- Bachelor Research Project Chemistry (WBCH901 -15)

- **Students with a BSc degree not in the first two categories will be considered on a case by case basis** including a verification of transcript and course content description, with a minimum requirement for a core program (with learning outcomes equivalent to the following courses in the BSc Chemistry program of the UG (6 out of the following 7 courses are required)

- [Organic Chemistry 1](#)
- [Organic Chemistry 2](#)
- [Physical Chemistry 1](#)
- [Physical Chemistry 2](#)
- [Spectroscopy](#)
- [Inorganic Chemistry](#)
- [Biochemistry](#)

Regular pre-master program

Applicants with a HBO degree from Hanze University of Applied Sciences or equivalent are expected to have followed successfully the following pre-master program:

- Organic Chemistry 2 (5 ECTS, block 1A)
- Calculus (5 ECTS, block 1A)
- Physical Chemistry 2 (5 ECTS, block 1B)
- Solar Cells (5 ECTS, block 1B)
- Biochemistry (5 ECTS, block 2A)
- Physical Organic and Photochemistry (5 ECTS, block 2A)
- Macromolecular Chemistry (5 ECTS, block 2A)
- Spectroscopy (5 ECTS, block 2B)
- Inorganic Chemistry (5 ECTS, block 2B)

Deviations from regular pre-master program

When the applicant has demonstrable knowledge (*e.g.* extracurricular courses at BSc level) of one of the core pre-master courses, an exemption can be granted. This is done in consultation with the program director.

Practical implementation of the admissibility check

The check for MSc Chemistry admissibility is performed by two BoA members per submission round. In case of doubt, the BoA chair reviews the file, and makes a decision, for which advice from the Program Director may be obtained.

The premaster applications are assessed by two BoA members per submission. In case of doubt, the file will be assessed by the BoA chair.

2.2. Selection

1. Weighted average of grades ≥ 7

Dutch degrees: When the weighted average of grades amount to 7 or higher, a fixed amount of 4 points is awarded.

Non-Dutch degrees: Students have to provide their weighted average grade and information about the grading system at their host institution. The Board of Admissions reserves the right to assess this information on a case-by-base basis, and reach a conclusion about the value of the weighted grade, and will award 4 points if the provided information proves a similar grade level. The Board of Admissions may seek advice from international colleagues.

2. Motivation

The applicant is awarded 2 points for each excellent answer, 1 point for each satisfying answer, or 0 points if the answer is not sufficient.

In case a specific motivation is not covered in the predefined list, the BoA members will together discuss the scoring of this answer, and note it in the scoring sheet.

3. Extracurricular activities

Points can be awarded for activities that showcase exceptional involvement, to a maximum of 5 points.

In case a specific activity is not covered in the predefined list, the BoA members will together discuss the scoring of this answer, and note it in the scoring sheet.

Practical implementation of the selection process

1. Two BoA members check the average weighted grades ≥ 7 of the updated grades list, and note this in the Mastersheet.

2. Two BoA members together score all three questions for each applicant. When an answer is not listed, or there is a disagreement on the scoring between the two BoA members, the file is flagged and discussed at the next BoA meeting.

3. Two BoA members assess the extracurricular activities with an exhaustive list of pre-defined activities. When an activity is not on the list, or there is a disagreement on the scoring between the two BoA members, the file is flagged and discussed at the next BoA meeting. The total scores are noted in the Master sheet,

3. 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 will assess and score the applications out of a total of 15 points over the three selection criteria: (i) average weighted grade, (ii) motivation, and (iii) extracurricular activities.

- (i) An average weighted grade for bachelor courses of 7 or greater will earn 4 pts
- (ii) The motivation table is comprised of 3 questions each of which can earn 2 pts
- (iii) Extracurricular activities, contingent on sufficient evidence provided, attract either 0.5 or 1 pt each to a maximum of 5 pts

A minimal score of 5 points is needed for direct admission to the MSc Chemistry.

Admission is always conditional on obtaining a BSc degree or completing the pre-master program before the MSc Chemistry start date.

The motivation table comprises of three questions:

Question	Consider including the following aspects
1. What specific aspects of the Master's programme in Chemistry at the University of Groningen motivated you to apply?	Specific courses and specialisations, research activities/groups, your experience during your BSc degree
2. How has your previous education prepared you for our research-focused Master's degree in Chemistry? Be sure to include how research projects or other relevant experiences contribute to your motivation.	Practical courses, research projects, educational activities tailored towards your preferred track
3. Why do you want to obtain a Master's degree in Chemistry? For example, list any concrete plans you have for after graduation.	Concrete ideas about next position (industry, academia, field), or efforts to arrive at a concrete plan

The Board of Admissions will offer places to candidates who score a total of 5 points or more. Candidates who are not selected can lodge a written appeal against this decision within six weeks of the date of sending, with the Board of Appeal for Examinations, P.O. Box 72, 9700 AB Groningen, the Netherlands.

The admission to the program is only valid for the academic year following the application date.

Students who are offered a place for an academic year have to accept or decline the place before August 31 preceding that academic year. Students who accept the offer need to be enrolled before September 1 of that academic year.

Appendix VII Transitional provisions (art. 7.1)

For cohort 2021-2022 and earlier

Course	May be replaced with	Reason

Appendix VIII Additional Requirements Open degree Programme (art. 3.10)

N/A for chemistry

Appendix IX Application and decision deadlines for admission (art. 2.7.1 en 2.7.3)

Programmes starting on 1 September 2022

Programme	Deadline of Application	Deadline of decision
Behavioural and Cognitive Neurosciences	1 May 2022	1 June 2022
Biology	1 May 2022	1 June 2022
Biomedical Engineering	1 May 2022	1 June 2022
Biomedical Sciences	1 May 2022	1 June 2022
Biomolecular Sciences	1 May 2022	1 June 2022
Chemistry	1 May 2022	1 June 2022
Ecology and Evolution	1 May 2022	1 June 2022
Energy and Environmental Sciences	1 May 2022	1 June 2022
Human-Machine Communication	1 May 2022	1 June 2022
Marine Biology	1 May 2022	1 June 2022
Mechanical Engineering	1 May 2022	1 June 2022
Medical Pharmaceutical Sciences	1 May 2022	1 June 2022
Nanoscience: for non-EU/EEA students	1 February 2022	1 June 2022
Nanoscience: for EU/EEA students	1 May 2022	1 June 2022
Science Education and Communication	1 May 2022	1 June 2022

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 2022	1 June 2022	15 October 2022	15 November 2022
Applied Physics	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Artificial Intelligence	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Astronomy	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Chemical Engineering	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Computing Science	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Farmacie	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Industrial Engineering and Management	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Mathematics	1 May 2022	1 June 2022	15 October 2022	15 November 2022
Physics	1 May 2022	1 June 2022	15 October 2022	15 November 2022