Scheikunde OW 2012

Faculty of Science,
Radboud University Nijmegen

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This report was finalized on 6 November 2012.

Report on the bachelor's programmes Chemistry, Molecular Life Sciences and Natural Sciences and the master's programmes Chemistry, Molecular Life Sciences and Natural Sciences of Radboud University Nijmegen

This report takes the NVAO's Assessment framework for limited programme assessments as a starting point.

Administrative data regarding the programmes

Bachelor's programme Chemistry

Name of the programme:	Chemistry
CROHO number:	56857
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	
Location(s):	Nijmegen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Bachelor's programme Molecular Life Sciences

Name of the programme:	Molecular Life Sciences
CROHO number:	59304
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	
Location(s):	Nijmegen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Bachelor's programme Natural Sciences

Name of the programme:	Natural Sciences (as of September 2012: Science)
CROHO number:	50013 (as of September 2012: 56948)
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	
Location(s):	Nijmegen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master's programme Chemistry

Name of the programme:	Chemistry

CROHO number:	66857
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	
Location(s):	Nijmegen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master's programme Molecular Life Sciences

Name of the programme:	Molecular Life Sciences
CROHO number:	69304
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	
Location(s):	Nijmegen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

Master's programme Natural Sciences

Name of the programme:	Natural Sciences
CROHO number:	66982
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	
Location(s):	Nijmegen
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

The visit of the assessment committee Scheikunde OW 2012 to the Faculty of Science of Radboud University Nijmegen took place on 15 and 16 May 2012.

Administrative data regarding the institution

Name of the institution:	Radboud University Nijmegen
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	positive

Quantitative data regarding the programmes

The required quantitative data regarding the programmes are included in Appendix 5.

Composition of the assessment committee

The committee that assessed the bachelor's and master's programmes consisted of:

- Prof. dr. E. Schacht (chair), Honorary Professor, field of expertise: Polymer Science, Ghent University, Belgium;
- Prof. dr. J. Heck, Full Professor Anorganic and Applied Chemistry, Universität Hamburg, Germany;
- Prof. dr. P. Kenis, Full Professor and dean, Department of Chemical & Biomolecular Engineering, University of Illinois at Urbana-Champaign, USA;
- Nicky Oppers, bachelor student Chemical Engineering, Eindhoven University of Technology, the Netherlands;
- Dr. G. Van Lommen, senior director Medicinal Chemistry, Galapagos.

The committee was supported by dr. J. De Groof, who acted as secretary. The cluster co-ordinator was dr. B. van Balen.

Appendix 1 contains the curricula vitae of the members of the committee.

Working method of the assessment committee

Preparation
The assessment of the Chemistry, Molecular Life Sciences and Natural Sciences programmes of Radboud University Nijmegen is part of a cluster assessment of 33 chemistry degree programmes offered by ten universities. The entire cluster committee consists of twelve members. For each visit a subcommittee is composed that ensures the necessary expertise to evaluate the programme. The kick off meeting for the cluster assessment was scheduled on 22 March 2012. During this meeting the committee members received an introduction into the assessment framework and evaluation procedures and the committee agreed upon its general working method. Furthermore the domain specific requirements and the most recent developments concerning the Chemistry domain were discussed. These domain specific requirements and the actual context form the starting point for the evaluation of the quality of the degree programmes.

The committee chair and the co-ordinator preserved the consistency in evaluation in the cluster project.

In preparation of the assessment of the programme, a self-assessment report was prepared by the programme management. This report was sent to QANU and, after a check by the secretary of the committee to ensure that the information provided was complete, forwarded to the committee members. The committee prepared the site visit by studying the self-assessment report and a number of bachelor's and master's theses. The secretary of the committee selected 24 bachelor and 24 master theses randomly and stratified out of a list of all graduates of the last two years. QANU asked the programmes to send the theses including the assessment by the supervisor and examiner and divided them among the subcommittee members.

For the assessment of the theses by the committee members, the rule was that if a thesis was assessed as questionable or unsatisfactory by a committee member, a reassessment was done by another committee member. If more than 10% of the theses are assessed as questionable

or unsatisfactory by two committee members, the selection of theses for the programme is extended with 10.

Site visit
The committee members formulated questions raised after studying the self-assessment report in advance. The secretary distributed these questions to all committee members.

The committee visited the programme on 15 and 16 May 2012. The programme of the site visit was developed by the committee's secretary in consultation with the programme management and the chair of the committee. The committee interviewed, next to students, teachers and alumni, the programme management and representatives of the Faculty Board, the Examination Board and the student and teacher members of the Programme Committee. An open office hour was scheduled and announced (but not used).

During the site visit the committee studied additional material made available by the programme management. Appendix 7 gives a complete overview of all documents available during the site visit. The last hours of the site visit were used by the committee to establish the assessments of the programme and to prepare the presentation of the findings of the committee to the representatives of the programme.

Report
The secretary wrote a draft report on basis of the findings of the committee. The draft report has been amended and detailed by the committee members. After approval of the draft report by the committee it was sent to the educational institute of Molecular Sciences for a check on facts. The comments by the institute were discussed in the committee; this discussion resulted in some changes in the report. Subsequently the committee established the final report.

The assessment was performed according to the NVAO (Accreditation Organization of the Netherlands and Flanders) framework for limited programme assessment (as of 20 November 2011). In this framework a four-point scale is prescribed for both the general assessment and the assessment of each of the three standards. The committee used the following definitions for the assessment of both the standards and the programme as a whole:

Generic quality
The quality that can reasonably be expected in an international perspective from a higher education bachelor's or master's programme.

Unsatisfactory
The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

Satisfactory
The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

Good
The programme systematically surpasses the current generic quality standards across its entire spectrum.

Excellent
The programme systematically well surpasses the current generic quality standards across its entire spectrum and is regarded as an (inter)national example.

General Assessment

When standard 1 or standard 3 is assessed as 'unsatisfactory' , the general assessment of a programme is 'unsatisfactory' .

The general assessment of the programme can be good when at least two standards, including standard 3, are assessed as 'good',

The general assessment of the programme can be excellent when at least two standards, including standard 3, are assessed as 'excellent'.

Summary judgement

Intended learning outcomes
Atomic and molecular structure and interaction are key concepts in the programmes in Chemistry, Molecular Life Sciences and Natural Sciences. These key concepts are taught in the common first three quarters of the first year. The multidisciplinary degree programmes of Molecular Life Sciences and Natural Sciences are inspired by the fact that scientific research increasingly takes place at the interface of scientific disciplines.

The main goal of the bachelor's programme is to prepare students to continue their studies in a related master's programme at the same or a different university. The master's programme prepares students for professional practice in the fields of generating knowledge (fundamental and applied research), transfer of existing knowledge (communication and education) and use of existing knowledge (business and management). To this end, four directions exist in the master's programmes, each with additional qualifications students acquire on top of the competences obtained by every Master of Science in their field.

Next to opting for one of the master directions, students also select a specialization. Currently the students choose their internship in various chemistry-, biology-, medicine- and physics-oriented research groups associated with the educational institute of Molecular Sciences (MW). In future, they will be opting for one of the newly developed master tracks.

The committee finds that the intended learning outcomes of the three different programmes are well described in terms of level and orientation. They comply with the domain specific framework and international requirements. The committee is of the opinion that the way the intended learning outcomes of the Molecular Life Sciences and Natural Sciences programmes are formulated is good. The committee appreciates that the intended learning outcomes of these two programmes are formulated in a sharp, integrated, and process-oriented way.

The committee values that the bachelor's programmes aim to provide the students with a broad education, whereas the master's programmes focus more on the research spearheads of the research groups related to the programme. Consequently, there is a strong link between education and research. The committee welcomes that new master tracks have been designed, making the profile of the master's programmes more focused. In this way, the educational institute MW follows national guidelines. Still, the committee advises the institute to continuously monitor that the learning outcomes of the programmes offer the right balance between focussing on research and aiming at the broadness graduates need to find a job in industry or pursue a master- or PhD-degree at another university.

The committee appreciates that the faculty of Science works with different master orientations, allowing students to orient themselves towards different professional careers.

The committee has noted that the institute has decided to replace the title of the Natural Sciences-programme from 'Natural Sciences' to 'Science' in an attempt to attract more students. The committee appreciates the proactive position of the educational institute MW and agrees that action had to be taken in order to improve the intake of students. The committee thinks that a well-defined new programme, with a proper and more attractive name that covers the content, can indeed be an improvement compared to the current programme, potentially resulting in attracting more students. Although the committee is not convinced that 'Science' is an adequate name for the programme, as it covers a broad domain

including alfa-, beta-, and gamma-sciences, the future will tell whether the new name appeals to new groups of students.

The committee urges the educational institute of Molecular Sciences to reframe the intended learning outcomes of the current Natural Sciences programme to align them with the new programme. Special attention will have to be given to finding the right balance between providing a broad profile to the students, while at the same time leaving students the possibility to switch to a monodisciplinary programme or to opt for the research-direction at master level.

Teaching learning environment
The committee values highly that the educational institute MW offers a common molecular core to all three programmes, giving students the opportunity to switch between programmes. Moreover, the committee lauds that students with different backgrounds follow courses together and make assignments in mixed groups, thus promoting the multidisciplinarity of students.

However, the committee is of the opinion that the educational institute MW should continue to look for an ideal pairing of broadness of the programme on the one hand, and depth and links with ongoing research on the other hand. This is especially the case for the Chemistry master's programme, where the committee thinks that the current choice of courses as well as the weight attributed to these courses, is too much oriented towards PhD-tracks at Nijmegen University and thus limits students' future employment in industry or at other universities.
One way to achieve this is to make the offered courses more balanced. At the master level, the committee finds the share of courses related to one specific topic (NMR) oversized, whereas the space foreseen for other basic topics and disciplines such as inorganic chemistry, polymer chemistry and physical chemistry, is limited. Some courses the committee finds essential have the same weight in the programme as subjects that are less related to the core of the programme. The committee considers this a shortcoming in the programme that should be taken into account when adjusting the curriculum. According to the committee, the programme requirements have to be formulated in such a way, that students cannot exclusively follow courses from one specific discipline (aimed at in-house research), while excluding courses on other basic topics from their programme.

Another way to broaden the horizon of the students is to ensure that students develop a mobile attitude during their education. In this context, the committee advises the educational institute MW to stimulate more students to do an extramural internship. In addition, initiatives should be taken to attract more students from other institutes, both for internships and registration for the master's programme.

The committee found that the weight attributed to courses is mostly well-balanced, although the committee learnt that there are some exceptions, which are mostly due to the recent standardization of courses to units of 3 or 6 EC. The committee therefore advises the educational institute MW to closely monitor whether the amount of EC attributed to courses throughout the programme is representative for the time invested by students. Also, the committee thinks that offering too many 3 EC-courses may lead to a fragmentation of the students' knowledge on certain topics. Against this background, the committee advises that unnecessary fragmentation and overlap of courses should be avoided.

The committee values that students have an important responsibility in composing their own programme, and obtained ample proof that students receive the necessary guidance in

composing their programme. The committee advises the programmes to continue the quality assurance in this regard, especially for the non-required part of the programme.

Internships take up an important part of the curriculum and in general, students are pleased with the supervision they received. This is lauded by the committee. For some of the bachelor's and master's theses the committee read, it was found that the subjects of the projects were too complicated and not adequately delineated. Consequently, the committee suggests that the educational institute MW looks for a way to ensure the quality and feasibility of the suggested themes. The committee thinks the latter is crucial, especially for the bachelor's theses, as they should aim to give students an attractive and instructive first taste of scientific research, and to motivate students to continue into that direction.

The teaching format and methods are, according to the committee, adequate and the learning environment is of good quality.

The committee found the honours track well thought through. The committee also noted that the educational institute MW has started the process of improving the internationalization of the programmes.

The committee saw that the educational institute MW invests in its recruitment policy, which has led to an increased intake in the Chemistry and Molecular Life Sciences programmes in the last few years. The committee values highly that in the master's programme, students can complete their whole training as a first degree pre-university teacher. However, the committee believes that the information strategy regarding all the orientations other than the research-orientation needs to be improved to benefit enrollment. The same holds true for the minor programmes at bachelor level, which so far have failed to attract many students.
The committee is concerned about the subcritical number of students in the Natural Sciences programme. The future will show whether the new programme succeeds in attracting new, larger groups of students. The committee warns for a possible conflict by broadening the programme from a physics- to a biology-orientation. The educational institute should properly inform future students upfront on the choices they will need to make early on in the programme to warrant their chances to continue in particular directions. During the site visit, the committee learnt that the alumni networking at the level of MW can certainly be improved and be used as an effective tool in the recruitment policy. Alumni sounded eager to take part in such an initiative.
The committee considers it important that the programme develops a communication strategy to attract master students from Dutch and foreign universities, as well as HBO-students. This will become crucial in securing a stable intake of students after the implementation of the 'harde knip'.

The committee is convinced that the study progress at the bachelor as well as the master level can be improved upon. The committee appreciates that the educational institute MW has already taken a series of measures to improve success rates. Still, it is the opinion of the committee that the selective function of the first year can be enhanced by imposing more rules regarding the sequencing of courses.

Assessment and achieved learning outcomes
Overall, the committee concludes that the existing assessment system, the level of the bachelor and master theses and the performance of graduates in the master's programme and in professional life, demonstrate that the achieved level of the bachelor's and master's programmes is adequate. The committee was especially pleased with the general quality of the

master theses of Molecular Life Sciences students. Also, the committee noted that the students and the alumni had a very high esteem of the latter master's programme.

The committee was pleased to find that, in response to the findings of the previous programme evaluation in 2006-2007, a standard evaluation form has been developed for the evaluation of the bachelor's and master's theses. Furthermore, the decision to require the second evaluator of each thesis to come from a different research group is lauded. The committee was also pleased that the overall grades given to the bachelor's and master's theses generally corresponded well with the assessment of the same reports by the committee members.

Still, the committee found that in a number of cases, the individually gradable items were not appropriately assessed. The committee advises the Examination Board to include the evaluation forms in its quality control system and ensures that a concise but adequate motivation is provided for the marks that have been given, including the marks for the sub-criteria. Also, the committee recommends that the gradable items are modified so they correspond better to specific required sections in the reports.

Moreover, the committee observed that several bachelor's and master's reports lacked certain sections that one would expect in every report, irrespective of specific research area, like abstract, objectives, conclusion or a statement of future outlook. The committee advises to develop a set of explicit guidelines for the preparation of the bachelor and master thesis, with specific attention to the required sections and what aspects should be covered in each. Furthermore, the committee advises to update the evaluation form, so that these additional 'points of attention' are included in the evaluation and result in a uniformly used, transparent document.

The committee was impressed by the maturity and openness of the selected students and alumni during the interviews. Concerning the level attained by the graduates, the committee advises the educational institute MW to monitor whether the new programme, with its broad set-up, still leads to graduates that can level with their monodisciplinary peers.

Bachelor's programme Chemistry:

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Bachelor's programme Molecular Life Sciences:

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Bachelor's programme Natural Sciences:

Standard 1: Intended learning outcomes	satisfactory

Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Master's programme Chemistry:

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Master's programme Molecular Life Sciences:

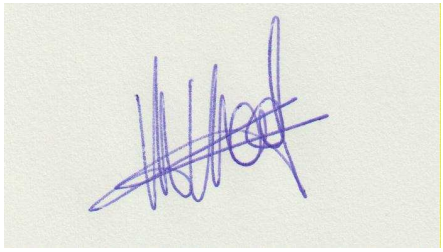
Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

Master's programme Natural Sciences:

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

The chair and the secretary of the committee hereby declare that all members of the committee have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 6 November 2012



Prof. dr. E. Schacht

Dr. J. De Groof

Description of the standards from the Assessment framework for limited programme assessments

Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

Explanation:
As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

Findings

Throughout the report, the findings have been extracted from the critical self-reflection, unless mentioned otherwise. The committee first goes into the considerations that are common for all bachelor's and master's programmes. Next, the specificities of each programme will be discussed.

The bachelor's and master's programmes in Chemistry, Molecular Life Sciences and Natural Sciences are organized by the educational institution of Molecular Sciences (MW) of the faculty of Science. Atomic and molecular structure and interaction are key concepts for all the programmes. The multidisciplinary degree programmes of Molecular Life Sciences and Natural Sciences are inspired by the fact that scientific research increasingly takes place at the interface of scientific disciplines.

The programmes at the MW are inspired by the research that is done in the research institutes associated with the faculty of Science, notably by the Institute for Molecules and Materials (IMM). Other closely associated centers are: the Donders Centre for Neuroscience (DCN), the Nijmegen Centre for Molecular Life Sciences (NCMLS), the Institute for Wetland and Water Research (IWWR), the Institute for Computing and Information Sciences (ICIS), and Institute for Science, Innovation and Society (ISIS).

The main goal of the bachelor's programme is to prepare students to continue their studies in a related master's programme at the same or a different university. On the other hand, the bachelor's degree also offers the students the possibility to enter the labor market, although the clear majority of bachelor graduates continue their studies.

The master's programme prepares students for professional practice in the fields of generating knowledge (fundamental and applied research), transfer of existing knowledge (communication and education) and use of existing knowledge (business and management). To this end, four directions exist in the master's programmes, each with additional qualifications students acquire on top of the competences obtained by every Master of Science in their field. In the research (O)-direction, students receive additional research training and specialization. Students choosing the communication (C)-direction learn to integrate disciplinary knowledge with science communication theories and skills. In the education (E)-direction, students gain the initial competence to fulfill the role as a first-degree pre-university teacher. The main objective of the management and technology (MT)-direction is to make students familiar with concepts and theories from organization studies and business administration, where science is applied in innovation processes.

Next to opting for one of the master directions, students also select a specialization. They currently do this by choosing to do their internship in various chemistry-, biology-, medicine- and physics-oriented research groups associated with MW. The specializations the different master's programmes aim at are listed in Appendix 4.

In line with the policy of the Ministry of Education and the Association of Universities in the Netherlands (VSNU), the faculty of Science is currently working on new master tracks that highlight the research strengths of the faculty and differentiate the corresponding education. The IMM, that is most closely related to the MW-institute, has designed two such master tracks, 'Physical chemistry of molecules and materials' and 'Chemistry for life', both of which will be accessible to students of Natural Sciences and Chemistry. Students of Molecular Life Sciences will only be eligible for the 'Chemistry for life'-track. Other master tracks will be offered in similar ways by the other Educational Institutes of the faculty of Science, some of which will also be accessible for MW-students (see Appendix 4 for an overview).

The intended learning outcomes of the programme are formulated following the domain-specific frame of reference that applies for all bachelor's and master's programmes in Chemistry/Chemical Technology and related molecular degree programmes in the Netherlands (see Appendix 2). An overview of the final qualifications and their correlation with the Dublin descriptors on the bachelor as well as the master level is provided in Appendix 3.

Intended learning outcomes bachelor's and master's programme Chemistry
At the bachelor level, the Chemistry programme aims to cover all topics in chemistry. At the same time, the themes of the programme reflect the research spearheads of the faculty of Science.

During the site visit, the programme management explained that the focus on research strengths at master level implies that there is less emphasis on inorganic chemistry or physical chemistry. To this end, the programme currently actively seeks co-operation with complementary chemistry programmes at other universities. Moreover, there are increasing interactions with biology and physics research groups to cater for students with interests in that direction.

Intended learning outcomes bachelor's and master's programme Molecular Life Sciences
The Molecular Life Sciences programme aims to offer multidisciplinary training and education at the interface of chemistry, biology and medicine. During the site visit, students pointed out to the assessment committee that this combination, as well as the possibility to specialize in a later stage, was especially appealing to them and an important reason for choosing for the programme in Nijmegen. The committee learnt that quite a few students eventually switch to the Chemistry programme, when they realize during the programme this is the discipline they prefer to focus on.

The bachelor's programme aims to provide students with a broad basis of all essential know-how within the field of Molecular Life Sciences. It shares its molecular focus with the bachelor's programmes in Chemistry and Natural Sciences, but strongly diverges from the latter two after the first three quarters in the first year. From then onwards, the focus is on the molecular basis of biomedical processes. The critical self-study mentions that this focus makes the programme unique when compared with other programmes, both at the Radboud University and in other universities in the Netherlands.

The objective of the master's programme in Molecular Life Sciences is to provide students with the knowledge, skills and attitudes to initiate, perform and evaluate scientific research projects that aim at gaining new concepts in research fields relevant to Molecular Life Sciences. Students are prepared to start a PhD research project or a professional career aimed at transferring or applying existing scientific knowledge.

Intended learning outcomes bachelor's and master's programme Natural Sciences
The Natural Sciences programme in Nijmegen aspires to offer unique, high-level interdisciplinary education, spanning large parts of chemistry, physics, and biology. During the site visit, the students of the Natural Sciences programme explained to the committee that this specific combination was an important factor in their decision to choose for this programme. The bachelor's programme trains scientists that are especially equipped with problem-solving skills as they have a thorough insight in the theories, methodologies and their backgrounds of the constituent disciplines. This is also why graduates from the Natural Science bachelor's programme qualify for a wide range of molecular science based master's programmes.

Master students in Natural Sciences specialize at the interface of (at least) two disciplines: biology and chemistry; biology and physics; or physics and chemistry. Graduates are able to assess and tackle multi-disciplinary scientific problems from different disciplinary angles and to rapidly acquire new knowledge in physics, chemistry or biology. Graduates should be able to work in a multidisciplinary research team or professional environment, together with their monodisciplinary peers. Therefore, the master's programme aims at the same research competences as the monodisciplinary degree programmes.

The committee has noted that the educational institute of MW has decided to change the title of the programme from 'Natural Sciences' to 'Science' in an attempt to attract more students. The aim is to cater for a growing number of students interested in combining knowledge from the natural sciences with business, innovation and societal competences. In this way, the programme seeks to find a response to the subcritical student intake of the current programme (see also standard 2–'student intake and recruitment').

The bachelor's programme will become broader in scope, yet it will also become more flexible, to prepare students for very different specializations. In any case, students choosing for the new bachelor's programme will still be able to opt for the O-direction in the master's programme if choosing the required courses at bachelor level. The assessment committee heard during the site visit that the intended learning outcomes of the new Science programme have not yet been formulated. This is a consequence of the rapid implementation of the new programme.

On being asked, the current students of the Natural Sciences programme told the assessment committee they consider the broadening of the programme not necessarily as an improvement, but rather as a leveling out of the current programme.

Considerations
The committee first goes into the considerations that are common to all programmes. Next, the specificities of each programme will be discussed.

The committee finds that the intended learning outcomes of the different programmes are well described in terms of level and orientation. They comply with the domain specific framework and international requirements.

The committee values that the bachelor's programmes aim to provide the students with a broad education, whereas the master's programmes focus more on the research spearheads of the research groups related to the programme. Consequently, there is a strong link between education and research. In this regard, the committee also welcomes that new master tracks have been designed, making the specific profile of the master's programmes at the Radboud University more coherent and visible. According to the committee, the educational institute MW now has to take the proper initiatives to inform future students on these new tracks.

The committee appreciates moreover that the faculty of Science works with different master's orientations, allowing students to orient themselves towards different professional careers.

Chemistry
The committee advises the educational institute MW to continuously monitor that students receive the broad basis that allows them to move from the bachelor's programme to related master's programmes they aspire to follow, within or outside the Radboud University. Against this background, the committee thinks that Physical Chemistry and Inorganic Chemistry must be preserved in the bachelor's programme. At the master level, the committee advises the educational institute MW to find the right balance between focussing on in-house research and aiming at broadness, which master graduates need in order to find a job in industry or to start a PhD at another university.

Molecular Life Sciences
The committee is of the opinion that the profile of this programme and the way the intended learning outcomes are formulated are good. The committee appreciates that the intended learning outcomes of the Molecular Life Sciences were formulated in a sharp, integrated, process-oriented way. The committee finds the multidisciplinary profile of the Molecular Life Sciences programme original and thinks it answers to the needs of future employers.

Natural Sciences
The committee values the multidisciplinary focus of the programme and appreciates the sharp integrated and process-oriented way in which the intended learning outcomes have been described.

During the site visit, the programme management clarified the rationale behind the reform of the Natural Sciences programme to the new programme. The committee appreciates the proactive position of the educational institute MW and agrees that action had to be taken in order to improve the intake of students. The committee thinks that a well thought-through, well-defined new programme, with a proper and more attractive name that covers the content, can indeed be an improvement compared to the current programme, potentially resulting in attracting more students. Although the committee is not convinced that 'Science' is an adequate name for the programme, as it covers a broad domain including alfa-, beta-, and gamma-sciences, the future will tell whether the new name appeals to new groups of students.

Also, the committee took notice of the fact that the transformation has been a swift one, which was decided upon in a top-down manner. Thus far, no new intended learning outcomes have been formulated, although the first students have already started the programme.

Against this background, the committee urges the educational institute of MW to reframe the intended learning outcomes of the Natural Sciences programme to align them with the new

programme. Special attention will have to be given to finding the right balance between providing a broad profile to the students, while at the same time leaving the option open to follow a master's programme with a research orientation. Also, the committee advises the programme management to communicate clearly to students about the new programme.

Conclusion
Bachelor's programme Chemistry: the committee assesses Standard 1 as **satisfactory**.
Bachelor's programme Molecular Life Sciences: the committee assesses Standard 1 as **good**.
Bachelor's programme Natural Sciences: the committee assesses Standard 1 as **satisfactory**.
Master's programme Chemistry: the committee assesses Standard 1 as **satisfactory**.
Master's programme Molecular Life Sciences: the committee assesses Standard 1 as **good**.
Master's programme Natural Sciences: the committee assesses Standard 1 as **satisfactory**.

Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Explanation:
The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

Findings

The curriculum of Molecular Sciences at the bachelor level

The bachelor's programmes of Chemistry, Molecular Life Sciences and Natural Sciences are strongly interrelated, as the molecular basis is common to all three**.** The first three quarters of the first bachelor year are common to all students, making it possible for students to switch between programmes until that time. During the site visit, students made clear to the assessment committee that this approach is highly valued. It is an important factor in choosing for the programmes at the Radboud University. The courses that the three bachelor's degree programmes have in common are shown in Appendix 4.

Key in the molecular basis of the three programmes are three general conceptual themes, that each develop during the bachelor's programme: Structure and Reactivity; Functionality; and Methods. For each of these themes, theoretical and practical courses have been defined. In addition, auxiliary sciences and skills, and reflective aspects were added to the programme. A steady build-up of knowledge and skills is aimed at as the courses build one upon the other within each theme. The size of the courses at the bachelor's level has been standardized to either 3 or 6 EC. In each separate programme, the students of the different programmes follow different paths, especially in the second and the third year (see Appendix 4).

All three programmes consist of compulsory courses, a differentiation phase, and the bachelor thesis. During the second and especially the third bachelor year, the share of electives increases. On being asked by the assessment committee, the Examination Board pointed out that the educational institute of MW follows the student-driven course selection closely. This is done by the study coordinators and study counselors of each separate programme (see also 'facilities'). Advise of the Examination Board is required if students wish to follow a programme that deviates from the norm. Moreover, all students' programmes are formally approved by the Examination Board.

Lecturers explained during the site visit that the coherence of the programmes is also assured by the Programme Committees and the Curriculum Committees. They mentioned that the constant monitoring of these committees allows for a structured build-up, even with small 'building blocks' of courses of 3 and 6 EC. This is necessary, especially in the differentiation phase of the programmes, when the paths students follow start to diverge. Students remarked that adequate steps are taken whenever they draw attention to overlaps or incoherencies in the programme.
It was explained to the committee that the educational institute MW does not work with strict rules concerning the order in which courses must be followed. Still, the study guide mentions which basic knowledge needs to be present in order to be able to follow a course. During the interviews, students told the committee they use this information to compose their programme. Moreover, they mentioned that the required part of the programme is a good preparation for the differentiation phase.

Practicals form an important part of the curriculum. The educational institute MW aspires to achieve an optimal link between theoretical courses and practicals. On being asked, students mentioned they obtain the necessary practical skills during the practicals. The more sophisticated techniques and materials are introduced later in the study, mostly during the internship.
Throughout the bachelor's programme, students learn how to write reports. This is done on the one hand by providing a 'reporting'-learning track. On the other hand, students are required to follow a writing course ('Schrijfcursus'). In the learning track, different reports are produced by the students (in different practicals and projects), for which the requirements are increasingly more demanding. At the end of the bachelor's programme, students produce a bachelor's thesis, which is a report of their bachelor internship, thereby showing a final proof of the quality of the report that they are able to produce in an independent manner.
Concerning the writing course, students mentioned that this module is especially aimed at improving the writing style of students and at journalistic reporting in Dutch. Most bachelor students the committee talked to, found the writing module ('Schrijfcursus') valuable. Still, students indicated that in addition to this course, a course on academic writing, preferably in English, would be welcomed. The committee learnt from the Programme Committees that an obligatory Academic Writing course (in English) is currently being planned for the master level.
Regarding the reporting track, students stated that they appreciate the thorough feedback that is given to them by the supervisors of the practicals. Still, students also explained that student-assistants from the same practical sometimes interpret the guidelines for reports differently and consequently give different scores and feedback. This obviously leads to confusion as to what the requirements for the report are. Moreover, Natural Sciences students mentioned that they sometimes experience difficulties with the different formats of reports in physics and chemistry practicals. Chemistry lecturers noted that although students can exercise their reporting skills during the practicals, the leap to writing the bachelor thesis is sometimes difficult for the students.

During the bachelor internship, the student has to work under guidance on a given scientific topic. The student has to search for and master the relevant scientific literature, formulate proper project goals, and perform relevant experiments, which will eventually lead to a set of results. The approach, results and an adequate scientific discussion are documented in the bachelor thesis and are presented in a formal oral presentation to a larger audience. Although most students do their internship within the Radboud University, it can also be done elsewhere.

Students told the committee that the amount of guidance received for writing the report of the internship (the bachelor thesis) is in most cases adequate, but differs from supervisor to supervisor. No standard template exists and different research groups use different instructions and structures for the report. Lecturers explained this is due to the different requirements in different disciplines.
Lecturers also clarified that lecturers-researchers in the research groups define the bachelor projects on an individual basis, after consultation within the research groups. For the Natural Sciences projects, there is also consultation with other research groups due to the interdisciplinary nature of the internships.

Following the suggestions made by the former assessment committee, all bachelor students now follow the 'Academische vorming' course, which lasts throughout the bachelor's programme. Its aim is to support students in their academic development. Each student is assigned a lecturer-mentor, with whom he or she discusses academic development issues, based on (reflection) documents in a portfolio. In the second and third year, students are required to follow at least twenty colloquiums, during which invited speakers talk about their career developments after having followed an education in the natural sciences. Students mentioned during the site visit that although they valued the idea behind the course, there is room for improvement. It became clear that it is not transparent for students what items need to be included in the portfolio. Also, they have the impression that some lecturer-mentors perform their task in a rather pro forma manner.

The attention in the curriculums for environment and sustainability has increased as a follow-up on suggestions made by the previous assessment committee. A course on Environmental Chemistry and Sustainability (3 EC) is now obligatory for all Chemistry-students. A minor in Environmental Chemistry (30 EC) has been put into place and a minor on Global challenges, science and entrepreneurship (30 EC) starts in September 2012.

Efforts are ongoing to increase the international content of the bachelor's programmes. Students have the possibility to spend one semester at the University of Glasgow (UK) or at Washington and Jefferson College (USA). In the Radboud Honours Academy, students are strongly encouraged to include an international activity in the extended bachelor internship. During the site visit, the programme management explained that its current strategy is to work with a few partners institutions, with the aim to come to systematic exchange of students. In order to facilitate the intake of exchange students, an increasing amount of courses are offered in English in the second and third year of the bachelor's programme. Also, it is the ambition to make one semester of the bachelor's programme free of compulsory courses, thus facilitating exchanges for Nijmegen students. During the site visit, students mentioned that international experiences are stimulated. The initiative is mostly left to the students, but interested students receive all the necessary information.

In the bachelor's programme, a faculty wide educational minor offers the students the possibility to obtain a teaching permit for lower-level secondary education. The field of teaching (chemistry and/or physics) depends on the original bachelor's programme. Other minor programmes have been composed for the separate programmes. They will be discussed below.

Excellent bachelor students can participate in the honours programme of the faculty of Science. The top 10% of the students are offered a challenging in-depth programme in the second and third year. Students follow an additional programme of 30 EC. In the common part of the programme (10 EC), students work in small teams to solve interdisciplinary

problems, each student contributing from his own expertise. Also, students follow courses that support them in fulfilling this task. 20 EC of the programme is attributed to an extended bachelor internship.

In addition, students can participate in the university wide, interdisciplinary honours programme, which also runs in the second and third bachelor year and entails about 840 extra hours of study. The programme aims to stimulate students to look across the borders of their discipline. This is done by following four courses that are designed specifically for the honours students. Students are stimulated to choose courses that are not related to their discipline. Also, students take part in interdisciplinary think tanks. Both the university-wide and the faculty of Science-honours programmes are part of the Radboud Honours Academy.

Chemistry programme
The bachelor's programme in Chemistry consists of 120 EC of compulsory courses, 48 EC of differentiation courses, and a bachelor thesis of 12 EC. In the second and third year, students have to choose from a wider range of courses that are roughly specific to a biological chemistry path, an organic chemistry path and a physical chemistry path. Students can make their own choices or choose one of the minors, which have been developed recently. The 30 EC minor programmes Chemistry students are eligible for (next to the faculty wide education minor) are Computing Science, Nanoscience, and Environmental Chemistry. These minors are especially suited for students wanting to broaden their profile outside the field of chemistry. In the study guide, students are informed on the electives that are required courses for entry in the master specializations.

On being asked whether all aspects of chemistry are given ample attention in the curriculum, students mentioned that most courses and electives are focused on organic chemistry. Students more interested in physical chemistry or inorganic chemistry have less electives to choose from. Lecturers told the committee that although no research department exists anymore that is devoted solely to inorganic chemistry, parts of inorganic chemistry remain present in the research at other groups, enabling students to do internships on these topics. Another possibility is that they do their internship elsewhere.

Molecular Life Sciences programme
The bachelor's degree course in Molecular Life Sciences consists of 99 EC of compulsory courses, 69 EC of electives and a bachelor thesis of 12 EC. No minor programmes are included in the programme, but there are plans to offer minors in the future.

The bachelor students follow a core curriculum obligatory to all Molecular Life Sciences students (quarters 1-6). This provides them with the biological and biomedical basis that is necessary in order to be able to eventually study the molecular basis of biological and pathological processes. In quarters 4-6 the biological and biomedical basis is provided in separate courses. In the differentiation phase (quarters 7 to 11), students make individual choices on consecutive four-week courses that specialize on a specific research field within Molecular Life Sciences. In the last quarter, students show proof of their acquired abilities by performing the research internship.

Structure of the Natural Sciences programme
The bachelor's programme consists of 120 EC of compulsory courses, 48 EC of differentiation courses and a bachelor's thesis of 12 EC. In the first two years of the programme, students are provided with basic knowledge and skills in the three monodisciplines (physics, chemistry, biology) as well as in mathematics. At the end of the second year, students orient themselves towards one of the following three specializations: physical-chemical, biological-physical or chemical-biological. In the third year, students follow compulsory courses as well as elective courses within the chosen discipline. In this last year, students take in-depth courses from the three monodisciplines, together with and at an equal level with monodisciplinary students. An interdisciplinary research project marks the end of the bachelor's programme.

Students of the Natural Sciences programme can choose many different courses from a variety of programmes. On being asked, the lecturers mentioned that the programme is currently making a list of courses that are mutually exclusive, in order to prevent overlap. Students also mentioned that some lecturers are not aware of the specificities of the Natural Sciences students' prior knowledge. This sometimes leads to knowledge deficiencies when following an elective jointly with monodisciplinary students. Lecturers explained that initiatives are now being taken to map the prerequisites of every course Natural Science students are able to follow.

The Natural Sciences programme is currently being transformed into the Science programme. The first year of the new programme started in the academic year 2011-2012. The content of the first year will be broadened and the share of science courses in that year will be slightly diminished. As the study guide mentions, the new programme will allow students to follow more diverse courses on more diverse levels. Also, it aims to make the transfer to monodisciplinary programmes easier. After the first year students will have to make a choice between three options: multidisciplinary deepening (comparable to the current Natural Sciences programme); application (by following a minor on Entrepreneurship, innovation and sustainability); and monodisciplinary deepening (by continuing in one of the monodisciplinary programmes of the faculty). In studying the new programme, the committee also noted that it will be more biology-oriented, diminishing the Physics-orientation of the current Natural Sciences programme. During the site visit, the committee heard that Science students that have chosen to emphasize on research in the second and third year, will still be able to follow the research orientation in the master's programme. The research groups offering the different future master tracks are currently in the process of defining which courses are required during the bachelor phase for admission.

The curriculum of Molecular Sciences at the master level
In the master's programme, as much as 60 to 90 EC of the programme is filled with internships. In addition, students take theoretical master level courses enabling them to broaden their theoretical knowledge to other subjects within the field of Molecular Sciences. The fields in which students fulfill their internships determine which courses are compulsory and the research specialization ('major') with which a graduate enters the job market. From the academic year 2012-2013 onwards, students have to choose a master track (see also standard 1 and Appendix 4). Within each track, students have to choose 15 EC of compulsory courses and one internship linked to the track. A second internship and electives can be chosen freely, but have to be approved by the Examination Board.

Master programmes differ depending on the orientation the students choose. Information on these different master's programmes can be found in Appendix 4. The programme of the O-

variant is different in each master's programme. Special programmes with specific internships have been developed for the E-, C- and MT-orientations. During the site visit, it was mentioned to the committee that although the O-variant most often leads to students continuing to do a PhD, the PhD-track also remains open for the other students and in the recent past students from the MT-orientation have indeed started with a PhD. The committee also learnt that students opting for the E-orientation acquire the complete first-degree pre-university teacher qualification when finishing the master's programme.

During the internship, the student becomes acquainted with the literature of the research project, with the research methods, and with the specific techniques. Students have to learn how to handle experimental results, difficulties, failures and stress, and actively participate in work discussions, literature discussions, problem evenings, group meetings, and official lectures. In the end, the student is fully introduced into the specialization and the experimental and/or theoretical methods of the field of science. In order to proof this, a master thesis is written and the student gives a public presentation. Contrary to the bachelor internship, students have to reconsider some of the concepts they regarded as well accepted in the light of the research they are executing.

During the internship, the student is supervised in a master-apprenticeship relationship. Master students are supervised on a daily basis by PhD-students and post-docs. Staff members are involved during progress meetings, work discussions, supervision of the writing of the thesis. They have the final responsibility. During the site visit, lecturers explained that the Examination Board takes action if student evaluations show that adequate supervision is lacking in a research group.

Research internships can be carried out in the research departments that are linked to the programmes. Students find this information in their study guide (see also Appendix 4). Students can do their internship at other departments than the ones listed, at other universities or even outside academia, but the Examination Board has to approve. If the internship takes place outside Radboud University, supervision of a scientific staff member from one of the listed departments is required in order to assure that these internships are conform the scientific standards set by the degree program.

Most students take two internships during their study. Often, they do the second internship outside of the listed research groups. Approximately 25% of the students currently do the internship abroad, making use of either Erasmus agreements or research contacts of the research group. It is the aim of the faculty to further develop the international orientation of the master's programme and a committee has been set up to investigate possibilities.

The students explained during the site visit that they chose their research theme and group on the basis of courses or lectures they had found interesting, the study guide and visits to the research groups. The lecturers explained that providing the list of possible themes of internships is the responsibility of each separate research group.

A course that is common to the Chemistry and the Molecular Life Sciences programmes is the 'Study Tour Chemistry' (4 EC). The tour is organized by the students (planning, organizing and implementing the day-to-day programme, and fund-raising). Participants prepare the study tour in small groups by means of organizing and attending lectures and making preparatory reports under the leadership of several members of the academic staff. The group reports are presented. During the tour, organizations, companies and institutions interesting for the students, are visited. On being asked, students told the committee they had

found this course to be instructive. The amount of work that was put into the course was in accordance with the EC attributed to the course.

Chemistry programme
The structure of the Chemistry programme (research direction) can be found in Appendix 4. Students are required to dedicate at least 90 EC to chemistry-related topics, including the major internship (60 EC) and 30 EC of courses. Students usually are obliged to follow 10 EC of courses connected to the research. This means the students can fill the remainder of the 30 EC with electives of choice. Students from the E-, C- or MT-variants have to follow 60 EC of chemistry-related topics and 60 EC of courses specific for the option they have chosen.

The programme management explained to the assessment committee that in the master's programme, even more focus is put on the link between strong research groups in Nijmegen and the courses that are offered. This is also a requirement of the government. As a consequence, there is an abundant choice of courses related to nuclear magnetic resonance (NMR), whereas other important fields in chemistry, like inorganic or physical chemistry, receive less attention.

Molecular Life Sciences programme
The master's programme consists of 30 EC of lectures and two internships (45 EC each). Each internship includes a literature thesis, and a 3 EC specific theoretical course connected to the internship. The programme also allows students to extend their second internship to 60 EC by using 15 EC of the elective courses. The internships have to be performed in two different research groups. The research projects are multidisciplinary, combining chemical, biological and biomedical approaches. The students can make an individual selection from a broad range of theoretical courses. During the site visit, students mentioned that student counselors advise to choose for electives within the sciences, as closely linked to the envisioned specialization as possible.

Natural Sciences programme
In the master's programme of Natural Sciences, students usually continue in the direction of specialization as chosen in the bachelor's programme, but this is not strictly required. Students follow 30 EC of basic and advanced courses, which have to be chosen from two different disciplines. Two internships are done (60 EC and 30 EC), including elective courses. Students in the research direction take two internships on the interface of the disciplines they choose, in research groups from different disciplines. Both internships need to be multidisciplinary. This is checked by the steering committee and the Examination Board. Master courses also have to be taken from two different disciplines.

Teaching concept and teaching format
In the first and second year of the bachelor's programme, students receive at least 25 hours of teaching per week (details in Appendix 5). Exams are done at the end of each quarter, with the possibility of doing a re-exam at the end of the year. The committee learnt during the site visit for an important part of the master's programme, students have a 38-hour working week, doing their research internship. Theoretical courses are given 2 hours a week.

The bachelor's programme works with relatively small lecture courses (most are 3 EC) that gradually build up the main topics. In line with the multidisciplinary objectives of the programme, students of different programmes follow courses together as much as possible. Lecturers mentioned during the interviews that students are often put together in mixed groups for their assignments.

Details of the teaching format of the different courses are given in Appendix 4. The following didactical teaching formats are used throughout the curriculum: lectures, tutorials, tutor hours, self-study, practical courses, computer aided education, response hours, working in group and video recording. Most 3 EC courses comprise one plenary lecture (2 x 45 min) and one tutorial (2 x 45 min, in small groups) per week. The tutorials are usually given in groups of twenty students, for practicals this is eight. Practicals are compulsory. Brief experiments or computer assignments are also used as illustrations. At the master level, the internship and the master-apprentice relation are crucial elements in the teaching concept. During the site visit, lecturers mentioned that the programmes are now also starting to use video-recordings of lectures, so students can catch up on the electronic learning environment if they miss a course.

The language of education is Dutch throughout the first year. In the second year English is gradually introduced, in order to facilitate student exchange and to prepare students for the master's programme. During the site visit, students mentioned they experienced no problems with this planning.

Admission requirements

Admission requirements at the bachelor level are the same for all three programmes and follow the national regulations. Bachelor students can enter the corresponding master's programmes prior to obtaining the bachelor's degree provided they have fulfilled at least 162 EC of the bachelor's programme, including the bachelor's thesis ('zachte knip'). Also, they must complete their bachelor's programme at last one year after entering the master's programme.

The master's programmes of the educational institute MW are also open to candidates that have not obtained a bachelor's degree at Radboud University. The master's programme of Chemistry is open to graduates from other Dutch universities with corresponding bachelor's degrees. Students from adjoining programmes can be admitted if sufficient elective courses were included in their bachelor's degree. If there are deficiencies, students are only admitted if the lack of knowledge can be made up for in the first part of the master's programme. Graduates with a degree from a University of Applied Science (HBO) can be admitted after successfully finishing a premaster programme. During the site visit, the committee learnt that the influx of HBO-students is considerable in the Chemistry-programme (see Appendix 5, tables 11 and 12). Required courses are often included in the minor of the HBO-programme, making the transition from HBO to university smoother, a fact that was confirmed by the HBO-students the committee talked to during the site visit.
Students who do not possess a bachelor's degree in Molecular Life Sciences from Radboud University, can be admitted to the master's programme in Molecular Life Sciences after successfully completing a bridging programme, with a maximum of 54 EC.
Intake requirements for the Natural Sciences are based on the fact that a student needs to be able to work on two interdisciplinary research topics. This limits the intake to either programmes that are very similar to the Natural Sciences bachelor's programme or to monodisciplinary programmes with minors in other disciplines. Deficiencies of candidates are assessed and individual programmes can be set up, subject to approval by the Examination Board. Bachelors from Universities of Applied Science (HBO) are not allowed to the programme as they have too many deficiencies.

During the site visit, the committee learnt that graduates from the new Science bachelor's programme will be eligible for the research-orientation at master level, provided they have followed the required courses at the bachelor level. The programme management stressed

that in the past, the multidisciplinary Natural Sciences students have been valued highly in research teams. In this perspective, it is also the ambition to continue having a master programme in Sciences, where students of the O-variant are required to do interdisciplinary internships.

Students with international bachelor's degrees can be admitted to the master's programmes subject to approval by the Examination Board. If necessary, bridging programmes can be composed for these students.

Student intake and recruitment

Student intake in the bachelor's programmes has risen in the past few years from 38 in the academic year 2006-2007 to 56 in the academic year 2009-2010 for Chemistry and from 42 to 48 in Molecular Life Sciences. Student intake in the bachelor's programme of Natural Sciences has fluctuated between 15 and 13 in that period, with better results in 2007-2008 and 2008-2009 (with respectively 24 and 18 students entering the programme). These numbers include HBO-students following a pre-master track as well as international students. Influx of HBO-students has been irregular, with 1 student starting the premaster programme in each of the last four academic years for Molecular Life Sciences and intake ranging from 6 to 11 for Chemistry (based on the data in tables 11 and 12, Appendix 5). The three bachelor's programmes also recruit international students, mainly from Germany. On being asked, the programme management mentioned that it is university policy not to focus on actively recruiting diploma students abroad at the bachelor level. All details on student intake can be found in Appendix 5.

At the master level, student intake has risen from 29 students in 2006-2007 to 34 in 2009-2010 for the Chemistry programme and from 16 to 31 in the Molecular Life Sciences. 7 students entered the Natural Sciences programme in 2006-2007; in 2009-2010 the number was 8. Most of these students are graduates from the bachelor's programmes of the educational institute MW.

The programme management explained to the assessment committee that student intake is a continuing point of concern. Different measures have been taken to address this problem at the bachelor level. First of all, the Natural Sciences programme has been broadened to the new Science programme, with the hope of attracting also the more broadly interested students. Secondly, a Radboud Pre-University College of Science has started, with the aim of informing and preparing students from secondary school. During the site visit, current students mentioned that the introductory weekends and information activities of the university had been successful in attracting them for the programmes.

At the master level, the distinctive features of the educational and research programmes at the Radboud University will be stressed more in the future by implementing the master tracks. This is necessary, as it is expected that the implementation of the so-called 'harde knip' (see also 'feasibility') will lead to more students switching universities between the bachelor and the master level. This new evolution is seen as a threat as well as an opportunity by the programme management.

Most students opt for the research variant at the master level. During the site visit, students mentioned that information sessions on the different master orientations are given in the third year of the bachelor's programme. Some students found this planning to be too late. The same remark was made on the choice for the minors during the bachelor's programme. On being asked, the programme management explained that students are also informed on

various career paths in the colloquium sessions that are part of the 'Academische Vorming' trajectory in the bachelor's programme. During these sessions, alumni inform students on careers when choosing for the C-, E- and MT-orientations.

During the site visit, the committee learnt that the alumni have only recently been involved to recruit students, making use of social media and including alumni in the colloquium sessions. During the site visit, the alumni expressed their interest for an enforced alumni network, especially if this would be organized at the level of MW.

Feasibility

The bachelor's programme is based on a student input of forty hours per week, consisting of a mixed balance of practical courses and project groups on the one hand and lectures, tutorials, self study and response hours on the other (see also Appendix 5). In the interviews, students confirmed that the programmes are tough but feasible. They indicated that in the past, problems with feasibility have arisen in particular due to the combination of bachelor and master courses in the absence of the so-called 'harde knip'.

During the site visit, students mentioned that in general they found the weight attributed to courses in accordance with the amount of work they had to put in. Chemistry students however mentioned that the Matlab course required more time investment than the 3 EC foreseen. Lecturers also found that the EC attributed to study trips may not be in accordance to the time investment required, although most students did not agree with this. The interviewed lecturers explained that the switch to the current system, using standardized blocks of courses of 3 and 6 EC, has meant that the weight attributed to many courses has changed, whereas the time-investment of students has not. This may have led to imbalances in some courses and requires continued attention.

Data on success rates in the bachelor's programme can be found in Appendix 5. The results show that the success rate falls below the target of more than 70% of the bachelor's students finishing in four years time. The faculty wants to improve this. One of the factors negatively influencing the data is the current open transition ('zachte knip') between bachelor's and master's programme, which allows student to postpone exams. Another element is that students showing very slow progress cannot be excluded from the programme.

Master success rates are also shown in Appendix 5. Although the success rates are high in the first years shown in table 9, they fall below the target of 70% in 2007. It is however difficult to obtain a clear view on the actual numbers. Since students cannot be registered for two programs, they are only registered as master students after they obtain their bachelor's degree. Combined with the system of the 'zachte knip', this means that students tend to have a slow study progress at the bachelor and a fast progress at the master level. Against this background, additional data are provided in the critical self-study (Appendix 5, table 10), showing combined bachelor's and master's study progress based on registered master's students. Molecular Life Sciences students reach success rates of well over 70% after 7 years (the maximum length), while Chemistry and Natural Sciences fall slightly below the target of 70%. On being asked, the programme management explained that the study progress of HBO-students varies. On average, it takes them two years to obtain the master's degree. Information on study-progress of HBO-students was also adopted in Appendix 5.

The faculty of Science has implemented measures to improve success rates. Measures taken include firstly the implementation of 'Binding Study Advice' ('Bindend Studie Advies' or BSA) as of September 2011. Students must obtain 39 EC during the first year of the

bachelor's programme. During the site visit, the programme management mentioned that more than eighty percent of students received a positive interim advice in February 2012, indicating that the BSA may have a positive result on study-progress and success rates. Secondly, as of September 2013, the so-called 'harde knip' will be implemented, making it impossible to enter the master's programme without having finished the bachelor's programme. Thirdly, all students also have to take a diagnostic mathematics test in the first year, which leads to customized student counseling. A fourth measure is that adaptive learning modules have been developed to support difficult courses. Finally, the faculty has started with more intensive student counseling (see also 'facilities').

On being asked, the Examination Board mentioned that the Radboud University has decided not to work with a fixed sequence of courses in its programmes. Preference is given to informing students about the vertical build-up of courses in the study guide on the one hand, and providing them with intensive counseling on this matter on the other hand.

During the site visit, students mentioned repeatedly that the approachability of the lecturers and the tutors had helped them to cope with the programme.

Staff

The educational institute MW draws its lecturers from the associated research institutes. Research professionals in the possession of a PhD constitute up to 40% of their time to education, thus strengthening the link between education and research. Didactical as well as research qualities are taken into account in appointing scientific staff. This is also the case in the annual performance interviews. The teaching staff of the institute is currently pursuing a Basic Teaching Qualification (BKO), the target being that 90% of the MW-staff has a BKO.

On being asked, students told the committee that the lecturers' knowledge of English is in general sufficient. From the lecturers the committee learnt that all new lecturers are now required to take an English test.

During the site visit, the Programme Committee explained the procedure that is followed if student evaluations show that the pedagogic approach of a lecturer is not sufficient. Students mentioned they felt that their suggestions are taken into account.

The majority of the education is provided by the 25 IMM staff members that are directly associated with the educational institute MW. In addition, a similar number is recruited from other disciplines to give specific courses. At the bachelor level, student-assistants are hired for additional supervision in practical courses and tutorials. During the site visit, it became clear to the committee that these assistants receive training for this task. Also, six secondary school teachers are hired for tutoring activities in the first year. At the master level, the scientific staff of all associated research institutes is involved in supervision of master students during internships. PhD-students and post-docs assist in this supervision.

At the bachelor as well as the master level, the student-staff ratio is ca. 20. More detailed information can be found in Appendix 5.

Facilities

Since September 2005, the faculty of Science is housed in a new, state-of-the-art building with modern facilities. The facilities comprise modern labs and some large infrastructural facilities hosted by the IMM that are beneficial for top level research in physical chemistry. The

committee was able to have a look at the facilities, including the rooms of the chemistry laboratory and the NMR-pavilion.

As mentioned above, the faculty of Science has intensified the student counseling in order to improve the success rates. The transition between secondary school and university is monitored and guided by pre-university tutors (high-school teachers), a system appreciated by the students. A mentoring system has been set up in the academic year 2011-2012, in which tutors meet with small groups of students every two months in the first year. Recently, new student counselors have been appointed to better guide students through the first year. Furthermore, students meet four times during the bachelor's programme (twice in the first year) with a member of the academic staff (lecturer-mentor), as part of the course 'Academische Vorming' (see also 'The curriculum of Molecular Sciences at the bachelor level'). Also, the study counselor acts directly if results for exams give a reason for doubt. Students' progress is monitored through the monitoring system Osiris.

During the site visit, students uttered their appreciation for the openness, availability and helpfulness of the student counselors, tutors and lecturers. The assessment committee learnt that the conversations students must have with the lecturer-mentor are strictly planned and are obligatory. Students have to prepare the meeting, by making a reflection assignment on their future plans and ambitions. However, students mentioned that the obligatory conversations are executed by some lecturers in a pro forma manner. Students also mentioned that sometimes there is an overlap between the themes to be discussed with the lecturer and with the student counselor.

Considerations

Curriculum

The committee values highly that the educational institute MW offers a common molecular core to all three programmes, giving students the opportunity to switch between programmes. The committee found that this is an important factor in attracting students. Moreover, the committee moreover lauds that students with different backgrounds follow courses together and make assignments in mixed groups, thus promoting the multidisciplinarity of students.

The committee appreciates the strong link between the curriculum and the research executed at the Radboud University. This can already be observed at the bachelor level, and is especially true for the master's programme. The committee appreciates that an important part of the master's programmes consist of research internships, during which students have first hand experience in doing research in a master-apprentice relationship.

However, the committee is of the opinion that the educational institute MW should continue to look for an ideal pairing of broadness of the programme on the one hand, and depth and links with ongoing research on the other hand. This is especially the case for the Chemistry master's programme, where specialization in disciplines such as inorganic chemistry, polymer chemistry and physical chemistry is given too little attention, most likely due to the fact that there is no link with current in-house research. It is the opinion of the committee that the current choice of courses as well as the weight attributed to these courses is too much oriented towards PhD-tracks at Nijmegen University and thus limits students' future employment in industry or at other universities.

The committee discussed at length about this issue and urges the educational institute to ensure that the education of students is sufficiently broadened in order for their future options to remain more open. One way to do so is to make the offered courses more

balanced. At the master level, the committee finds the share of NMR-related courses oversized (13 EC in total), whereas the space foreseen for other basic topics and disciplines such as inorganic chemistry, polymer chemistry, and physical chemistry, is limited. Some courses that the committee finds essential (e.g. 'Polymer Chemistry, 3 EC) have the same weight in the programme as subjects that are less related to the core of the programme (e.g. 'Apoptosis', 3 EC; 'Study tour', 4 EC; 'Psychology', 3 EC), and are moreover not obligatory. The committee considers this a shortcoming in the programme that should be taken into account when adjusting the curriculum. According to the committee, the programme requirements have to be formulated in such a way, that students cannot exclusively follow courses from one specific discipline (aimed at in-house research), while excluding courses on other basic topics from their programme.

Another way to broaden the horizon of the students is to ensure that students develop a mobile attitude during their education. This can be done by stimulating the students to do one of their internships outside of Nijmegen University, at another university or in industry. Considering the necessity of this mobile attitude, especially if the master's programme has a narrow focus, the committee advises the educational institute MW to explore ways to motivate more students to do an extramural internship. In addition, initiatives should be taken to attract more students from other institutes to do an internship at Nijmegen University.

The curriculum at the bachelor level consists of many different courses, most of which are 3 or 6 EC. The committee concluded that the weight attributed to courses is mostly well-balanced. The committee learnt from students as well as lecturers that there are some exceptions, and that they are mostly due to the recent standardization of courses to units of 3 or 6 EC. The committee advises the education institute MW to closely monitor whether the EC attributed to courses throughout the programme are representative of the time invested by the students. Also, the committee has the opinion that offering too many 3 EC-courses may lead to a fragmentation of the students' knowledge on certain topics. Against this background, the committee advises that unnecessary fragmentation and overlap of courses should be avoided.

A large share of the programmes is reserved for student-driven course selections. The committee values that students have an important responsibility in composing their own programme, but prior to the site visit it also had some reserve as to whether this leads to individual programmes that are sufficiently coherent and discipline related. During the site visit, the committee received ample proof that students receive the necessary guidance in composing their programme, that horizontal and vertical coherence is assured, and that students are urged to follow courses related to their discipline/specialization. The committee advises the programmes to continue the quality assurance in this regard, especially for the non-required part of the programme.

At the bachelor level, the committee especially appreciated the existence of the 'Academische Vorming' module and the 'reporting'-trajectory. Still, the committee also thinks there is room for improvement as to how they are implemented. For 'Academische Vorming', the committee advises to improve on the one hand the guidelines on the course requirements, as the committee learnt this was not clear to all students. Moreover, the committee suggests that the educational institute MW looks for ways to make the well-thought out concept of the dialogues between the mentor-lecturer and the student less pro forma. It is the opinion of the assessment committee that more information should be given as to what is to be discussed

with the student-counselor on the one hand and what with the lecturer-mentor on the other hand, to avoid the existing uncertainty on this matter in future years.

For the reporting-trajectory, the committee advises that more time is allotted to make the difference between reporting formats in chemistry and physics explicit. The educational institute MW should also ensure that the guidelines for the practical reports are not implemented differently by different student-assistants in the same practical. Moreover, the committee insists that students receive clearer guidelines on how to write a report, especially on important parts of reports like definition, problem statement or conclusion. The committee feels that giving students more insight into this structure will also help them in eventually writing a bachelor's and master's thesis that is up to standard. The committee supports the plans of the educational institute to implement an academic writing course in English in the near future.

The committee lauds that internships take up an important part of the curriculum and found that in general, students were pleased with the supervision they received. For some of the bachelor's and master's theses the committee read, it was found that the subjects of the projects were too complicated and not adequately delineated. Consequently, the committee suggests that the educational institute MW looks for a way to ensure the quality and feasibility of the suggested themes. The committee thinks this is crucial, especially for the bachelor's theses, as they should aim to give students an attractive and instructive first taste of scientific research, and to motivate students to continue into that direction.

The committee found the honours track well thought through. Also, the educational institute of MW has taken an ample start to improve the internationalization of the programmes.

In general, the committee found evidence that the educational institute MW aims at continuous improvement. Most of the problems students signaled during the site visit, or most of the remarks made by the committee, are already known to the institute's management. Also, the institute has implemented many of the remarks of the previous assessment committee. This culture of continuous evaluation, assessment, and improvement was seen as very positive by the committee.

Teaching format and teaching-learning environment
The committee found the teaching format and methods to be adequate and considers the teaching-learning environment to be of good quality. The teachers are approachable and students repeatedly stressed that problems can be addressed directly to the lecturers. The research and educational facilities are excellent. The committee also appreciates that every single programme has a study counselor and study coordinator that help to delineate the students' study trajectory and are available for students' questions.

Student intake and study progress
The committee saw that the educational institute MW invests in its recruitment policy, which has led to an increased intake in the Chemistry and Molecular Life Sciences programmes in the last few years. The committee values highly that in the master's programme, students can complete their full training as a first degree pre-university teacher. Still, the E-track attracts few students. The committee thinks the information (and its distribution) on all the orientations other than the O-orientation can be improved to benefit enrollment. The same holds true for the minor programmes, which have failed to attract many students.

The committee is concerned about the subcritical number of students in the Natural Sciences programme. However, the committee values that the faculty of Science and the educational institute MW have already taken action to remediate this problem by starting the implementation of the new Science programme. The future will show whether the new programme will be able to attract new, larger groups of students in the bachelor's programme. The committee warns for a possible conflict by broadening the programme from a physics- to a biology-orientation. The educational institute should properly inform future students upfront on the choices they will need to make early on in the programme to warrant their chances to continue in particular directions.
Also, at this time it is unclear whether the new Science students will opt for a master's programme at the faculty of Science. If they choose to broaden their profile at bachelor level, they may as well opt for master's programmes outside of this faculty. This makes it uncertain whether the new programme will eventually also lead to an increased master's intake in the faculty of Science.

During the site visit, the committee learnt that the alumni networking can be improved upon and can be used as an effective tool in the recruitment policy. Alumni sounded eager to take part in such an initiative. An improved cooperation between the study organizations and the faculty can result in more interactions between university-industry-secondary education. HBO-alumni or alumni from the different tracks and orientations can be involved on information days to inform students on the different possibilities. The committee considers it important that the programme develops a communication strategy to attract master students from other Dutch and foreign universities, as well as HBO-students. This will become crucial in securing a stable intake of students after the implementation of the 'harde knip'.

The committee is convinced that the study progress at the bachelor as well as the master level can be improved. The committee appreciates that the educational institute MW has already taken a series of measures to improve study progress. The committee agrees with the institute that the BSA and the so-called 'harde knip' will most likely influence the study progress in a positive way. Still, it is the opinion of the committee that the selective function of the first year can be enhanced by imposing more rules regarding the sequencing of courses. This is especially true for the new Science programme, which will be entered by students with less extensive mathematical backgrounds, making the need for a thorough selection in the first bachelor year even more pressing.

Conclusion
Bachelor's programme Chemistry: the committee assesses Standard 2 as **good**.
Bachelor's programme Molecular Life Sciences: the committee assesses Standard 2 as **good**.
Bachelor's programme Natural Sciences: the committee assesses Standard 2 as **satisfactory**.
Master's programme Chemistry: the committee assesses Standard 2 as **satisfactory**.
Master's programme Molecular Life Sciences: the committee assesses Standard 2 as **good**.
Master's programme Natural Sciences: the committee assesses Standard 2 as **satisfactory**.

Standard 3: Assessment and achieved learning outcomes

The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

Explanation:
The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes. The tests and assessments are valid, reliable and transparent to the students.

Findings

The assessment committee has read the programme's education and (final) examinations regulations (OER), has spoken with the members of the Examination Board and has evaluated bachelor and master theses as well as exams of the different years of the programme.

Quality assurance of assessment
In order to improve the quality of assessment, a faculty committee was set up in the recent past, to formulate new rules and regulations. The new measures have been implemented starting from the academic year 2011-2012. In the past, the most important tasks of the Examination Board included the checking of exams and reports/theses on a random basis, and verifying whether students' programs fulfill the OER requirements. New tasks include supervising the quality of individual courses. Also, a decision has been made recently to evolve to one Examination Board in the educational institute instead of three, in order to have one standard evaluation and quality.

For regular courses, it is determined that they are generally assessed with written exams. The lecturer ensures that the learning goals are addressed in the exams, a process that is facilitated by using a test matrix. Written exams are as a rule checked by a colleague. Correction models are provided to give students adequate feedback. Oral exams take place in the presence of a peer or are recorded. If assessment takes place through assignments, an assessment form with grading criteria is foreseen. For projects and practical courses, the practical components are graded by the direct supervisor, but always verified by the staff co-ordinating the course. In addition, grades are obtained for the separate written reports and if applicable for the oral presentation.

During the site visit, the Examination Board mentioned that it checks 10% of the bachelor's as well as the master's theses. This selection can be extended if irregularities are found. The Examination Board stated that it is a priority to ensure that on the one hand all final projects are evaluated using the standard form and that on the other hand the form is filled out correctly.

Assessment system
The teaching schedule of the faculty of Science consists of four quarters of eight weeks of teaching, followed by a two-week examination period. Re-exams can be done right after the examination period and a second time at the end of the academic year. The interviewed students mentioned they found this scheme feasible. During the site visit, it was mentioned that in future, only one re-exam will be possible, scheduled close after the initial exam. Additional learning and training tasks will be required of students before they are admitted to a second re-exam.

In the bachelor's as well as the master's programme, a variety of evaluation formats is used, all of which are listed in Appendix 4. Written exams are used in more than 85% of the 3 and 6 EC courses. The written exams consist mostly of open questions; multiple choice (MC) questions are sometimes used additionally. This was confirmed by the students during the site visit. The committee learnt from the interviews that practicals and projects are evaluated using three criteria: the work students perform in the labs throughout the year, written reports and presentations. Peer-evaluation is also used during the practicals.

Formative assessments are used in order to stimulate students to keep up with the teaching. To stimulate students to take part, bonus points can be obtained. The same holds true for exercises in tutorials. Portfolio assessment is used in the bachelor's course on 'Academische Vorming'.

Final projects: bachelor's and master's thesis
The assessment of the internship and thesis is done by the project supervisor, who uses the dedicated assessment forms, based on the academic competences that the student has attained in the bachelor's or master's programme. These assessment forms are new and were introduced following the suggestions made by the previous assessment committee. During the site visit it became clear that some but not all students receive the assessment criteria before starting their final project. Lecturers explained that the mark students receive is based on the final version they submit, but that supervisors take the learning trajectory into account when grading. The evaluation form leaves room for differentiating between the product and the process.

Another measure that has been implemented recently is that the thesis and the oral presentation must be assessed by a second reviewer from another research group. If the internship is done outside of university, the second evaluator will be external.

On being asked, the Examination Board mentioned that the standard assessment form has only recently been introduced and that consequently there is room for improvement. In a new version of the form, performance indicators for the marks will be provided, which will improve the reliability of the evaluation procedure further.

Performance of graduates
More than 95% of bachelor graduates continue their study in one of the existing master's programmes. Staff experience is that students are well prepared for the master's programmes at Radboud University as well as elsewhere. On being asked, the programme management mentioned that bachelor students Natural Sciences, who want to follow a master's programme at another university, will have to plan ahead with respect to the courses they have to choose as electives in order to achieve the learning outcomes necessary to be admitted. In some cases, they may have to take additional courses. The programme management also mentioned, however, that this is no different for the Chemistry students. This situation will be even more outspoken in the future, as master's programmes in the Netherlands are required to be more focused on their research strongholds.

During the discussion with the assessment committee, students from the Natural Sciences mentioned that, during their internships, they do sometimes notice that they lack some basic knowledge that the monodisciplinary peers in the research group have acquired. Still, their multidisciplinary background helps them communicate with people from the different disciplines during the internship. However, the students also mentioned that they were able to get up to speed very fast.

Recent data from a survey among alumni give insight in the performance of Chemistry master graduates. For the other two programmes, response rates were too low. The job perspective of Chemistry graduates is very good and a considerable number continues to do a PhD. A significant number of students (ca. 25%) go abroad for their internship, often in top-level research groups, and they often get very good feedback.

The alumni explained during the site visit that they appreciated the opportunity they had received to identify a specialization they were really interested in. The broadness of the programme allowed them to develop a unique profile. They also mentioned that the critical point of view they had developed during the studies is something they value highly. The alumni and the master students of the Molecular Life Sciences programme told the committee that they had a very high esteem of the programme they had followed.

Considerations

The committee has noticed that, in general, the programme has an adequate assessment system and assessment procedures. The committee appreciates the recent activities of the Examination Board to further improve the quality of the thesis evaluation.

Overall, the committee concludes that the existing assessment system, the level of the bachelor and master theses and the performance of graduates in the master's programme and in professional life demonstrate that the achieved level of the bachelor's and master's programmes is adequate.

The committee was pleased to find that, in response to the findings of the previous programme evaluation in 2006-2007, a standard evaluation form has been developed for the evaluation of the bachelor's and master's theses. The committee appreciates that the process as well as the product are taken into account in the evaluation, and that performance indicators enabling a more precise grading are being developed. Furthermore, the decision to require the second evaluator of each thesis to come from a different research group is lauded in light of ensuring consistency and quality control across all research groups in the different bachelor's and master's programmes. The committee was also pleased that the overall grades given to the bachelor's and master's theses generally corresponded well with the assessment of the same theses by the committee members. The committee was especially pleased with the general quality of the master theses of Molecular Life Sciences students. Another positive point is that the full spectrum of grades, from 6 to 9,5 with Gaussian distribution, is being used for the evaluations.

Still, the committee found that in a number of cases, the individually gradable items were not appropriately assessed. For example, for any student to receive the exact same grade for each gradable sub-item is not credible. The committee considers this undesirable since a nuanced grading on the different items leaves more room for feedback. The committee learnt during the site visit that the educational institute MW is aware that there is room for improvement in how the forms are used and that they are committed to take the necessary steps. The committee suggests that the Examination Board includes the evaluation forms in its quality control system and ensures that a concise but adequate motivation is provided for the marks that have been given, including the marks for the sub-criteria. Also, the committee recommends that the gradable items are modified so they correspond better to specific required sections in the reports.

Moreover, the committee observed that several bachelor's and master's theses lacked certain sections that one would expect in every thesis, irrespective of the specific research area, like abstract, objectives, conclusion or a statement of future outlook. That these important elements are lacking in the thesis also means that the supervisor has not put the attention of the students on the fact that these elements are required.

The committee advises to develop a set of explicit guidelines for the preparation of the bachelor and master thesis, with specific attention to the required sections and what aspects should be covered in each. Furthermore, the committee advises to update the evaluation form with additional 'points of attention', referring to the required sections, as students use the evaluation form to guide them in preparation of the project. This will result in a uniformly used, transparent document.
Explicitly evaluating the theses and the oral presentation on key elements, which are currently lacking from some theses, will induce students to actually include these items. As mentioned above, linking the specific requirements for the reports with the gradable items on the forms will help to accomplish the desired improvement in quality.

The committee was impressed by the maturity and openness of the students and alumni during the interviews. Also, the committee noted that the master students and the alumni of the Molecular Life Sciences programme had a very high esteem of the programme. Concerning the level attained by the graduates, the committee advises the educational institute MW to constantly monitor whether the broad set-up of the new programme still leads to a level where the multidisciplinary Science-students have to put in little effort to level with their monodisciplinary peers.

Conclusion
Bachelor's programme Chemistry: the committee assesses Standard 3 as **satisfactory**.
Bachelor's programme Molecular Life Sciences: the committee assesses Standard 3 as **satisfactory**.
Bachelor's programme Natural Sciences: the committee assesses Standard 3 as **satisfactory**.
Master's programme Chemistry: the committee assesses Standard 3 as **satisfactory**.
Master's programme Molecular Life Sciences: the committee assesses Standard 3 as **good**.
Master's programme Natural Sciences: the committee assesses Standard 3 as **satisfactory**.

General conclusion

The committee finds that the intended learning outcomes of the different programmes are well described in terms of level and orientation. They comply with the domain specific framework and international requirements. The committee appreciates that the intended learning outcomes of the Molecular Life Sciences and Natural Sciences programmes are formulated in a sharp, integrated, and process-oriented way. The committee urges the educational institute of Molecular Sciences to reframe the intended learning outcomes of the Natural Sciences programme to align them with the new Science programme.

The committee finds that the teaching-learning environment offered by the programme enables students to achieve the intended learning outcomes. The teaching format and methods are adequate, the facilities are excellent and the lecturers are of high quality. The committee is of the opinion that the educational institute MW should continue to look for an ideal pairing of broadness of the programme on the one hand, and depth and links with ongoing research on the other hand. This is especially the case for the Chemistry master's programme. The committee noted that the educational institute MW invests in its recruitment

policy, but the low intake of students in the Natural Sciences programme remains a point of concern. It now has to be awaited whether the new programme succeeds in attracting more students.

Overall, the committee concludes that the existing assessment system, the level of the bachelor and master theses and the performance of graduates in the master's programme and in professional life, demonstrate that the achieved level of the bachelor's and master's programmes is adequate and in line with what one may expect. The committee was especially pleased with the general quality of the master theses of Molecular Life Sciences students. For the bachelor's as well as the master's thesis, the committee strongly advises to develop a set of explicit guidelines for the preparation and evaluation of the bachelor's and master's thesis, with specific attention to required sections and what aspects should be covered in each.

Conclusion

The committee assesses the *bachelor's programme Chemistry* as **satisfactory**.
The committee assesses the *bachelor's programme Molecular Life Science* as **satisfactory**.
The committee assesses the *bachelor's programme Natural Sciences* as **satisfactory**.
The committee assesses the *master's programme Chemistry* as **satisfactory**.
The committee assesses the *master's programme Molecular Life Sciences* as **good**.
The committee assesses the *master's programme Natural Sciences* as **satisfactory**.

Appendices

Appendix 1: Curricula vitae of the members of the assessment committee

Prof. dr. Jürgen Heck studied Chemistry at the TU Braunschweig and acquired the diploma of Diplomchemiker (Dipl. Chem.) in 1978 at the University of Marburg, where he also obtained a Ph.D. for his research on inorganic (organometallic) chemistry and en EPR spectroscopy (1982). After his postdoctoral study at the University of Zürich, he started his research for a 'Habilitation' at the University of Marburg in 1983. Additionally, he organized and supervised an advanced inorganic-chemical practical. He obtained his 'Habilitation' in 1989 and became 'Universitair Hoofddocent' Inorganic Chemistry at the KU Nijmegen (now Radboud University). Since 1992, he has been the holder of the chair 'organometallic chemistry' at the Chemistry department at the University of Hamburg. In this period, he has been the director of the 'Institut für Anorganische und Angewandte Chemie' twice and has been vice-dean en dean of the Chemistry department of the University of Hamburg. His scientific research is aimed at metal-metal-interactions in di- and oligonuclear organometallic complexes.

Prof. dr. Paul Kenis received his BSc in Chemistry from Nijmegen/Radboud University and his Ph.D. in Chemical Engineering from Twente University. His Ph.D. research pertained the synthesis and characterization of supramolecular materials with nonlinear optical properties. After a Postdoc at Harvard University in the area of microfluidics, he joined the faculty at the University of Illinois at Urbana-Champaign in 2000, where he currently is a Professor in the Department of Chemical & Biomolecular Engineering. He has affiliate appointments in Mechanical Science & Engineering, Bioengineering, the Institute for Genomic Biology, the Beckman Institute, and the Seitz Materials Research Laboratory. His research efforts focus on the design and application of microchemical systems for applications in energy conversion, crystallization, cell biology, and diagnostics. His research has led to over 100 publications in archival journals and several patented technologies, some of which are being pursued for commercialization. His administrative experience includes being the associate director for industrial liaisons of an NSF-funded NanoScience & Engineering Center (NSEC), theme leader for regenerative biology at IGB, and currently he is the Head (dean) of the Department of Chemical & Biomolecular Engineering. He also is a member of the external advisory board of the department of chemical engineering at the University of Washington, Seattle.

Nicky Oppers is a bachelor student Chemical Engineering at the Eindhoven University of Technology. Since 2010, he has been a student-member of the programme committee Scheikundige Technologie and the quality assurance committee Scheikundige Technologie. From June 2010 until September 2011, he was a board member of the study association T.S.V. 'Jan Pieter Minckelers'. As a board member he has been a student-member of the Graduate School Committee, a student-member of the committee 'Redesign Bachelor Scheikundige Technologie', a member of the student advisory committee, a member of the ad hoc committee 'regeerplannen', and the chair of the 'Stichting Overleg Scheikundig Technologische Studieverenigingen' (OSTS). Furthermore, he has been a student-assistant in the first-year-project OGO Sustainable Energy from September 2011 until February 2012.

Prof. dr. Etienne Schacht is honorary full professor in Polymer Science at the Department of Organic Chemistry of the University of Gent, Belgium. He is founder of the Polymer Chemistry & Biomaterials Research Group of the University Gent, co-author of more than 440 peer reviewed international papers, promoter of more than 50 Ph-D works; co-founder and former president of the Belgian Polymer Group (BPG); honorary member of the BPG council and currently coordinator of the BPG ThinkTank group: co-founder and former president of IBITECH, the Institute for Biomedical Technology University Gent; honorary

member of the Romanian Society for Biomaterials. He has been involved in a large number of European and national and regional research projects. Prof. Schacht was for 12 years member of the Council of the European Society for Biomaterials, where he was responsible for the European Doctoral Award programme. He is/was member of the editorial board of several international research journals and served as external expert for several European organizations. He was external coordinator of the 2011 assessment of the research at the Department of Engineering of the Free University Brussel.
At present Prof. Schacht is chairman of a committee of the FRS-F.N.R.S of the French community in Belgium.

Dr. Guy Van Lommen studied chemistry at RUCA and the VUB. In 1977 he received his doctorate at the chemistry group at the VUB. He started his career as a researcher at the NFWO and IWT and was a post-doc at the University of Arizona. From 1981 to 2007 he worked at Johnson & Johnson Pharmaceutical Research and Development (formerly Janssen Pharmaceutica) in Beerse, in the department of medicinal chemistry, initially as a researcher and then from 1992 as a senior research fellow. His research domains were situated in cardiovascular, anti-inflammatory, metabolic diseases and pain research, as well as research on herbicides. Since January 2008, he is senior director of medicinal chemistry at Galapagos Mechelen. Van Lommen is the author of several publications and has multiple patens to his name. He was a member of the Chemistry programme committee of Avans Hogeschool Breda and the Karel de Grote Hogeschool College. He has participated in the assessment of academic chemistry programmes in Flanders (2002-2003 and 2010) and the applied bachelor chemistry (2007-2008).

Appendix 2: Domain-specific framework of reference

De regiecommissie van de VSNU Kamer Scheikunde heeft in overleg met het afnemend veld onderstaand referentiekader voor de bachelor- en masteropleidingen Scheikunde, Scheikundige Technologie, Moleculaire Levenswetenschappen, Natuurwetenschappen en (Bio)-Farmaceutische Wetenschappen opgesteld. De opleidingen worden gezamenlijk aangeduid als '*chemie en verwante moleculaire opleidingen*'.

Deze bijlage bevat het referentiekader voor de bachelor- en masteropleidingen.

Karakterisering van universitaire bacheloropleidingen binnen het domein *chemie en verwante moleculaire opleidingen* in Nederland

In de Nederlandse structuur is een bacheloropleiding in de eerste plaats gericht op doorstroming naar een masteropleiding, waarbij sprake moet zijn van verbreding van de keuzemogelijkheden. Zo hebben studenten de mogelijkheid om na hun bacheloropleiding bij een andere universiteit een (Engelstalige) masteropleiding te volgen. De bacheloropleiding zal dus breed en oriënterend moeten zijn met de mogelijkheid tot differentiatie, zonder dat dit de mogelijkheden van keuze voor een masteropleiding binnen de *chemie en verwante moleculaire opleidingen* te veel beperkt. Daarnaast is uitstroom na de bacheloropleiding mogelijk, zodat de opleiding tevens een afgerond karakter dient te hebben. De bacheloropleiding dient tevens gericht te zijn op de ontwikkeling van algemene academische vaardigheden en een academische attitude, zodat afgestudeerde bachelorstudenten kunnen doorstromen naar functies in de maatschappij waarvoor dit soort vaardigheden worden gevraagd.[1]

De aanwezigheid van hooggekwalificeerde docenten met een universitaire achtergrond is van groot belang voor de aard en het niveau van het wetenschappelijk onderwijs in de bacheloropleiding. Docenten zijn gepromoveerd, hebben ervaring met en zijn betrokken bij het wetenschappelijk onderzoek. Daarnaast is een academische ambiance wat betreft infrastructuur en onderzoeksomgeving vereist.

Tegen deze achtergrond zijn onderstaande eindkwalificaties voor een Nederlandse universitaire bacheloropleiding *chemie en verwante moleculaire opleidingen* geformuleerd. Het diploma dat wordt behaald is een Bachelor of Science (BSc) in scheikunde, chemische technologie, moleculaire levenswetenschappen, natuurwetenschappen, of (Bio)-farmaceutische wetenschappen.

Eindkwalificaties van de universitaire bacheloropleiding Scheikunde/Scheikundige Technologie

Vakverbonden kennis en vaardigheden

De Bachelor of Science in Chemistry/Chemical Engineering:

- Heeft voldoende inzicht in de diverse specialisaties van de Scheikunde/Scheikundige Technologie die voortbouwen op de bachelorfase om een verantwoorde keuze te maken voor een vervolgopleiding;

[1] Bij het arbeidsmarktperspectief voor de BSc in *chemie en verwante moleculaire opleidingen* dient rekening te worden gehouden met de typisch Nederlandse situatie dat grote werkgevers voor posities, waarvoor bachelors (BSc) in aanmerking zouden kunnen komen, de voorkeur geven aan bachelors of applied science (BASc ('hbo'ers')). Deze laatsten zijn doorgaans meer opgeleid in de praktische vaardigheden, en als beroepsopleiding meer toegespitst op het werken in de chemische industrie. De meeste andere Europese landen (met uitzondering van Duitsland en Engeland) hebben geen opleidingen vergelijkbaar met de Nederlandse bachelor of applied science.

- Heeft een gedegen theoretische en praktische basiskennis van de Scheikunde[2] /Scheikundige Technologie[3] en de hulpvakken Natuurkunde, Wiskunde, Informatica, Biologie/ (Bio)technologie die toereikend is om met succes een masteropleiding op het terrein van de Scheikunde/Scheikundige Technologie te volgen;
- Heeft kennisgemaakt met wetenschappelijke onderzoeksvaardigheden en ontwerpmethoden op het gebied van de Scheikunde respectievelijk de Scheikundige Technologie en heeft daarvan een proeve van bekwaamheid afgelegd;
- Is zich bewust van de mogelijkheden op de arbeidsmarkt na eventuele afsluiting van de studie met een bachelordiploma;
- Heeft kennis van de veiligheids- en milieuaspecten van de scheikunde;
- Is zich bewust van de rol van de scheikunde in de maatschappij en van het internationale karakter van de scheikunde.

Algemene vaardigheden

De Bachelor of Science in Chemistry/Chemical Engineering beheerst de algemene vaardigheden op het gebied van het presenteren en rapporteren, informatie zoeken en verwerken, computergebruik, projectmatig werken en het werken in projectgroepen. Voor een gedetailleerde beschrijving van cognitieve en communicatieve competenties wordt verwezen naar het opleidingsspecifieke deel.

Eindkwalificaties van de universitaire bacheloropleiding Moleculaire Levenswetenschappen Wageningen

Vakverbonden kennis en vaardigheden

De Bachelor of Science in Moleculaire Levenswetenschappen Wageningen:

- Heeft voldoende inzicht in de diverse specialisaties van de moleculaire levenswetenschappen die voortbouwen op de bachelorfase om een verantwoorde keuze te maken voor een vervolgopleiding;
- Heeft een gedegen theoretische en praktische basiskennis van de moleculaire levenswetenschappen[4] en de hulpvakken Natuurkunde, Wiskunde, Informatica, Biologie/ (Bio)technologie die toereikend is om met succes een masteropleiding op het terrein van de moleculaire levenswetenschappen te volgen;
- Heeft kennisgemaakt met wetenschappelijke onderzoeksvaardigheden en ontwerpmethoden op het gebied van de moleculaire levenswetenschappen en heeft daarvan een proeve van bekwaamheid afgelegd;
- Is zich bewust van de mogelijkheden op de arbeidsmarkt na eventuele afsluiting van de studie met een bachelordiploma;
- Heeft kennis van de veiligheids- en milieuaspecten van de scheikunde en genetische modificaties;
- Is zich bewust van de rol van de scheikunde en (bio)technologie in de maatschappij en van het internationale karakter ervan.

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[2] Te weten analytische chemie, anorganische chemie, biochemie, fysische chemie, organische chemie.

[3] Te weten analytische chemie, anorganische chemie, biochemie, fysische chemie, organische chemie, fysische transportverschijnselen, procesontwerp, chemische reactorkunde, scheidingsmethoden, procestechnologie, systeem- en regeltechniek, materiaalkunde.

[4] Te weten analytische chemie, anorganische chemie, biochemie, fysische chemie, organische chemie, microbiologie, biochemie, moleculaire biologie.

Algemene vaardigheden

De Bachelor of Science in Moleculaire Levenswetenschappen Wageningen beheerst de algemene vaardigheden op het gebied van het presenteren en rapporteren, informatie zoeken en verwerken, computergebruik, projectmatig werken en het werken in projectgroepen. Voor een gedetailleerde beschrijving van cognitieve en communicatieve competenties wordt verwezen naar het opleidingsspecifieke deel.

Eindkwalificaties van de universitaire bacheloropleiding Moleculaire Levenswetenschappen Nijmegen

Vakverbonden kennis en vaardigheden
De bachelor of Science in Moleculaire Levenswetenschappen Nijmegen:

- Is in staat, op basis van zijn kennis van de chemie, biologie, medische wetenschappen en bijbehorende hulpwetenschappen, om een onderzoek naar de moleculaire achtergronden van biomedische processen kritisch te analyseren, waarbij hij gebruik weet te maken van de onderlinge verbanden tussen genoemde disciplines;
- Is in staat, gebaseerd op zijn kennis en inzicht in de moleculaire structuur en reactiviteit van zowel de levende als de niet-levende materie, om theoretische en praktische analyses te verrichten aan moleculaire reacties en interacties;
- Is in staat, gebaseerd op zijn kennis en inzicht in de genetische grondslag van levende processen, om de relatie aan te geven tussen genetische informatie en biomedische processen, en daarmee een verklaring te geven voor de rol van individuele moleculen bij ziekteprocessen;
- Is in staat een verscheidenheid aan relevante, basale technieken te hanteren en heeft het vermogen zich nieuwe technische vaardigheden eigen te maken;
- Is in staat, gebaseerd op zijn theoretische en praktische vaardigheden, om een experiment op het gebied van de moleculaire levenswetenschappen probleemgericht op te zetten aan de hand van een door zichzelf gestelde hypothese, daarvan de resultaten systematisch te bewerken en kritisch te interpreteren, en vervolgens conclusies uit dit onderzoek te trekken;
- Is in staat de resultaten van zijn onderzoek op een heldere manier schriftelijk te verwoorden, gebaseerd op de opbouw van een wetenschappelijk artikel;
- Is na een oriëntatie op de mogelijke afstudeervarianten en afweging van maatschappelijke perspectieven in staat om een gefundeerde keuze te maken voor een masteropleiding. Is daarbinnen in staat om zich in een periode van een jaar theoretisch en experimenteel te specialiseren in een vakgebied dat zich bezig houdt met onderzoek aan de moleculaire basis van biologische en biomedische processen.

Algemene vaardigheden
De Bachelor of Science in Moleculaire Levenswetenschappen Nijmegen beheerst de algemene vaardigheden op het gebied van het presenteren en rapporteren, informatie zoeken en verwerken, computergebruik, projectmatig werken en het werken in projectgroepen. Voor een gedetailleerde beschrijving van cognitieve en communicatieve competenties wordt verwezen naar het opleidingsspecifieke deel.

Eindkwalificaties van de universitaire bacheloropleiding Natuurwetenschappen

Vakverbonden kennis en vaardigheden

De Bachelor of Science in Natuurwetenschappen:

- Heeft een algemeen inzicht verworven in de kernbegrippen en kenmerkende werkwijzen van de constituerende disciplines;
- Heeft zich daartoe de belangrijkste algemene biologisch-chemische, fysisch-chemische en biologisch-fysische denk- en werkwijzen hebben eigen gemaakt, nodig om multidisciplinaire natuurwetenschappelijke problemen te begrijpen in hun maatschappelijke en wetenschappelijke context;
- Kan concrete wetenschappelijke problemen binnen de natuurwetenschappen analyseren door middel van abstractie en op basis van natuurwetenschappelijke theorieën en modellen;
- Kan daartoe zelfstandig kennisbronnen in het relevante wetenschapsgebied opsporen, raadplegen en bewerken;
- Kan bestaand onderzoek naar vraagstukken van natuurwetenschappelijke aard begrijpen vanuit een basiskennis van de betreffende disciplines;
- Kan natuurwetenschappelijke vraagstellingen omzetten in een toetsbare hypothese volgens de criteria van empirisch onderzoek;
- Kan onder begeleiding deze hypotheses toetsen in de vorm van experimenten en daaraan gerelateerd theoretisch onderzoek;
- Is in staat zijn de maatschappelijke discussie over vraagstukken en problemen op multidisciplinair natuurwetenschappelijk gebied kritisch te volgen;
- Is in staat zijn een gemotiveerde keuze te maken voor ofwel het vervolg van de studie op masterniveau ofwel voor uitstroom naar een andere opleiding dan wel een functie in de samenleving.

Algemene vaardigheden
De Bachelor of Science in Natuurwetenschappen beheerst de algemene vaardigheden op het gebied van het presenteren en rapporteren, informatie zoeken en verwerken, computergebruik, projectmatig werken en het werken in projectgroepen. Voor een gedetailleerde beschrijving van cognitieve en communicatieve competenties wordt verwezen naar het opleidingsspecifieke deel.

Eindkwalificaties van de universitaire bacheloropleiding Farmaceutische Wetenschappen

Vakverbonden kennis en vaardigheden
De Bachelor of Science in Farmaceutische wetenschappen:

- Heeft voldoende inzicht in de diverse specialisaties van de farmaceutische wetenschappen die voortbouwen op de bachelorfase om een verantwoorde keuze te maken voor een vervolgopleiding;
- Heeft een gedegen theoretische en praktische basiskennis van de scheikunde (te weten analytische chemie, biochemie, organische chemie, theoretische chemie) en de farmaceutische wetenschappen, alsmede de hulpvakken natuurkunde, wiskunde, informatica, biologie en medische fysiologie die toereikend is om met succes een masteropleiding op het terrein van de farmaceutische wetenschappen te volgen;
- Heeft kennis gemaakt met wetenschappelijke onderzoeksvaardigheden op het gebied van de farmaceutische wetenschappen en heeft daarvan een proeve van bekwaamheid afgelegd;

- Is zich bewust van de mogelijkheden op de arbeidsmarkt na eventuele afsluiting van de studie met een bachelordiploma;
- Heeft kennis van de veiligheids- en milieuaspecten van de farmaceutische wetenschappen;
- Is zich bewust van de rol van de farmaceutische wetenschappen in de maatschappij en van het internationale karakter van de farmaceutische wetenschappen.

Algemene vaardigheden
De Bachelor of Science in Farmaceutische wetenschappen beheerst de algemene vaardigheden op het gebied van het presenteren en rapporteren, informatie zoeken en verwerken, computergebruik, projectmatig werken en het werken in groepen. Voor een gedetailleerde beschrijving van cognitieve en communicatieve competenties wordt verwezen naar het opleidingsspecifieke deel.

Eindkwalificaties van de universitaire bacheloropleiding Bio-Farmaceutische Wetenschappen

Vakverbonden kennis en vaardigheden
De Bachelor of Science in Bio-Farmaceutische Wetenschappen:

- Heeft voldoende inzicht in de diverse specialisaties van de (bio-)farmaceutische wetenschappen en aanpalende opleidingen op het gebied van de chemie en de moleculaire levenswetenschappen die voortbouwen op de bachelorfase om een verantwoorde keuze te maken voor een vervolgopleiding;
- Heeft een gedegen theoretische en praktische basiskennis van de scheikunde (organische en analytische chemie, biochemie, moleculaire biologie) en de bio-farmaceutische wetenschappen (ontwikkeling en effecten van geneesmiddelen, actuele concepten en werkwijzen van het geneesmiddelenonderzoek), alsmede hulpvakken (wiskunde, informatica, fysiologie, pathologie, anatomie, immunologie), die toereikend is om met succes een masteropleiding op het terrein van de bio-farmaceutische wetenschappen of een verwant vakgebied te volgen;
- Heeft overzicht gekregen van het vakgebied van het geneesmiddelenonderzoek en inzicht verkregen in de positie van verschillende deelgebieden binnen dit vakgebied en hun relatie tot aanpalende wetenschapsgebieden;
- Heeft inzicht verkregen in de wijze waarop bij geneesmiddelenonderzoek gangbare hypothesen via experimenten kunnen worden getoetst en hoe verworven kennis kan leiden tot theorievorming;
- Heeft kennis gemaakt met wetenschappelijke onderzoeksvaardigheden op het gebied van geneesmiddelenonderzoek en heeft daarvan een proeve van bekwaamheid afgelegd;
- Is zich bewust van de mogelijkheden op de arbeidsmarkt na eventuele afsluiting van de studie met een bachelordiploma;
- Heeft kennis van de veiligheids- en milieuaspecten van de bio-farmaceutische wetenschappen;
- Is zich bewust van de rol van het geneesmiddelenonderzoek in de maatschappij en van het internationale karakter van de (bio-)farmaceutische wetenschappen.

Algemene vaardigheden
De Bachelor of Science in Bio-Farmaceutische Wetenschappen beheerst de algemene vaardigheden op het gebied van het presenteren en rapporteren, informatie zoeken en verwerken, computergebruik, projectmatig werken en het werken in groepen. Voor een gedetailleerde beschrijving van cognitieve en communicatieve competenties wordt verwezen naar het opleidingsspecifieke deel.

Globale curriculumstructuur van een universitaire bacheloropleiding *chemie en verwante moleculaire opleidingen* in Nederland

De bacheloropleiding bestaat uit een basisprogramma van minimaal twee studiejaren. Het derde studiejaar van de bacheloropleiding omvat een substantieel deel aan chemie of verwante moleculaire vakken binnen het domein. Daarnaast kan maximaal een derde door de studenten worden ingevuld als keuzeruimte. Het is wenselijk om in het derde studiejaar ruimte in het programma te hebben voor oriëntatie op de praktijk. In het derde jaar wordt een individuele proeve van bekwaamheid afgelegd. Dat kan een onderzoeksscriptie zijn, een ontwerp of een stage.

Eindkwalificaties van de Masteropleiding *chemie en verwante moleculaire opleidingen Nederland* (onderzoeksspecialisatie)

Doel Masteropleidingen
In het kader van de introductie van de Bachelor-Masterstructuur is het wenselijk om moderne Masteropleidingen aan te bieden, die ook internationaal in aanzien staan. Om deze doelstelling te bereiken dienen moderne, flexibele curricula te worden geïntroduceerd die inspelen op actuele ontwikkelingen op het gebied van wetenschappelijk onderzoek en wetenschappelijk onderwijs.
De Masteropleidingen (MSc) *chemie en verwante moleculaire opleidingen* in Nederland beogen:

- Studenten op te leiden voor zelfstandige beroepsuitoefening. Hieronder dient in dit verband te worden verstaan het uitvoeren van fundamenteel wetenschappelijk onderzoek, alsook het werken met de bestaande wetenschappelijke kennis en het toepassen daarvan op steeds andere en nieuwe praktijksituaties;
- Interdisciplinaire samenwerking in wetenschapsontwikkeling vanuit een (bio)chemische achtergrondkennis actief te stimuleren;
- Vaardigheden, kennis en inzicht te ontwikkelen in een specialisme van het vakgebied, met het accent op inzicht in en de aanpak van wetenschappelijke vraagstellingen;
- Onderwijs te bieden dat studentgericht is en naar internationale maatstaven van hoge kwaliteit;
- Een deel van de te verwerven kennis en inzicht op te laten doen in een internationaal verband;
- Een inspirerende academische leeromgeving en studeerbare paden aan te bieden aan een veeleisende en heterogeen samengestelde studentenpopulatie;
- Het vermogen te ontwikkelen om verworven kennis aan anderen over te dragen.

Voor de inrichting van het onderwijs van de opleiding geldt dat kennis en vaardigheden moeten worden opgedaan in soortgelijke situaties als waarin zij uiteindelijk toegepast worden. Om deze reden dient op een heldere wijze te worden beschreven hoe de eind- kwalificaties van de opleiding tot uiting dienen te komen in het onderwijsprogramma van de opleiding.

Algemene eindkwalificaties voor de Masteropleidingen
De onderstaande algemene eindkwalificaties kunnen voor alle Masteropleidingen Chemie en verwante moleculaire opleidingen worden geformuleerd:

De afgestudeerde in dit domein van chemie en verwante moleculaire opleidingen:

- Dient in staat te zijn de vakliteratuur op de voor hem relevante deelgebieden in algemene zin bij te houden en te benutten;
- Dient in staat te zijn zich in een redelijke tijd in te werken in een deelgebied van het domein chemie en verwante moleculaire opleidingen;
- Dient in staat te zijn een onderzoekswerkplan te formuleren op basis van een globale vraagstelling in een deelgebied van het domein chemie en verwante moleculaire opleidingen;
- Dient in staat te zijn onderzoeksresultaten te analyseren en te interpreteren, en dient in staat te zijn er conclusies uit te trekken;
- Dient inzetbaar te zijn in functies waarin kennis en onderzoeksvaardigheden op het gebied van de chemie en verwante moleculaire opleidingen vereist zijn;

- Dient voldoende kennis van en inzicht te hebben in de maatschappelijke rol van het domein van de betreffende opleiding om tot een verantwoorde beroepskeuze en beroepsuitoefening te kunnen komen;
- Dient inzicht te hebben in de rol van chemie en verwante moleculaire opleidingen in een duurzame samenleving;
- Dient in staat te zijn samen te werken met anderen, kennis aan anderen over te dragen, een voordracht te houden, een verslag dan wel internationaal toegankelijke wetenschappelijke publicatie te schrijven en deel te nemen aan een discussie over een vakonderwerp;
- Dient zelfstandig in staat te zijn om experimenten en de bijbehorende controles te bedenken, uit te voeren, en te evalueren;
- Dient de verkregen resultaten en conclusies te kunnen plaatsen in het kader van door anderen verkregen resultaten.

Het is goed mogelijk dat er naast bovengenoemde algemene eindkwalificaties nog extra eindkwalificaties worden geformuleerd. Hierbij kan gedacht worden aan een communicatie-, educatie- en managementvariant (die zijn in het algemeen faculteitsbreed, en additief op de vakeindkwalificaties), maar ook aan verschillen tussen opleidingen. Voor een meer gedetailleerde beschrijving van deze extra eindkwalificaties voor de verschillende Master-opleidingen in het domein van *chemie en verwante moleculaire opleidingen* wordt verwezen naar de verschillende opleidingsspecifieke delen. Ter illustratie is dit hieronder gegeven voor Scheikunde en Scheikundige Technologie.

Enkele Masterspecifieke eindkwalificaties voor Scheikundige Technologie
Voor de opleidingen Scheikundige Technologie zijn een aantal extra eindkwalificaties geformuleerd gericht op de meer technische component van deze opleidingen:

- Dient in staat te zijn een realistisch proces te ontwerpen, inclusief het invullen van de deelstappen, zoals het opstellen van stroomdiagrammen, het omschrijven van apparatuur en processtromen en warmtebeheren het berekenen van het gedrag van procesapparatuur; alsmede het aangeven van alternatieven voor deelstappen;
- Dient inzicht te hebben in (1) de relatie procesproduct; (2) het minimaliseren van bijproduct- en afvalstromen; (3) bereidingsmethoden van klassen van moleculen en van producten;
- Dient kennis te hebben van de formulering van een aantal producten, de specificaties, de analysemethoden en de wisselwerking tussen de componenten en van voor de vervaardiging van chemische of biotechnologische producten belangrijke fysische en mechanische werkwijzen.

Enkele Masterspecifieke eindkwalificaties voor Scheikunde
Voor de opleidingen Scheikunde zijn een aantal extra eindkwalificaties geformuleerd gericht op de meer wetenschappelijke component van deze opleidingen:

- Dient in staat te zijn om te beoordelen of de eigenschappen van gemaakte producten en de eventuele bijproducten of afvalproducten op korte of langere termijn tot ongewenste neveneffecten kunnen leiden;
- Dient in staat te zijn om – naast het hoofdgebied van studie – op een tweede onderdeel binnen de chemie op academisch niveau een vraagstelling op onderzoeksgebied te kunnen aanpakken.

NB1: Voor de specialistische MSc-opleidingen van een sterk interdisciplinair karakter, zoals nanotechnologie, drug innovation, die in het algemeen worden uitgevoerd in samenwerking met (of primair door) andere vakgebieden (natuurkunde, biologie, farmacie), kunnen soortgelijke meer specifieke eindkwalificaties worden opgesteld. In het algemeen kan men daar niet met elk BSc-pakket S (of ST) instromen.

Appendix 3: Intended learning outcomes

Bachelor's programmes

Final qualifications for the Chemistry programme

Chemistry-related qualifications
The Bachelor of Science in Chemistry:

CH.B1 has sufficient knowledge and understanding of the fields of Chemistry to make a sensible choice for a subsequent educational program
CH.B2 has adequate theoretical and practical knowledge to successfully complete a Master's degree program in Chemistry
CH.B3 is introduced to scientific research methods and has given proof of his abilities and skills
CH.B4 is familiar with his potential on the job market
CH.B5 is acquainted with the safety and environmental aspects of Chemistry
CH.B6 is aware of the role of Chemistry in society and of the international nature of Chemistry

General academic qualifications
The Bachelor of Science in Chemistry:
CH.B7 possesses general communication skills, covering both written and oral communication, possesses interpersonal skills, relating to the ability to interact with other people and to engage in team work, as well as information-retrieval and information technology skills

Dublin descriptor	Final qualifications
Knowledge and understanding	Chemistry: CH.B2, CH.B3, CH.B5
Applying knowledge and understanding	Chemistry: CH.B3, CH.B5
Making judgements	Chemistry: CH.B1, CH.B4, CH.B6
Communication	Chemistry: CH.B3, CH.B7
Learning skills	Chemistry: CH.B1, CH.B7

Correlation between Dublin descriptors and final qualifications.

Final qualifications for the Molecular Life Sciences programme

Molecular Life Sciences-related qualifications
The Bachelor of Science in Molecular Life Sciences:

MLS.B1 is, on the basis of a broad knowledge of Chemistry, Biology, Medical Sciences and related auxiliary sciences, able to critically analyse research concerning the molecular background of biomedical processes, applying the logical link between the disciplines mentioned
MLS.B2 is, on the basis of knowledge of and insight into the molecular structure and reactivity of both living and nonliving systems, able to perform theoretical and practical analyses of molecular reactions and interactions
MLS.B3 is, on the basis of knowledge of and insight into the genetic basis of living processes, able to give the relationship between genetic information and biomedical processes,

and as such give an explanation of the role that individual molecules play during disease processes

MLS.B4 is able to employ a variety of relevant, basal techniques and has the capacity to acquire new technical skills

MLS.B5 is, on the basis of theoretical and practical skills, able to set up an experiment in the field of Molecular Life Sciences, problem oriented and on the basis of a hypothesis formulated by his own, systematically shape and critically interpret the results of the experiment, and subsequently draw conclusions from this research

MLS.B6 is able to make a clearly written report on the results of his research, based on the build-up of a scientific article

MLS.B7 is, following an orientation concerning the possible graduation directions and consideration of societal perspectives, able to make a solid choice for a proper Master program. Is, in this program and within a period of one year, able to specialize theoretically and practically in a field dealing with research on the molecular basis of biological and biomedical processes

General academic qualifications

The Bachelor of Science in Molecular Life Sciences:

MLS.B8 possesses general skills to orally present and make written reports, search for and process information, use computers, and work by means of projects and within project groups.

Dublin descriptor	**Final qualifications**
Knowledge and understanding	Molecular Life Sciences: MLS.B2, MLS.B3
Applying knowledge and understanding	Molecular Life Sciences: MLS.B5
Making judgements	Molecular Life Sciences: MLS.B1, MLS.B7, MLS.B8
Communication	Molecular Life Sciences: MLS.B6, MLS.B8
Learning skills	Molecular Life Sciences: MLS.B4, MLS.B8

Correlation between Dublin descriptors and final qualifications.

Final qualifications for the Natural Sciences program

A Bachelor of Science in Natural Sciences:

NS.B1 has a general understanding of core concepts and typical methods of the constituting disciplines

NS.B2 is acquainted with the relevant Biological-Chemical, Chemical-Physical, and Physical-Biological working and thinking methods, needed to understand multi-disciplinary scientific problems in their societal context

NS.B3 is able to analyze scientific problems within the Natural Sciences using abstraction and scientific theories and models

NS.B4 to that end is able to independently locate, consult and apply sources within the relevant field

NS.B5 is able to understand scientific questions using basic knowledge from the relevant scientific field

NS.B6 is able to transform a scientific question into a verifiable hypothesis according to the criteria from empirical research
NS.B7 is able to test this hypothesis under guidance using experiments and accompanying theoretical research
NS.B8 is able to make a written and oral report in which results are analyzed and discussed critically and objectively with respect to their reliability and relevance
NS.B9 is able to critically follow the societal discussion about issues within the multi-disciplinary scientific field
NS.B10 is able to make an informed selection for a Master study, another form of further education, or a function within society

Dublin descriptor	**Final qualifications**
Knowledge and understanding	Natural Sciences: NS.B1, NS.B2
Applying knowledge and understanding	Natural Sciences: NS.B2, NS.B3, NS.B5, NS.B6, NS.B7
Making judgements	Natural Sciences: NS.B6, NS.B7, NS.B8, NS.B9
Communication	Natural Sciences: NS.B8
Learning skills	Natural Sciences: NS.B2, NS.B4, NS.B5, NS.B10

Correlation between Dublin descriptors and final qualifications.

Master's programmes

General final qualifications for the Chemistry program

The graduate in Chemistry:

CH.M1 has a thorough theoretical and practical knowledge of modern-day chemistry
CH.M2 must be able to keep up with the literature in his/her field of science and must be able to use it
CH.M3 must be able to acquire knowledge in other fields of chemistry in an acceptable time frame
CH.M4 must be able to formulate a research planning on the basis of a general chemical question
CH.M5 must be able to analyze results of investigations, interpret them and draw conclusions
CH.M6 can be employed in functions in which chemical knowledge and research skills are needed
CH.M7 is sufficiently aware of the role of chemistry in society to make a justified choice of profession and practice of profession
CH.M8 can deal with safety and environmental issues of chemistry and has an adequate understanding of the role of chemistry in a sustainable society
CH.M9 is able to present his/her work to specialists in the field, but also to a laymen audience, both orally and written and has adequate interpersonal skills, relating to the ability to interact with other people and to engage in team working
CH.M10 is able to set up and perform relatively independently experiments and checks
CH.M11 must be able to put new results in the framework of results obtained by others

General final qualifications for the Molecular Life Sciences program
The graduate in Molecular Life Sciences:

MLS.M1 is, on the basis of a broad knowledge of the molecular mechanisms underlying biological and biomedical processes and combined with specialist knowledge and research experience in at least one subarea of Molecular Life Sciences, able to set up and conduct research designed to acquire new knowledge of and insights into this research area

MLS.M2 is able to independently identify, critically read and comprehend relevant, up-to-date international literature from different disciplines and integrate the literature into a common theme

MLS.M3 is able to formulate new questions and hypotheses in the field of Molecular Life Sciences and to select the correct paths and research methods to resolve the questions/hypotheses, taking into account the availability of services and resources

MLS.M4 is able to set up and conduct a scientific experiment independently, including the appropriate controls, as well as interpret and evaluate the results obtained in terms of well-founded scientific conclusions

MLS.M5 is able to clearly describe research results in a written report, in accordance with the standards of a scientific article

MLS.M6 is able to show independent professional practice whereby, depending on the chosen direction, the emphasis is on conducting fundamental scientific research (under supervision), transferring existing scientific knowledge or applying existing scientific knowledge

MLS.M7 is able to provide insight and think problem-oriented with a critical attitude towards scientific insights and, also based on an ability to abstract, to analyze a scientific problem by reducing the problem to testable subproblems, whereby in the analysis the essentials are discerned from side issues, and to achieve a synthesis from solutions of subproblems, to put the synthesis into a scientific context, and as such contribute to the general development of theories

MLS.M8 is able to practice his/her profession with social responsibility, considering the ethical consequences of research in the field of Molecular Life Sciences and along with an ability to reflect on the potential effects towards society and sustainability of the community

MLS.M9 is, through self-reflection and discussions with others, able to evaluate his or her own performance

MLS.M10 is able to follow the general scientific developments in the field of Molecular Life Sciences, particularly within the specializations chosen, besides current specializations, to master another Molecular Life Sciences area at a specialist level

MLS.M11 is able to communicate with professional colleagues working in the same field about scientific knowledge at a specialist level

General final qualifications for the Natural Sciences program
The graduate in Natural Sciences:

NS.M1 has specialized insight in at least one interdisciplinary field of Natural Sciences (i.e. one of the related fields, Chemistry/Biology, Biology/Physics and Physics/Chemistry)

NS.M2 has sufficient knowledge in this specialized field to carry out scientific research under supervision

NS.M3 has the ability to read scientific articles about their chosen specializations comprehensively, to master newly acquired knowledge within those fields of specialization and to integrate it into existing knowledge
NS.M4 has the ability to formulate new definitions of questions and hypotheses within their chosen specializations and to select the correct paths and research methods for resolving these questions
NS.M5 has the ability to follow general scientific developments within the chosen interface of Natural Sciences
NS.M6 has the ability to adapt at a specialist level of another sub-specialization within the chosen interface of Natural Sciences
NS.M7 has the ability, under supervision, to set up experimental or theoretical research, to treat systematically and critically interpret the research results and to formulate conclusion
NS.M8 has the ability to present research results, both orally with clear delivery and, in written form, in a scientific article for professional colleagues and for a non-specific, expert audience
NS.M9 has the ability to communicate about scientific knowledge at specialist level with professional colleagues working in the same discipline
NS.M10 has sufficient knowledge of and insight in the societal significance of the Natural Sciences to be able to reflect on social problems based on the knowledge gained from the Natural Sciences

Specific final qualifications for the O-direction
The graduate in the O-direction of Chemistry:

CH.O1 is able to set up and perform independently experiments, design appropriate checks and evaluate the results in a given time frame
CH.O2 is able to formulate a vision on the scientific developments in his/her field of Chemistry
CH.O3 can analyze independently experiments and chemical processes, interpret the results and present the outcome at different abstraction levels
CH.O4 is able to write independently the basis for a scientific publication or research proposal

The graduate in the O-direction of Molecular Life Sciences:

MLS.O1 is, based on specialized knowledge and research experience in two sub-areas within the field of Molecular Life Sciences, able to set up and perform independently experiments, design appropriate checks and evaluate the results in a given time frame
MLS.O2 is able to write independently the basis for a scientific publication or research proposal
MLS.O3 is, based on a critical analysis of research results, able of breaking new ground in research areas
MLS.O4 is, in addition to his or her current specializations, able of working at a specialist level of another branch of Molecular Life Sciences

The graduate in the O-direction of Natural Sciences:

NS.O1 has sufficient knowledge and skills to carry out independent research within at least one interdisciplinary subject in the Natural Sciences

NS.O2 is able to critically analyze research results and based on these results is able to carry research to the next level

Specific final qualifications for the C-, E- and MT-directions
The graduate in the C-direction:

C1 has knowledge and skills derived from communication studies
C2 is capable of designing, conducting, delegating and supervising communication research, independently and methodically
C3 is able to contribute to the analysis and approach to problems that occur in the interaction between science, technology and society
C4 has an overview of the interaction and communication processes that occur in social discourse
C5 is able to work effectively in a policy team with a broad composition (interaction between science, technology and society) and is open for other types of knowledge (intuitive and practical experience)

The graduate in the E-direction is able to fulfil the following roles as a teacher, and has the capacity to continued development within these:

E1 the classroom instructor (didactic actions)
E2 the expert (in science education)
E3 the pedagogue (social aspects)
E4 the reflective professional (skills for self-improvement as a professional)
E5 the instructor outside the classroom (additional tasks, management and working with colleagues)
E6 the developer and researcher (analyze and develop educational material)

The graduate in the MT-direction:

MT1 is familiar with the language of management, in addition to the language of his own natural-science specialization
MT2 is capable of conducting research independently with regard to problems that occur at the interface of technology, organization and society
MT3 is capable of contributing to the solution of management problems
MT4 is capable of effectively cooperating and communicating in a multi-disciplinary team

Dublin descriptor	**General Chemistry qualifications**	**Specific qualifications (one set)**
Knowledge and understanding	CH.M1, CH.M2, CH.M3, CH.M7, CH.M8	CH.O1, CH.O3/C1–C5/MT1–MT4/E1, E2, E4, E6
Applying knowledge and understanding	CH.M2, CH.M4, CH.M5, CH.M6, CH.M10, CH.M11	CH.O1, CH.O3/C2, C3, C5/MT2–MT4/E1, E3, E4, E6
Making judgments	CH.M7, CH.M8, CH.M11	CH.O2/C3–C5/MT3–MT4/E2, E3–E5
Communication	CH.M6, CH.M9	CH.O4/C5/MT4/E1–E5
Learning skills	CH.M1, CH.M2, CH.M9	C2, C5/MT2/E1, E4, E6

Correlation between Dublin descriptors and Chemistry final qualifications.

Dublin descriptor	General Molecular Life Sciences qualifications	Specific qualifications (one set)
Knowledge and understanding	MLS.M1, MLS.M3, MLS.M4	MLS.O1/C1–C5/MT1–MT4/E1, E2, E4, E6
Applying knowledge and understanding	MLS.M2, MLS.M3, MLS4	MLS.O3/C2, C3, C5/MT2–MT4/E1, E3, E4, E6
Making judgements	MLS.M7, MLS.M8, MLS.M9, MLS.M10	C3–C5/MT3–MT4/E2, E3–E5
Communication	MLS.M5, MLS.M11	MLS.O2/C5/MT4/E1–E5
Learning skills	MLS.M6	MLS.O4/C2, C5/MT2/E1, E4, E6

Correlation between Dublin descriptors and Molecular Life Sciences final qualifications.

Dublin descriptor	General Natural Sciences qualifications	Specific qualifications (one set)
Knowledge and understanding	NS.M1-NS.M10	NS.O1, NS.O2/C1–C5/MT1–MT4/E1, E2, E4, E6
Applying knowledge and understanding	NS.M3, NS.M4, NS.M6	NS.O1/C2, C3, C5/MT2–MT4/E1, E3, E4, E6
Making judgments	NS.M3, NS.M4, NS.M7, NS.M8, NS.M10	NS.O2/C3–C5/MT3–MT4/E2, E3–E5
Communication	NS.M8, NS.M9	C5/MT4/E1–E5
Learning skills	NS.M3, NS.M4, NS.M5, NS.M6	NS.O1/C2, C5/MT2/E1, E4, E6

Correlation between Dublin descriptors and Natural Sciences final qualifications.

Appendix 4: Overview of the curricula

Bachelor's curriculum

Common molecular basis of the three Bachelor's degree programs

Theme	Course	ec	Quarter
Structure and Reactivity	Atoom- en Molecuulbouw	3	1
	Moleculaire structuur	3	2
	Reacties en kinetiek	3	3
	Project reacties en kinetiek[1]	6	3
	Coördinatiechemie	3	5
Functionality	Biomoleculen	3	1
	Biochemische processen	3	2
	Project Biochemie1	6	2
	Thermodynamica	3	3
	DNA technieken	3	5
Methods	Bioinformatica	3	5
	Practicum chemische analyse	3	1
	Spectroscopische technieken	3	4
	Statistiek	3	5
	Programmeren in Matlab	3	6
Auxiliary components	Wiskunde 1	3	1
	Mechanica 1A/B	3	1
	Wiskunde 2	3	2
	Wiskunde 3	3	3
	Electriciteit en Magnetisme 1A/B	3	4

1 This is a 3 ec course for Natural Sciences students, but has been removed as of September 2011.

Components of the bachelor's programmes

Chemistry Program components		Ec
• Compulsory courses		120
Including *Academische Vorming*	(3 ec)	
Including *Schrijfcursus*	(3 ec)	
Including *Inleiding Filosofie en Ethiek*	(3 ec)	
• Differentiation		48
Including optional minor program and/or elective	(30-42 ec)	
Including free elective courses	(6 ec)	
• Bachelor Thesis		12

Molecular Life Sciences Program		ec
• Compulsory courses		99
Including *Academische Vorming*	(3 ec)	
Including *Schrijfcursus*	(3 ec)	
Including *Inleiding Filosofie en Ethiek*	(3 ec)	
• Differentiation		69
Including priority courses	(42 ec)	
Including elective courses	(21 ec)	
Including free elective courses	(6 ec)	
• Bachelor Thesis		12
Optional extension of Bachelor Thesis	(3 ec)	

Natural Sciences Program components		ec
• Compulsory courses		120
Including *Academische Vorming*	(3 ec)	
Including *Schrijfcursus*	(3 ec)	
Including Inleiding *Filosofie en Ethiek*	(3 ec)	
• Differentiation		48
Including optional minor program or elective	(15-30 ec)	
Including specialization specific compulsory	(12-27 ec)	
Including free elective courses	(6 ec)	
• Bachelor Thesis		12

Matrix learning outcomes, courses, teaching format and assessment method

Chemistry

C = compulsory; **E** = elective; **CH.Bx** = Final qualification

Teaching format: l = lectures, e = tutorials (exercise hours), p = practical course, r = response hours, t = tutor hours, c = computer aided education, g = working in groups

Test forms: we = written examination, pw = practical work, ce = computer examination, op oral presentation, a = assignments, r = report

Year	Quarter	C	E	Course name	ec	CH.B1	CH.B2	CH.B3	CH.B4	CH.B5	CH.B6	CH.B7	Teaching format	Test forms
1	1	x		Chemische analyse	3	x	x	x					p	pw, r, we
1	1	x		Mechanica 1A	3	x	x						l, e, t	we
1	1	x		Wiskunde 1	3	x	x						l, e	We
1	1	x		Biomoleculen	3	x	x						l, e	we
1	1	x		Atoom- en molecuulbouw	3	x	x						c, l, t, e	we
1	1	x		Inleiding in de filosofie en ethiek	3		x			x	x	x	l, a	a
1	2	x		Wiskunde 2	3	x	x						l, e	we
1	2	x		Project biochemie	6	x	x	x		x		x	l, p	pw, r, op
1	2	x		Biochemische processen	3	x	x						l, e	we
1	2	x		Moleculaire structuur	3	x	x						l,e,r,c	we
1	3	x		Project reacties en kinetiek	6	x	x	x		x		x	p	pw, r, op
1	3	x		Reacties en kinetiek	3	x	x						l, t	we
1	3	x		Wiskunde 3	3	x							l, e	we
1	3	x		Thermodynamica	3	x		x					l, e, t	we
1	4	x		Electriciteit en magnetisme 1A	3	x	x						l, e, p	we
1	4	x		Project thermodynamica	6	x	x	x		x		x	c	pw, r, op
1	4	x		Spectroscopische technieken	3	x	x						l, e, c	we,ce
1	4	x		Milieuchemie en duurzaamheid	3	x				x	x		l, r, c	we, op
1	1,2,3,4	x		Orientatiecursus CEM: schrijfvaardigheid	3							x	e	a
2	1	x		Lineaire algebra	3	x	x						l, e	we
2	1	x		DNA-technologie	3	x	x	x		x	x		l, p, r	we, pw, r
2	1	x		Bioinformatica	3	x	x	x				x	l, c	we
2	1	x		Coördinatiechemie	3	x	x						l, e	we

2	1		x	Biochemie-Moleculaire biologie II	6	x	x	x		x		x	l, e, r, g	we, op
2	1	x		Statistiek	3	x	x						l, e, c	we
2	2	x		Kristalstructuur	3	x	x	x		x			l, e	we
2	2	x		Programmeren in Matlab	3	x	x						c	pw, a, op
2	2		x	Practicum anorganische chemie	3	x	x	x		x		x	p	pw, r
2	2	x		Mechanica 2A	3	x	x						l, e, t	we
2	3	x		Quantummechanica 1	3	x	x						l, e, r	we
2	3	x		Fourier analyse	3	x	x						c, e	we, ce
2	3		x	Bioanorganische chemie	3	x	x						l, e	we
2	3	x	x	Microscopische technieken	3	x	x	x					l, e, c	we, pw
2	3		x	Toxicologie	6	x	x			x			l, e, r, c, g	we, a
2	3		x	Practicum NMR	3	x	x	x		x		x	c	pw, a
2	4	x		Electriciteit en magnetisme 2A	3	x	x						l, e, t	we
2	4		x	Practicum gecondenseerde materie	3	x	x	x		x		x	l, p	pw, r
2	4	x		Quantummechanica 2	3	x	x						l, e, r	we
2	4	x	x	Synthese biomoleculen	3	x	x						l, r	we
2	4	x	x	Project synthese biomoleculen	6	x	x	x		x		x	l, e, r, c	we, pw, r
2	2	x		Thermodynamica 2	3	x	x	x					l, e, p	we, pw
2	4	x		Gecondenseerde materie	3	x	x						l, e	we
3	1		x	Inleiding in de chemie en fysica van de atmosfeer	3	x	x	x		x	x		l, e	we
3	1		x	Chemische binding	3	x	x						l, e	we
3	1		x	Magnetische resonantie	6	x	x	x				x	l, e, p, c	we, pw, ce
3	1		x	Statistische thermodynamica	6	x	x	x				x	l, e, c	we, ce
3	1		x	Structuur biomoleculen	3	x	x	x				x	l, e, c	we, pw, op
3	1		x	Metaalorganische chemie	6	x	x				x		l, e	we
3	2		x	Organische chemie 1	6	x	x						l	we
3	2		x	Quantumchemie	3	x	x						l, e, c	we, ce
3	2	x	x	Atoom- en molecuulspectroscopie	3	x	x	x				x	l, e	we
3	2		x	Kristalgroei	3	x	x						l, e	we
3	2		x	Single molecule studies	3	x	x						l, e	we
3	3		x	Humane en ecologische risicobeoordeling	6	x				x	x		l, r, c, g	we, pw

3	3		x	Organische chemie 2	6	x	x				x		l, e	we
3	3		x	Chemometrie	6	x	x	x		x		x	l, r	a
3	3		x	Structuur, functie en bioinformatica	6	x	x	x		x		x	l, c	we, a
3	4		x	Farmacochemie	6	x	x	x		x		x	l, e, c, g, r	we, op
3	4	x		Academische vorming	3	x			x			x	l	a
3	4		x	Practicum synthese	3	x	x	x		x		x	p	pw, r
3	4	x		Bachelorstage	12	x	x	x		x	x	x	p	pw, op, r
3	3		x	Chemie en samenleving	3	x	x		x	x	x	x	l, e	a
3			x	Orientatiestage educatie	3	x			x			x	p	pw, a

Molecular Life Sciences

C = compulsory; **E** = elective; **MLS.Bx** = Final qualification; **MLS P/O** = 2nd and 3rd year Priority or Optional course

Teaching format: l = lectures, e = tutorials (exercise hours), p = practical course, r = response hours, t = tutor hours, c = computer aided education, g = working in groups

Test forms: we = written examination, pw = practical work, ce = computer examination, op = oral presentation, a = assignments, r = report

Year	Quarter	C	E	MLS P/O	Course	ec	MLS. B1	MLS. B2	MLS. B3	MLS. B4	MLS. B5	MLS. B6	MLS. B7	MLS. B8	Teaching Format	Test forms
1	1	x			Chemische analyse	3	x	x						x	p	pw
1	1	x			Mechanica 1A	3	x							x	l, e, t	we
1	1	x			Wiskunde 1	3	x							x	l, e	we
1	1	x			Biomoleculen	3	x	x							l, e	we
1	1	x			Atoom- en molecuulbouw	3	x	x						x	c, l, t, e	we
1	2	x			Wiskunde 2	3	x							x	l, e	we
1	2	x			Project biochemie	6	x	x		x		x		x	l, p	pw, r, op
1	2	x			Biochemische processen	3	x	x						x	l, e	we
1	2	x			Moleculaire structuur	3	x	x						x	l,e,r,c	we
1	3	x			Project reacties en kinetiek	6	x	x		x		x		x	p	pw, r, op
1	3	x			Reacties en kinetiek	3	x	x						x	l, t	we
1	3	x			Wiskunde 3	3	x							x	l, e	we
1	3	x			Thermodynamica	3	x	x						x	l, e, t	we
1	4	x			Electriciteit en magnetisme 1A	3	x	x						x	l, e, p	we
1	4	x			Spectroscopische technieken	3	x	x						x	l, e, c	we,ce

1	4	x			Aspecten van MLW	3	x		x	x		x		x	l, p, r	we, pw
1	4	x			Project celbiofysica	3	x		x	x				x	l, c, p, t, r	we
1	1,2,3,4	x			Orientatiecursus CEM:	3								x	e	a
2	1	x			DNA-technologie	3	x		x	x				x	l, p, r	we, pw
2	1	x			Coördinatiechemie	3	x	x						x	l, e	we
2	1	x			Biochemie in de levende cel	3	x		x	x		x		x	l, p, r	we, pw, op
2	1	x			Bioinformatica A	3	x		x					x	l, c	we, a
2	1	x			Statistiek	3	x							x	l, e, c	we
2	2	x			Kristalstructuur	3	x	x		x		x		x	l, e	we
2	2	x			Algemene fysiologie	3	x		x					x	l, c, g	we, a, op
2	2	x			MLW en samenleving	3								x	l, g	op
2	2	x			Genetica	3	x		x	x		x		x	l, e, p	we, pw
2	2	x			Programmeren: Matlab	3				x				x	c	a, we
2	3		x	P	Celbiologie der dieren	6	x		x	x		x		x	l, e, p, c	we, op, a
2	3		x	P	Toxicologie	6	x	x	x					x	l, e, r, c, g	we, a
2	3		x	O	Adaptatiefysiologie	6	x		x	x				x	l, p, t	we, pw, op
2	3		x	O	Human embryology &	6	x		x	x				x	l, p, r	we, pw
2	3		x	O	Hersenen en gedrag: sensomotoriek	3	x		x	x				x	l, c, r	we, pw
2	3		x	O	Bioanorganische chemie	3	x	x						x	l, e	we
2	3	x			Inleiding in de filosofie en ethiek	3								x	l, e	we
2	4		x	P	Synthese biomoleculen	3	x	x							l, r	we
2	4		x	P	Project synthese biomoleculen	6	x	x		x		x		x	l, e, r, c	we, pw
2	4		x	P	Neurobiology	6	x		x	x				x	l, r	we, ce
2	4		x	P	Farmacochemie	6	x	x	x					x	l, e, c, g, r	we, op
2	4		x	O	Endocrinologie	6	x		x	x				x	l, e, p, c	we, pop
2	4		x	O	Evolutiebiologie	6	x		x	x				x	l, e, p, r	we, op, a
2	4		x	O	Medische pathologie	6	x		x	x				x	l, p, r	we
3	1		x	P	Biochemie-Moleculaire biologie II	6	x		x					x	l, e, r, g	we, op
3	1		x	P	Structuur biomoleculen	3	x	x						x	l, e, c	we, pw, op
3	1		x	O	Brain, dynamics and connectivity	6	x		x	x				x	l, e, r	we, op
3	1		x	O	Humane en ecologische risicobeoordeling	6	x							x	l, r, c, g	we, pw

3	1		x	O	Neurodevelopment	6	x		x	x					l, p, c, r	we, op, a
3	1		x	O	Genoomanalyse van planten	6	x		x	x				x	l, p, e	we, op, r
3	1		x	O	Metaalorganische chemie	6	x	x						x	l, e	we
3	1		x	O	Fysiologie van micro-organismen	6	x		x	x					l, e, p, t	we, pw, op
3	2		x	P	Organische chemie 1	6	x	x						x	l	we
3	2		x	P	Nanobiotechnologie	6	x	x	x	x	x	x		x	l, e, p, r	we, op, a
3	2		x	P	Single molecules studies	3	x	x						x	l, e	we
3	2		x	P	Functionele genomics	6	x	x	x					x	l, e, r, c	we, pe
3	2		x	P	Immunologie	6	x		x	x				x	l, p, r, c	we, pw
3	2		x	P	Quantummechanica & spectroscopy in	6	x							x	l, e	we
3	2		x	O	Neurobiofysica	6	x		x	x				x	l, p, r, e	we
3	2		x		Introductiecursus radionucliden	0				x					l, e	pw, we
3	3		x	P	Moleculaire basis van ziekten	6	x		x	x				x	l,p,c,r,c	we,op, a
3	3		x	P	Structuur, functie en bioinformatica	6	x		x					x	l, c	we, a
3	3		x	P	Vergelijkende genoomanalyse	3	x		x	x				x	l, p	we, op
3	3		x	P	Medische biotechnologie	6	x		x	x					l, e, p, c	we, pe
3	3		x	P	Neuroscience: van basis tot kliniek	6	x		x	x				x	l, c, r	we, a, op
3	3		x	O	Organische chemie 2	6	x	x						x	l, e	we
3	3		x	O	Chemometrie	6	x	x						x	l, r	a
3	3		x	O	Biotechnologie van planten	6	x		x	x				x	l, e, p	we
3	3		x	O	Pathofysiologie van de nier	6	x	x		x				x	l, p, r, g	we
3	4		x		Practicum synthese	3	x	x		x		x		x	p	pw
3			x		Orientatiestage educatie	3							x	x	p	pw, a
3	4	x			Academische vorming	3							x	x	l	a
3	4	x			Bachelorstage	12	x			x	x	x		x	p	pw, op, r

Natural Sciences

C = compulsory; **E** = elective; **NS.Bx** = Final qualification; Courses for the new science program are indicated in italics.

Teaching format: l = lectures, e = tutorials (exercise hours), p = practical course, r = response hours, t = tutor hours, c = computer aided education, g = working in groups

Test forms: we = written examination, pw = practical work, ce = computer examination, op = oral presentation, a = assignments, r = report

Year	Quarter	C	E	Course	ec	NS. B1	NS. B2	NS .B3	NS. B4	NS. B5	NS. B6	NS. B7	NS. B8	NS. B9	NS. B10	Teaching Format	Test Forms
1	1	x		Chemische analyse	3	x	x									p	pw
1	1	x		Mechanica 1A	3	x	x									l, e, t	we
1	1	x		Mechanica 1B	3	x	x									l, e, t	we
1	1	x		Wiskunde 1	3	x										l, e	we
1	1	x		Biomoleculen	3	x	x									l, e	we
1	1	x		Atoom- en molecuulbouw	3	x	x									c, l, t, e	we
1	2	x		Wiskunde 2	3	x										l, e	we
1	2	x		Mechanica 2A	3	x	x									l, e, t	we
1	2	x		Mechanica 2B	3	x	x									l, e, t	we
1	2	x		Biochemische processen	3	x	x									l, e	we
1	2	x		Moleculaire structuur	3	x	x									l,e,r,c	we
1	2	x		*Programmeren*	3	x										l, e, c, g	we
1	2	x		Project biochemie	3	x	x		x				x			l, p	pw, op
1	3	x		Reacties en kinetiek	3	x	x									l, t	we
1	3	x		Wiskunde 3	3	x										l, e	we
1	3	x		Thermodynamica	3	x	x									l, e, t	we
1	3	x		Energiemetabolismen	3	x	x									l, e	we, op
1	3	x		Inleiding biofysica	3	x	x									l, e	we
1	3	x		Elektriciteit en magnetisme 1B	3	x	x									l, e, t	we
1	3	x		Project reacties en kinetiek	3	x	x						x			p	pw
1	4	x		Electriciteit en magnetisme 1A	3	x	x									l, e, p	we
1	4	x		Fourier analyse en mechanische golven	3	x	x									l, e	we
1	4	x		Wiskunde 4	3	x										l, e	we
1	4	x		*Formele talen, grammatica's en automaten*	3	x										l	we
1	4		x	Elektriciteit en magnetisme 2B	3	x	x									l, e, t	we

1	4		x	*Evolutie*	3	x	x									l	we
1	4	x		Electriciteit en magnetisme 2A	3	x	x									l, e, t	we
1	1,2,3,4	x		Panorama: Science for innovation and society	6	x	x	x					x	x		l, g	a
2	1	x		Lineaire algebra	3	x										l, e	we
2	1	x		DNA-technologie	3	x	x				x	x	x			l, p, r	we, pw
2	1	x		Coördinatiechemie	3	x	x			x						l, e	we
2	1	x		Bioinformatica A	3	x	x									l, c	we, a
2	1	x		Biochemie-Moleculaire biologie II	6	x	x						x			l, e, r, g	we, op
2	1	x		Trillingen en golven	3	x	x									l, e	we
2	2	x		Kristalstructuur	3	x	x		x	x	x		x			l, e	we
2	2	x		Algemene fysiologie	3	x	x									l, c, g	we, a, op
2	2	x		Thermodynamica 2	3	x	x	x			x	x				l, e, p	we, pw
2	2	x		Analytische mechanica	3	x	x									l, e	we
2	2		x	Practicum anorganische chemie	3	x	x						x			p	pw
2	3	x		Quantummechanica 1	3	x	x									l, e, r	we
2	3		x	Bioanorganische chemie	3	x	x			x						l, e	we
2	3		x	Microscopische technieken	3	x	x									l, e, c	we, pw
2	3	x		Programmeren in Matlab NW	3	x										c	ce, a
2	3		x	Celbiologie der dieren	6	x	x						x			l, e, p, c	we, op, a
2	3		x	Inleiding nanowetenschappen en technologie	3	x	x									l, e	we, op
2	3		x	Practicum NMR	3	x	x						x			c	pw, a
2	3	x		Inleiding in de filosofie en ethiek	3									x		l, e	we
2	4		x	Newtoniaanse kosmologie	3	x	x									l, e	we
2	4	x		Quantummechanica 2	3	x	x									l, e, r	we
2	4		x	Synthese biomoleculen	3	x	x									l, r	we
2	4	x		Project spectroscopie	3	x	x	x	x	x	x	x	x			p	pw
2	4		x	Neurobiology	6	x	x									l, r	we, ce
2	4		x	Project synthese biomoleculen	6	x	x	x					x			l, e, r, c	we, pw
2	2,3	x		Fysisch practicum	6	x	x				x	x	x			l, e, p	we, pw
3	1		x	Inleiding in de chemie en fysica van de atmosfeer	3	x	x	x								l, e	we
3	1		x	Nanofysica	3	x	x									l, e	we

3	1		x	Optica: de manipulatie van licht	3	x	x									l, e	we
3	1	x		Statistiek	3	x										l, e, c	we
3	1	x		Chemische binding	3	x	x									l, e	we
3	1		x	Magnetische resonantie	6	x	x						x			l, e, p, c	we, pw, ce
3	1		x	Inleiding magnetische resonantie	3	x	x									l, e, p	we, ce
3	1		x	Structuur biomoleculen	3	x	x	x	x							l, e, c	we, pw, op
3	1		x	Structuur der materie	6											l, e	we
3	1		x	Statistische thermodynamica	6	x	x									l, e, c	we, ce
3	1		x	Metaalorganische chemie	6	x	x			x						l, e	we
3	2	x		Moleculaire Biofysica	3	x	x		x				x			l,e	we, pw
3	2		x	Organische chemie 1	6	x	x									l	we
3	2		x	Electromagnetisme A	3	x	x									l, e	we
3	2		x	Atoom- en molecuulspectroscopie	3	x	x	x								l, e	we
3	2		x	Single molecule studies	3	x	x									l, e	we
3	2		x	Quantumchemie	3	x	x	x								l, e, c	we, ce
3	2		x	Kristalgroei	3	x	x									l, e	we
3	2		x	Functionele genomics	6	x	x	x	x							l, e, r, c	we, pe
3	3		x	Studiereis Natuurwetenschappen	3	x	x						x		x		a
3	3		x	Electronica	3	x	x				x	x				l, e, p	we, pw
3	3		x	Structuur, functie en bioinformatica	6	x	x	x	x		x	x	x			l, c	we, a
3	3		x	Electromagnetisme B	3	x	x									l, e	we
3	3		x	Vergelijkende genoomanalyse	3	x	x	x	x							l, p	we, op
3	3		x	Inleiding in de neuroimaging technieken	3	x	x									l, e	we
3	3		x	Toxicologie	6	x	x			x						l, e, r, c, g	we, a
3	3		x	Organische chemie 2	6	x	x			x						l, e	we
3	3		x	Chemometrie	6	x	x									l, r	a
3	3		x	Biotechnologie van planten	6	x	x									l, e, p	we
3	3		x	Chemie en samenleving	3									x		l, e	a
3	4	x		Academische vorming	3								x		x	l	a
3	4		x	Vaste stoffysica	3	x	x									l, e	we
3	4		x	Neurofysica	3	x	x									l, e	we

3	4		x	Farmacochemie	6	x	x			x						l, e, c, g, r	we, op
3	4		x	Gecondenseerde materie	3	x	x	x								l, e	we
3	1,2,3,4	x		Orientatiecursus CEM: schrijfvaardigheid	3								x			e	a
3			x	Orientatiestage educatie	3										x	p	pw, a
3	4	x		Bachelorstage	12			x	x	x	x	x	x		x	p	pw, op, r

Master's curriculum

Communication, Education and Management & Technology direction (C-, E-, MT- directions)

Program first year - Molecular Sciences program:		**ec**
• Basic and advanced courses (compulsory and elective)		15
Including Philosophy	(3 ec)	
Including free elective courses	(3 ec)	
• Internship		45
Including practical research, report and oral presentation	(36 ec)	
Including literature thesis	(6 ec)	
Including theoretical component	(3 ec)	
Program second year – Direction specific program		**ec**
• C-, E- or MT-specific program		60
Including compulsory courses	(30 ec)	
Including internship	(27 ec)	
Including free elective courses	(3 ec)	

Research-direction (O-direction) in Chemistry

Chemistry Program components		**ec**
• Basic and advanced courses (compulsory and elective)		30
Including Philosophy	(3 ec)	
• Major internship		60
Including Master Thesis and presentation	(54 ec)	
Including literature thesis	(6 ec)	
• Minor program		30
Including choice between minor internship or electives	(24 ec)	
Including free elective courses	(6 ec)	

Research-direction (O-direction) in Molecular Lifes Sciences

Molecular Life Sciences Program Components		**ec**
• Basic and advanced courses (compulsory and elective)		30
Including Philosophy	(3 ec)	
Including free elective courses	(6 ec)	
• Internship I		45
Including Master Thesis and presentation	(36 ec)	
Including literature thesis	(6 ec)	
Including theoretical component	(3 ec)	
• Internship II		45
Including Master Thesis and presentation	(36 ec)	
Including literature thesis	(6 ec)	
Including theoretical component	(3 ec)	

Research-direction (O-direction) in Natural Sciences

Natural Sciences Program Components		**ec**
• Basic and advanced courses (compulsory and elective)		30
Including Philosophy	(3 ec)	
• Major internship		60
Including Master Thesis and presentation	(min 48 ec)	
Including elective courses	(max 12 ec)	
• Minor internship		30
Including elective courses	(6 ec)	

Master's curriculum: Matrix learning outcomes, courses, teaching format and assessment method

Chemistry

CH.Mx = Final qualification;

Teaching format: l = lectures, e = tutorials (exercise hours), p = practical course, r = response hours, t = tutor hours, c = computer aided education, g = working in groups

Test forms: we = written examination, pw = practical work, ce = computer examination, op = oral presentation, oe= oral examination, a = assignments, r = report

Course	ec	CH. M1	CH. M2	CH. M3	CH. M4	CH. M5	CH. M6	CH. M7	CH. M8	CH. M9	CH. M10	CH. M11	Teaching format	Test forms
Advanced crystallography	4	x	x	X									l, e	we
Advanced molecular structure determination	3	x	x	X		x							l	we, pw
Advanced organic chemistry	6	x	x	X									l	we
Application of metal catalysis in natural products	3	x	x	X									l	a
Biocatalysis	2	x	x	X									l	a
Bioinformatics of protein structure	6	x	x	X									l, e	a
Chemical biology	6	x	x	X									l, p	pw, op
Chemometrics II	4	x	x	X		x							l, p	op
Course working with radionuclides level	2	x							x				l, e, p	we
Ecological and environmental concepts	3	x	x	X				x	x				l	w
Environmental and ecological modelling	3	x	x	X				x	x				l, c	w, p
Environmental ethics	3							x	x				l	op, a
Evolution and the mind	3							x	x				l	a
Global ethics and sustainable development	3							x	x				l	a
Group theory	9	x	x	X									l, e	oe
Industrial pharmaceutical chemistry	3	x	x	X				x					l, e	we
Instrumental analysis for molecular chemistry	3	x	x	X		x							l, e	we
Interaction of light with molecules and materials	6	x	x	X									l, e	oe
Magnetic resonance II	6	x	x	X		x							r	we
Magnetic resonance IIIa, Advanced biomolecular NMR	4	x	x	X		x							r	we
Magnetic resonance III b, Solid-state NMR	3	x	x	X		x							l	we
Materials science	6	x	x	X									l, e	a
Mechanical engineering	2												l, p	pw
Molecular materials	3	x	x	X									l	we, op, a
Molecular modelling	3	x	x	X									l, e, c	we, a
Pattern recognition for the natural sciences	6	x	x	X		x							l, c	we
Philosophy 2	3							x	x				l	a
Physical organic chemistry of the cell	3	x	x	X									l	we
Physics of molecules and molecular aggregates	6	x	x	X									l, e	we
Polymer chemistry	3	x	x	X									l	we, a
Quantum dynamics	3	x	x	X									l	we
Risk management of chemicals	3	x	x	X				x	x				l, c, g	r
Science & literature	3							x	x				l	a
Study tour chemistry	4	x	x	X				x	x	x				a
Sustainable production and consumption	3	x	x	X				x	x				l, r, c	we
Systems chemistry	3	x	x	X									l	we
Intership / Master thesis	54	x	x	X	x	x	x	x	x	x	x	x	p	pw, op, r

Molecular Life Sciences

MLS.Mx = Final qualification;

Teaching format: l = lectures, e = tutorials (exercise hours), p = practical course, r = response hours, c = computer aided education, g = working in groups

Test forms: we = written examination, pw = practical work, ce = computer examination, op = oral presentation, oe= oral examination, a = assignments, r = report

Course	ec	MLS. M1	MLS. M2	MLS. M3	MLS. M4	MLS. M5	MLS. M6	MLS. M7	MLS. M8	MLS. M9	MLS. M10	MLS. M11	Teaching format	Test forms
Adaptation physiology	3		x								x		l	we
Advanced molecular structure determination	3		x		x						x		l	we, pw
Advanced organic chemistry	6		x								x		l	we
Apoptosis	3		x								x		l	we
Application of metal catalysis in natural products	3		x								x		l	a
Biocatalysis	2		x								x		l	a
Bioethics for life scientists	3								x				l	op
Bioinformatics of protein structure	6		x								x		l, e	a
Cellular imaging in four dimensions	3		x								x		l	op
Chemical biology	6		x								x		l, p	pw, op
Chemometrics II	4		x								x		l, p	op
Computational drug discovery	4		x								x		l, c	op
Course working with radionuclides	2		x		x						x		l, e, p	we
Endocrinology	3		x								x		l	we
Evolution and the mind	3								x				e	a
Global ethics and sustainable development	3								x				l	a
Human genetics	3		x								x		l, r, g, c	we
Industrial pharmaceutical chemistry	3		x						x	x	x		l, e	we
Instrumental analysis for molecular chemistry	3		x								x		l, e	we
Introduction Java to bioinformatics	6		x								x		l, c	ce
Laboratory animal science	3				x				x				l, p, g	we
Magnetic resonance II	6		x								x		r	we
Magnetic resonance IIIa, Advanced biomolecular NMR	4		x								x		r	we
Metabolism, transport and motility	3		x								x		l	we
Molecular and cellular neurobiology	3		x								x		l	we
Molecular and translational oncology	3		x								x		l, e	we
Molecular aspects of host defense, tissue destruction and repair	3		x								x		l	we
Molecular biology: Gene expression, chromatin and disease	3		x								x		l	we
Molecular materials	3		x								x		l	we, op, a
Oncology	3		x								x		l	we
Pattern recognition for the natural sciences	6		x								x		l, c	we
Philosophy 2	3								x				l	a
Physical organic chemistry of the cell	3		x								x		l	we
Polymer chemistry	3		x								x		l	we, a
Post-transcriptional regulation in health and disease	3		x								x		l, r	we
Principles of systems biology	3		x								x		l	we
Science & literature	3								x				l, e	a

Stress: for better or worse	3		x								x		l	we
Study tour chemistry	4		x						x	x	x			a
Systems chemistry	3		x								x		l	we
Systems neuroscience	3		x								x		l, g	we, a
Trends in medical biosciences II	3		x								x		l, g	we
Internship / Master thesis	36-45	x	x	x	x	x	x	x	x	x	x	x	p	pw, op, r

Natural Sciences

NS.Mx = Final qualification (Appendix 3.3);

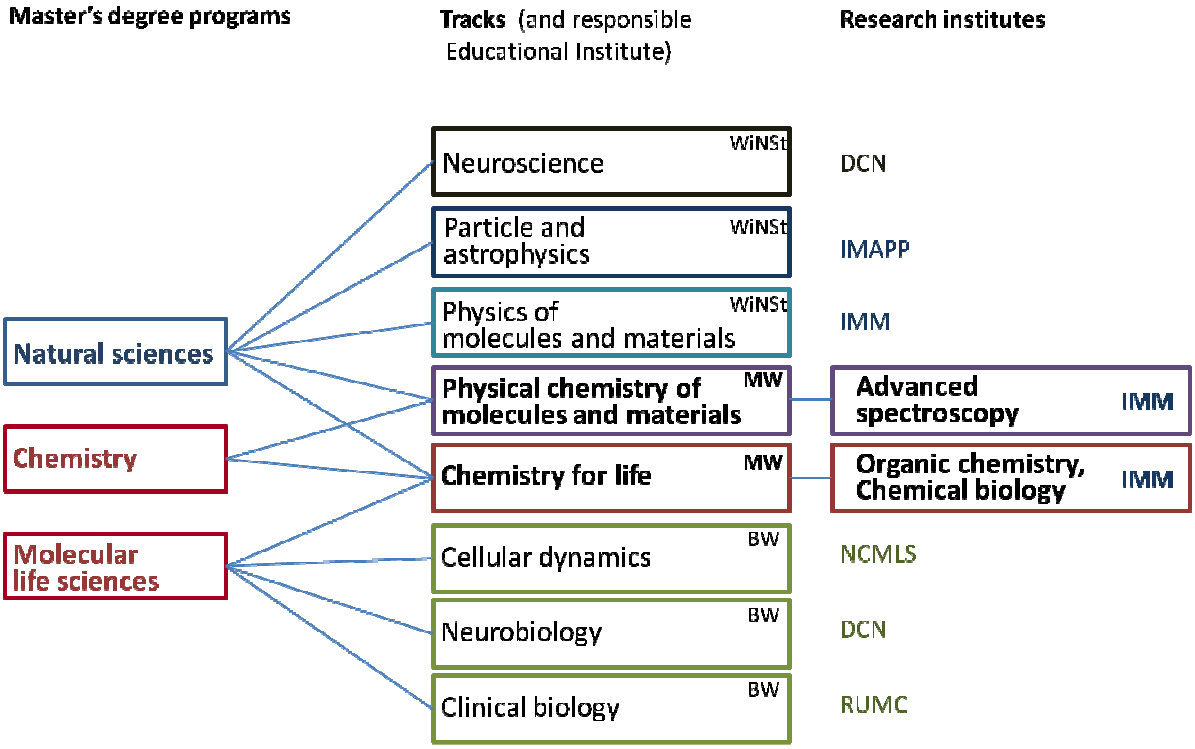
Teaching format: l = lectures, e = tutorials (exercise hours), p = practical course, = response hours, c = computer aided education, g = working in groups

Test forms: we = written examination, pw = practical work, ce = computer examination, op = oral presentation, oe= oral examination, a = assignments, r = report

Course	**ec**	**NS. M1**	**NS. M2**	**NS. M3**	**NS M4**	**NS. M5**	**NS. M6**	**NS. M7**	**NS. M8**	**NS. M9**	**NS. M10**	**Teaching format**	**Test forms**
Adaptation physiology	3	x	x	x		x						l	we
Advanced crystallography	4	x	x	x		x						l, e	we
Advanced molecular structure determination	3	x	x	x		x						l	we, pw
Advanced organic chemistry	6	x	x	x		x						l	we
Apoptosis	3	x	x	x		x						l	we
Bioinformatics of protein structure	6	x	x	x		x						l, e	a
Brain and behaviour 2	6	x	x	x		x						l	we
Chemical biology	6	x	x	x		x						l, p	pw, op
Chemometrics II	4	x	x	x		x						l, p	op
Computational drug discovery	4	x	x	x		x						l, c	op
Computational neuroscience	6	x	x	x		x						l, e	we, a
Course working with radionuclides level	2		x								x	l, e, p	we
Ecological and environmental concepts	3	x	x	x		x						l	w
Electronic structure of materials	6	x	x	x		x						l	oe
Endocrinology	3	x	x	x		x						l	we
Environmental and ecological modelling	3	x	x	x		x						l, c	w, p
Environmental ethics	3	x	x	x		x						l	op, a
Evolution and the mind	3										x	l	a
Experimental techniques	3	x	x	x		x						l, e	op
Global ethics and sustainable development	3										x	l	a
Group theory	9	x	x	x		x						l, e	oe
Instrumental analysis for molecular chemistry	3	x	x	x		x						l, e	we
Interaction of light with molecules and materials	6	x	x	x		x						l, e	oe
Internship / Master thesis	30-60	x	x	x	x	x	x	x	x	x	x	p	pw, op, r
Laboratory animal science	3		x								x	l, p, g	we
Magnetic resonance II	6	x	x	x		x						r	we
Magnetic resonance III b, Solid-state NMR	3	x	x	x		x						l	we

Magnetic resonance IIIa, Advanced biomolecular NMR	4	x	x	x		x						r	we
Materials science	6	x	x	x		x						l, e	a
Mechanical engineering	2							x				l, p	pw
Metabolism, transport and motility	3	x	x	x		x						l	we
Molecular materials	3	x	x	x		x						l	we, op, a
Molecular modelling	3	x	x	x		x						l, e, c	we, a
Nano magnetism	6	x	x	x		x						l	a, op, oe
Pattern recognition for the natural sciences	6	x	x	x		x						l, c	we
Philosophy 2	3										x	l	a
Physical organic chemistry of the cell	3	x	x	x		x						l	we
Physics of molecules and molecular aggregates	6	x	x	x		x						l, e	we
Polymer chemistry	3	x	x	x		x						l	we, a
Principles of systems biology	3	x	x	x		x						l	we
Quantum dynamics	3	x	x	x		x						l	we
Risk management of chemicals	3	x	x	x		x						l, c, p	r
Scanning probe microscopy	3	x	x	x		x						l	op
Science & literature	3										x	l, e	a
Solid state physics	6	x	x	x		x						l,e	we
Study tour natural sciences	3										x		a
Sustainable production and consumption	3	x	x	x		x						l, r, c	we
Systems chemistry	3	x	x	x		x						l	we

Master's specializations



Chemistry

The Master's degree program in Chemistry aims at specialization in one of the following fields of science, offered by the IMM, NCMLS or IWWR.

Research group	Faculty	Institute
Analytical chemistry	Science	IMM
Applied Materials Science	Science	IMM
Biochemistry	UMCN	NCMLS
Bioinformatics	UMCN	NCMLS
Biomolecular Chemistry	Science/UMCN	IMM/NCMLS
Bio Organic Chemistry	Science	IMM
Biophysical chemistry	Science	IMM
Green(Environmental) Chemistry	Science	IWWR
Molecular and Biophysics	Science	IMM
Molecular and Laser Physics	Science	IMM
Molecular Materials	Science	IMM
Molecular Pharmacology and Toxicology	UMCN	NCMLS
Physical Organic Chemistry	Science	IMM
Scanning Probe Microscopy	Science	IMM
Solid State Chemistry	Science	IMM
Solid State NMR	Science	IMM
Synthetic Organic Chemistry	Science	IMM
Theoretical Chemistry	Science	IMM

Molecular Life Sciences

The Master's degree program in Molecular Life Sciences aims at specialization in one of the following fields of science, offered by IMM, NCMLS, IWWR or DCN:

Research group	Faculty	Institute
Analytical chemistry	Science	IMM
Applied biology	Science	NCMLS
Biomolecular Chemistry	Science	IMM
Bioinformatics	Science	NCMLS
Biophysical chemistry	Science	IMM
Biophysics	Science	DCN
Cell biology	Science	NCMLS
Cellular animal physiology	Science	DCN
Evolutionary microbiology	Science	IWWR
Microbiology	Science	IWWR
Molecular animal physiology	Science	DCN
Molecular biology	Science	NCMLS
Organic chemistry	Science	NCMLS
Organismal animal physiology	Science	IWWR
Plant cell biology	Science	IWWR
Plant genetics	Science	IWWR
Biochemistry	UMCN	NCMLS
Cell biology	UMCN	NCMLS
Cell physiology	UMCN	NCMLS
Experimental urology	UMCN	NCMLS
Hematology	UMCN	NCMLS
Human genetics	UMCN	NCMLS
Medical microbiology/Medical parasitology	UMCN	NCMLS
Molecular pharmacology and toxicology	UMCN	NCMLS
Nephrology	UMCN	NCMLS
Nijmegen centre for mitochondrial disorders/Pediatrics	UMCN	NCMLS
Pathology	UMCN	
Cognitive Neuropscience	UMCN	DCN
Rheumatology	UMCN	NCMLS
Skin Biology & Experimental Dermatology	UMCN	
Tumor-immunology	UMCN	NCMLS
Groups in DCN	UMCN/Science	DCN

Natural Sciences

The Master's degree program in Natural Sciences aims at specialization in one of the following fields of science, offered by IMM, NCMLS, IWWR or DCN:

Research group	Faculty	Institute
Analytical Chemistry	Science	IMM
Bio Organic Chemistry	Science	IMM
Biochemistry	UMCN	NCMLS
Bioinformatics (CMBI)	UMCN	NCMLS
Biomolecular Chemistry	Science	IMM
Biophysical Chemistry	Science	IMM
Cell Biology	UMCN	NCMLS
Molecular Materials	Science	IMM
Solid State Chemistry	Science	IMM
Solid State NMR	Science	IMM
Synthetic Organic Chemistry	Science	IMM
Theoretical Chemistry	Science	IMM
Applied Materials Science	Science	IMM
Condensed Matter Science and HFML	Science	IMM
Electronic Structure of Materials	Science	IMM
Molecular and Laser Physics	Science	IMM
Molecule and Biophysics	Science	IMM
Scanning Probe Microscopie	Science	IMM

Appendix 5: Quantitative data regarding the programmes

Data on intake, transfers and graduates

Bachelor's programme

Uniformed VSNU KPI's of the Bachelor's degree programmes

Table 1. Cohortomvang en samenstelling Bachelor

*Als de opleiding schakelstudenten inschrijft in de bachelorfase, is HBO incl. studenten in schakelprogramma/ premaster.

	Jaar	Cohortomvang met vooropleidingscategorie					Totaal
		VWO	HBO prop	HBO*	Buitenland	Overig	
Scheikunde RU	02/ 03	13	1	7	0	2	23
	03/ 04	21	0	13	0	1	35
	04/ 05	28	1	12	1	1	43
	05/ 06	24	1	9	0	0	34
	06/ 07	38	0	0	0	0	38
	07/ 08	31	2	4	2	2	41
	08/ 09	35	2	6	4	2	49
	09/ 10	45	3	7	0	1	56
Totaal Universiteiten	02/ 03	89	4	13	2	5	113
	03/ 04	120	2	14	8	4	148
	04/ 05	158	4	14	5	4	185
	05/ 06	196	2	11	1	3	213
	06/ 07	191	1	5	5	6	208
	07/ 08	185	6	7	6	8	212
	08/ 09	175	3	8	10	7	203
	09/ 10	200	4	11	5	5	225
MLW RU	02/ 03	16	2	3	0	1	22
	03/ 04	16	0	2	0	2	20
	04/ 05	34	0	2	7	0	43
	05/ 06	35	1	5	2	1	44
	06/ 07	37	0	1	4	0	42
	07/ 08	29	0	5	4	0	38
	08/ 09	46	1	1	8	1	57
	09/ 10	41	1	0	6	0	48
Totaal Universiteiten	02/ 03	16	2	3	0	1	22
	03/ 04	16	0	2	0	2	20
	04/ 05	108	3	4	13	11	139
	05/ 06	87	1	6	32	3	129
	06/ 07	82	0	2	51	13	148
	07/ 08	116	0	5	31	4	156
	08/ 09	132	1	2	32	4	171
	09/ 10	77	1	1	11	0	90
NS RU	04/ 05	12	0	0	0	1	13
	05/ 06	20	0	0	2	1	23
	06/ 07	14	0	0	1	0	15
	07/ 08	23	0	1	0	0	24
	08/ 09	15	0	1	2	0	18
	09/ 10	8	0	0	5	0	13

Table 2. Bachelorrendement van herinschrijvers opleiding, (VWO Instroom), en hoop binnen instelling

	Cohort	Omvang	% van	Bachelorrendement van herinschrijvers					hoop /inst
		herins.	totale cohort	na 3 jaar	na 4 jaar	na 5 jaar	na 6 jaar	> 6 jaar	> 6 jaar
		absoluut			**Percentage** (cumulatief), niet vermeld als totaal < 4				
Scheikunde RU	02/ 03	10	77	20	60	70	70	100	100
	03/ 04	20	95	25	60	60	65	75	75
	04/ 05	23	82	9	17	65	83		
	05/ 06	19	79	37	63	63			
	06/ 07	32	84	19	34				
	07/ 08	27	87	22					
	08/ 09	30	86						
	09/ 10	40	89						
Totaal Universiteiten	02/ 03	71	80	25	58	66	73	80	83
	03/ 04	96	80	35	57	71	81	83	84
	04/ 05	135	85	21	49	68	75		
	05/ 06	156	80	29	51	67			
	06/ 07	152	80	33	53				
	07/ 08	160	86	32					
	08/ 09	126	72						
	09/ 10	156	78						
Moleculaire Levenswet RU	02/ 03	12	75	42	67	83	83	83	83
	03/ 04	14	88	36	71	86	86	93	93
	04/ 05	27	79	59	78	85	93		
	05/ 06	24	69	42	67	88			
	06/ 07	27	73	41	59				
	07/ 08	21	72	29					
	08/ 09	39	85						
	09/ 10	31	76						
Totaal Universiteiten	02/ 03	12	75	42	67	83	83	83	83
	03/ 04	14	88	36	71	86	86	93	93
	04/ 05	83	77	63	80	87	89		
	05/ 06	60	69	47	68	78			
	06/ 07	61	74	44	57				
	07/ 08	83	72	8					
	08/ 09	105	80						
	09/ 10	61	79						
Natuurwetenschappen RU	04/ 05	9	75	0	44	56	67		
	05/ 06	14	70	7	21	50			
	06/ 07	11	79	0	27				
	07/ 08	18	78	22					
	08/ 09	9	60						
	09/ 10	8	100						

Data provided in the critical self study

Table 3. Success rates in the bachelor's programme of the three degree programs

Students reregistered in 2nd year / Students having obtained Bachelor in 4 years (Bachelor success rates)					
	2002	**2003**	**2004**	**2005**	**2006**
Chemistry	9/6 (66%)	18/12 (66%)	22/4 (18%)	16/11 (68%)	28/10 (35%)
Molecular Life Sciences	12/8 (66%)	14/10 (71%)	26/21 (80%)	23/16 (69%)	25/15 (60%)
Natural Sciences	11/4 (36%)	23/7 (23%)	5/1 (20%)	13/3 (23%)	9/3 (33%)
RU FNWI (average)	40%	40%	47%	50%	48%
RU (average)	53%	54%	54%	59%	65%

Master's programme

Uniformed VSNU KPI's of the Master's degree programs

Table 4. Cohortomvang en onderwijs-herkomst masterinstroom

	Jaar	Eigen universiteit	Andere universiteiten NL	HBO	Buiten HO	Totaal
Scheikunde						
Radboud Universiteit	04/ 05	21	1	0	0	22
	05/ 06	14	0	0	0	14
	06/ 07	29	0	0	0	29
	07/ 08	21	0	0	0	21
	08/ 09	9	0	0	0	9
	09/ 10	34	0	0	0	34
Totaal Universiteiten	02/ 03	8	1	16	1	26
	03/ 04	26	3	28	7	64
	04/ 05	40	3	27	14	84
	05/ 06	37	14	30	15	96
	06/ 07	72	12	25	13	122
	07/ 08	68	10	31	16	125
	08/ 09	66	17	26	4	113
	09/ 10	88	16	34	20	158
Moleculaire Levenswetenschappen						
Radboud Universiteit	04/ 05	3	0	1	0	4
	05/ 06	14	0	0	0	14
	06/ 07	16	0	0	0	16
	07/ 08	50	0	0	0	50
	08/ 09	9	1	0	2	12
	09/ 10	31	0	0	0	31
Natuurwetenschappen						
Radboud Universiteit	05/ 06	3	0	0	0	3
	06/ 07	7	0	0	0	7
	07/ 08	18	0	0	2	20
	08/ 09	3	0	0	0	3
	09/ 10	8	0	0	0	8

Table 5. Studieduur masteropleiding naar onderwijs-herkomst

		Eigen Universiteit		Andere Univ. Nederl.		HBO		Buiten HO	
	Afstudeer cohort	Geslaagd	Duur opl.	Geslaagd	Duur opl.	Geslaagd	Duur opl.	Geslaagd	Duur opl.
		absoluut	Gemidd.	absoluut	Gemidd.	absoluut	Gemidd.	absoluut	Gemidd.
			in maanden		in maanden		in maanden		in maanden
Scheikunde									
RU	04/ 05	7	9						
	05/ 06	8	19						
	06/ 07	12	19						
	07/ 08	19	23						
	08/ 09	15	27						
	09/ 10	16	22						
Totaal Universiteiten	02/ 03	1	1						
	03/ 04	16	11			7	22		
	04/ 05	21	14	3	26	14	24	3	24
	05/ 06	24	17	4	12	12	28	9	23
	06/ 07	27	19	7	17	13	28	7	22
	07/ 08	40	21	6	27	21	34	9	28
	08/ 09	53	24	5	26	16	36	10	26
	09/ 10	39	26	8	27	22	35	4	31
Moleculaire Levenswetenschappen									
RU	04/ 05	1	11						
	05/ 06	4	7						
	06/ 07	6	17						
	07/ 08	15	19						
	08/ 09	20	23	1	10				
	09/ 10	14	25					1	24
Natuurwetenschappen									
RU	06/ 07	2	5						
	07/ 08	5	21						
	08/ 09	6	24					1	24
	09/ 10	11	21						

Table 6. Instellingsverblijfsduur mastergeslaagden naar onderwijs-herkomst

		Eigen Universiteit		Andere Univ. Nederl.		HBO		Buiten HO	
	afstudeer cohort	Geslaagd	Duur opl.	Geslaagd	Duur opl.	Geslaagd	Duur opl.	Geslaagd	Duur opl.
		absoluut	Gemidd.	absoluut	Gemidd.	absoluut	Gemidd.	absoluut	Gemidd.
			in maanden		in maanden		in maanden		in maanden
Scheikunde									
RU	04/ 05	7	40						
	05/ 06	8	41						
	06/ 07	12	47						
	07/ 08	19	59						
	08/ 09	15	65						
	09/ 10	16	71						

Totaal Universiteiten	02/ 03	1	60						
	03/ 04	16	38			7	22		
	04/ 05	21	41	3	26	14	24	3	24
	05/ 06	24	54	4	12	12	28	9	23
	06/ 07	27	60	7	17	13	28	7	22
	07/ 08	40	62	6	27	21	34	9	28
	08/ 09	53	73	5	26	16	36	10	26
	09/ 10	39	70	8	27	22	35	4	31
Moleculaire Levenswetenschappen									
RU	04/ 05	1	60						
	05/ 06	4	52						
	06/ 07	6	61						
	07/ 08	15	57						
	08/ 09	20	55	1	10				
	09/ 10	14	63					1	24
Natuurwetenschappen									
RU	06/ 07	2	72						
	07/ 08	5	71						
	08/ 09	6	79					1	24
	09/ 10	11	76						

Table 7. Mastergeslaagden per jaar per instelling

Cohort	Totaal Chem	Chem RU	Totaal MLW	MLW RU	Totaal NW	NW RU
02/ 03	1	0				
03/ 04	23	0				
04/ 05	42	7	1	1		
05/ 06	49	8	4	4		
06/ 07	55	12	6	6	2	2
07/ 08	77	19	15	15	5	5
08/ 09	84	15	21	21	7	7
09/ 10	77	16	15	15	11	11

Data provided in the critical self study

Table 8. Success rates in the master's programme based on registered master students

Registered Master students/ Number of students graduated in three years (Master success rates)				
Degree program	**2004**	**2005**	**2006**	**2007**
Chemistry	14/10 (71%)	12/10 (83%)	24/20 (83%)	17/9 (53%)
Molecular Life Sciences	1/1 (100%)	10/9 (90%	12/11 (92%)	41/25 (63%)
Natural Sciences		2/2 (100%)	5/4 (80%)	16/9 (56%)

Table 9. Combined Bachelor and Master efficiency based on registered Master students[8]

Degree program	Cohort	2002	2003	2004	2005	2006
Chemistry	Intake	14	20	25	15	28
Efficiency in	5 years	7%	35%	0%	0%	7%
	6 years	29%	65%	36%	53%	
	7 years	57%	75%	64%		
Molecular Life Sciences	Intake	14	14	28	22	22
Efficiency in	5 years	43%	0%	32%	14%	27%
	6 years	86%	79%	61%	77%	
	7 years	86%	79%	89%		
Natural Sciences	Intake	8	16	7	8	4
Efficiency in	5 years	0%	6%	29%	13%	0%
	6 years	38%	19%	71%	38%	
	7 years	63%	50%	86%		

Table 10. Molecular Life Sciences: HBO-intake (including premaster programme)

FNWI	Ma after:							
Cohort	# students	1 Year (%)	2 Year (%)	3 Year (%)	4 Year (%)	5 Year (%)	6 Year (%)	7 Year (%)
2002-2003[1]	nvt							
2003-2004[2]	nvt							
2004-2005[3]	1	0	0					
2005-2006[4]	4	0	0	0	50			
2006-2007[5]	0							
2007-2008[6]	6	17	17	33	67			

2008-2009[7]	1	0	0	0	0			
2009-2010[8]	1	0	0	0				
2010-2011[9]	1	0	0					
2011-2012[10]	1	0	0					

1) No MLW HBO.

2) No MLW HBO.

3) 1 student stopped within 1 year.

4) 1 student stopped within 1 year and 1 student after 2 years.

5) No HBO students.

6) 1 student stopped within 1 year and 1 student stopped after 2 years.

7) 4 students stopped before 1 October.

Table 11. Chemistry: HBO-intake (including premaster programme)

FNWI	**Ma after:**						
Cohort	**# students**	**2 Year (%)**	**3 Year (%)**	**4 Year (%)**	**5 Year (%)**	**6 Year (%)**	**7 Year (%)**
2002-2003[1]	8	0	50	75	75	75	
2003-2004[2]	15	7	40	53	73	80	
2004-2005[3]	14	0	36	50	64	71	79
2005-2006[4]	10	0	20	40	50	50	50

2006-2007[5]	0						
2007-2008[6]	7	0	29				
2008-2009[7]	7	0	43	43			
2009-2010[8]	9	22	22				
2010-2011[9]	11	0					
2011-2012[10]	6	0					

1) 1 student stopped within 1 year and 1 student stopped within 2 years.
2) 2 students stopped within 1 year and 1 student stopped within 2 years.
3) 2 students stopped within 1 year and 1 student stopped within 2 years.
4) 2 students stopped within 1 year and 2 students stopped within 2 years.
5) No HBO students.
6) 2 students stopped within 1 year, 1 student stopped within 2 years and 2 students stopped after 2 years.
7) 2 students stopped within 1 year and 1 student stopped within 2 years.

Contact hours bachelor's programmes

Table 12. Chemistry: Teaching methods used in the various Chemistry courses (hrs).

Semester	lec-tures	tutorials	tutor hours	self-study	practical courses	comp aided education	response hours	assess-ment	total hrs
1-2	231	168	53	584	498	52	8	86	1680
3-4	280	240	–	770	160	160	16	54	1680
5-6*	Semesters with elective courses, which differ for each individual student.								

Table 13. Molecular Life Sciences: Teaching methods used in the various Molecular Life Sciences courses (hrs).

Semester	lec-tures	tutorials	tutor hours	self-study	practical courses	comp aided education	response hours	assess-ment	total hrs

1-2	251	184	53	603	406	86	8	89	1680
3	152	64	–	404	62	130	–	28	840
4-6*	Semesters with elective courses, which differ for each individual student.								

Table 14. Natural Sciences: Teaching methods used in the various Natural Sciences courses (hrs).

Semester	lec-tures	tutorials	tutor hours	self-study	practical courses	comp aided education	response hours	assess-ment	total hrs
1–2	271	214	69	606	382	22	8	108	1680
3–4	265	246	–	789	232	81	16	51	1680
5–6*	Semesters with elective courses, which differ for each individual student.								

Staff-student ratio

Educational Institute MW

Table 15. Students/FTE education

FTE education	Amount of students	Students/FTE Education
28,9	600	20,7

Bachelor's programmes

Table 16. Hours of education delivered by the various research institutes.

Hrs delivered by	Total	DCN	ICIS	IMAPP	IMM	ISIS	IWWR	NCMLS	UMC
Mol Sciences	48370	2273	2234	1375	30849	2701	1638	2399	4901
Chem	25515	194	1541	928	20111	929	531	95	1187
MLS	15003	814	355	49	6281	1540	870	2155	2939
NS	7852	1265	338	398	4457	232	237	150	774

Master's programmes

Table 17. Hours of education delivered by the various research institutes.

Hrs delivered by	Total	DCN	ICIS	IMAPP	IMM	ISIS	IWWR	NCMLS	UMC
Mol Sciences	48370	2273	2234	1375	30849	2701	1638	2399	4901
Chem	25515	194	1541	928	20111	929	531	95	1187
MLS	15003	814	355	49	6281	1540	870	2155	2939
NS	7852	1265	338	398	4457	232	237	150	774

Appendix 6: Programme of the site visit

Dinsdag 15-mei	**Programma onderwijsvisitatie Moleculaire Wetenschappen 15-16 mei 2012**		
8.30	**8.45**	**HG01.**	Ontvangst: Decaan, vice-decaan, directeur OMW
8.45	**10.30**		Intern overleg commissie
10.30	**11.30**		Management:
			Inleidende presentatie: prof. dr. Floris Rutjes, onderwijsdirecteur (± 5 min)
			Prof. dr. Lutgarde Buydens (vice-decaan onderwijs), prof. dr. Floris Rutjes (onderwijsdirecteur)
			Opleidingscoordinatoren: prof. dr. Gerard Martens (MLW), prof. dr. Dave Parker (NW), dr. Rene de Gelder (Sk)
			Dr. Luc-Jan Laarhoven (secretaris OWI), dr. Ger Boonen (hoofd facultaire onderwijsondersteuning)
11.30	**12.30**		Studenten Natuurwetenschappen (ba en ma)
			1e jaar: Koen van Asseldonk 2e jaar: Sanne Lenselink + Selwin Hageraats 3e jaar: Renate Jansen + Julia Krug Master: Bas van Oorschot (fysisch chemisch, MT-variant) Roger Rikken (Fysisch Chemisch) Esra te Brinke (Biologisch Chemisch)
12.30	**13.30**	**HG01.057**	Lunch
13.30	**14.15**	**HG01.060**	Docenten Natuurwetenschappen (Ba + Ma)
			Prof. dr. Arno Kentgens prof. dr. Bert Kappen Dr. Peter Christianen dr. Paul Kouwer Dr. Wim Scheenen Prof. dr. Ben Dankbaar (MT-variant)
14.15	**15.15**		Studenten Moleculaire Levenswetenschappen
			1e jaar: Layla van Nieuwenhuizen 2e jaar: Maarten-Pieter Wintjes + Bianca de Pooter 3e jaar: Annemarie Post + Joost Lamain Master: Lianne Lelieveldt Sjoerd Postma Jan Hendrik Venhuizen
15.15	**15.30**		Pauze
15.30	**16.15**		Docenten Moleculaire Levenswetenschappen (Ba + Ma)
			Prof. dr. Jan van Hest prof. dr. Lettie Lubsen dr. Hans Heus Dr. Jan Koenderink dr. Peter Klaren Dr. Joost Martens
16.15	**17.15**		Alumni

			Stefan van Rootselaar (AIO Org chemie) Sanne Schoffelen (gepromoveerd, DSM, thans tijdelijk bij prof. v. Hest) Hanka Vensselaar (AIO NCMLS, kan tot 16:45) Suzanne Pen (Blue4Green) Nieky Steenkiste (C-variant, freelance wetenschapscommunicatie) Ryan Heesbeen (Synnafix BV) Luuk Wilders (HBO doorstromer, FutureChemistry) Roel Manning (MT-variant, nu Teijn Aramid) Boukje Huijben (sk + milieukunde, nu AIO TUe) Marloes van der Wal (HBO doorstromer, MT-variant, Philips) Koos Wilke (leraar scheikunde) Steven Roeters (AIO UVA) Rik Nievergeld (MSD) Julian Tramper (AIO Biofyisca) Vincent Breukels (gepromoveerd protein biophysics)
Woensdag 16-mei			*Andere gespreksruimte in verband met Beta bedrijvenbeurs*
8.00	**8.45**		Rondleiding practicum, bibliotheek, studielandschap
9.00	**10.00**	**HFML2.20**	Studenten Scheikunde
			1e jaar: Daniel de Jong 2e jaar: Anne Coenen 3e jaar: Renee Ripken + Emiel Beeksma Master: Sander Habets (NMR, analytische chemie + buitenlandstage) Robert Harmel (Org chemie) Lise Schoonen (Org chemie) Anne Bakker (vaste stof chemie) HBO doorstromer: Gaston Richelle
10.00	**10.45**		Docenten Scheikunde (Ba+Ma)
			Prof. dr. Gerrit Groenenboom prof. dr. Elias Vlieg Dr. Ernst van Eck dr. Hans Elemans Drs. Tom Bloemberg (practicumleider) Drs. Wim Gielen (docent wiskunde) Dr. Roald Verhoeff (C-variant)
10.45	**11.00**		Pauze
11.00	**11.45**		OLC (studenten en docenten)
		Sk	Prof. dr. Ger Pruijn + Lisanne Kempkes
		MLW	Dr. Dennis Lowik + Donny Jansen
		NW	Dr. Hugo Meekes + Jos Deurloo
11.45	**12.30**		Examencommissies
		Sk	Prof. dr. Sybren Wijmenga, Wilma Philipse
		MLW	Dr. Wilbert Boelens, drs. Gerrie Coppens
		NW	Prof. dr. Wilhelm Huck, dr. Jan Keltjens, dr. Luc-Jan Laarhoven
12.30	**13.30**	**HFML2.11**	Lunch

13.30	**14.00**		Inloopspreekuur
14.00	**15.00**		Eindgesprek met management
			prof. dr. Lutgarde Buydens (vice-decaan), prof. dr. Floris Rutjes (onderwijsdirecteur)
			Opleidingscoordinatoren: prof. dr. Gerard Martens (MLW), prof. dr. Dave Parker (NW), dr. Rene de Gelder (Sk)
			dr. Luc-Jan Laarhoven (secretaris OWI), dr. Ger Boonen (hoofd facultaire onderwijsondersteuning)
15.00	**17.00**		Commissie vaststelling bevindingen
17.00	**17.30**	**HG00.307**	Mondelinge rapportage
17.30		**vide**	Borrel

Appendix 7: Theses and documents studied by the committee

Prior to the site visit, the committee studied the theses of the students with the following student numbers:

Bachelor theses
Chemistry
714437
512397
709441
711012
237752
412740
616273
235903
813788
709417
813966
813877

Molecular Life Sciences
636258
314684
622311
845566
700010
616524
650390

Natural Sciences
700061
800139
721271
531685
500100

Master theses
Chemistry
520128
515779
512435
548677
116793
412635
421820
132640
512559
412678
506141
519278

Molecular Life Sciences
513962
420611
414131
132926
610399
414018
753602

Natural Sciences
418021
521515
351652
338710
314366

During the site visit, the committee studied, among other things, the following documents (partly as hard copies, partly via the institute's electronic learning environment)

- Course manuals bachelor's and master's programme;
- Standard/basic books;
- Tests, assessment criteria, assessment forms and answers;
- Strategic plans of Radboud University Nijmegen and Faculty of Science;
- Documents on the implementation and follow-up of the 'Sectorplan Natuur- en Scheikunde';
- Report NVAO-audit of institutional quality assurance system;
- QANU-reports Research Reviews Chemistry and Physics;
- Reports of research groups associated with the programmes;
- Faculty regulations;
- Minutes of the Board of Examiners;
- Minutes of het Programme Committee;
- Minutes committee 'Nieuw Bachelorcurriculum Science';
- Minutes Curriculum Committee Molecular Sciences;
- Presentations and notes meetings of lecturers;
- Programme year reports Molecular Sciences;
- Notes on development of master tracks;
- Concept of 'Academische Vorming' and student portfolio;
- Booklet 'Criteria for academic bachelor and master curricula';
- Internships forms, new version;
- Recent course evaluations (from 2008-2009 onwards);
- Information on outreach and information initiatives;
- Report on 'Careers of FNWI alumni 1994-2008';
- Information on 'Study Tour Chemistry'.

Appendix 8: Declarations of independence

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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Etienne SCHACHT

ADRES: Rysseveldstraat, 99
B-8840 STADEN, België

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

ZIE BIJLAGE

AANGEVRAAGD DOOR DE INSTELLING:

ZIE BIJLAGE

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

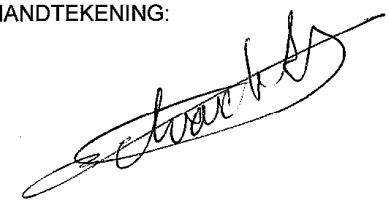
VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Rotterdam DATUM: 22/03/2012

HANDTEKENING:



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nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: VAN LOMMEL GUY

PRIVÉ ADRES: KLETS 34

B- 2530 Berlaar België

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Scheikunde

AANGEVRAAGD DOOR DE INSTELLING:

QANU

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Rotterdam DATUM: 22/3/2012

HANDTEKENING:

2

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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Prof. Dr. Jürgen Heck

PRIVÉ ADRES: Süderoogstieg 77
D - 22926 Ahrensburg

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Scheikunde

AANGEVRAAGD DOOR DE INSTELLING:

QANU

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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nvao
nederlands-vlaamse accreditatieorganisatie

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Hamburg DATUM: 9.7.2012

HANDTEKENING:

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Prof. Dr. Paul J.A. Kenis

PRIVÉ ADRES:

2208 South Staley Road, Champaign, IL, 61822, USA

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Chemie, Radboud Universiteit, Nijmegen

AANGEVRAAGD DOOR DE INSTELLING:

Quality Assurance Netherlands Universities (QANU)

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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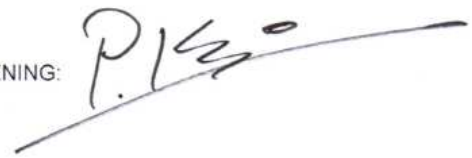
VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Champaign IL, USA DATUM: 26 Maart 2012

HANDTEKENING: 

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nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Nicky Oppers

PRIVÉ ADRES: Winkelstraat 12A
5644 EK
Eindhoven

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Scheikunde

AANGEVRAAGD DOOR DE INSTELLING:

QANU

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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nederlands-vlaamse accreditatieorganisatie

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VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Rotterdam DATUM: 22-03-2012

HANDTEKENING:

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Jeje De Graef

PRIVÉ ADRES:
Daenestraat 17
2600 Berchem
België

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Bachelor - master Natuurwetenschappen; Bachelor - master Moleculaire Levenswetenschappen; Bachelor - master Scheikunde

AANGEVRAAGD DOOR DE INSTELLING:

Radboud Universiteit Nijmegen

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVEPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN.

nvao

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VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Berchem DATUM: 16/04/2012

HANDTEKENING:

2