Scheikunde OW 2012

Faculty of Agricultural and Environmental Sciences,
Wageningen University

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This report was finalized on 6 November 2012.

Report on the bachelor's programme Moleculaire Levenswetenschappen and the master's programme Molecular Life Sciences of Wageningen University

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

Administrative data regarding the programmes

Bachelor's programme Moleculaire Levenswetenschappen

Name of the programme:	Moleculaire Levenswetenschappen
CROHO number:	59304
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	
Location(s):	Wageningen
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:	60303
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	Biomedical Research, Biological Chemistry, Physical Biology, Physical Chemistry, Environmental Chemistry
Location(s):	Wageningen
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 Agricultural and Environmental Sciences of Wageningen University took place on 14 May 2012.

Administrative data regarding the institution

Name of the institution:	Wageningen University
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment: internationalization on the institutional level	positive, with special feature

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 programme Moleculaire Levenswetenschappen and the master's programme Molecular Life Sciences consisted of:

- Prof. dr. E. Schacht (chair), Honorary Professor Organic Chemistry, Ghent University, Belgium;
- Prof. dr. P. Geerlings, Full Professor General and Quantum Chemistry, dean of the Faculty of Science and Bio-engineering Sciences, Vrije Universiteit Brussel, Belgium;
- Prof. dr. J. Heck, Full Professor Anorganic and Applied Chemistry, Universität Hamburg, Germany;
- 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 Molecular Life Sciences programmes of Wageningen University 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 coordinator 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 fifteen bachelor and fifteen master theses randomly and stratified out of a list of all graduates of the last two years per programme. QANU asked the programmes to send the theses including the assessment by the supervisor and examiner and divided them among the subcommittee members. Each committee member, therefore, assessed three theses per programme.

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 to 25.

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

The committee visited the programme on 14 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).

On 13 May 2012, the committee had a preliminary meeting and studied the 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 programme for a check on facts. The comments by the programme 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
In the bachelor's and master's programme of Molecular Life Sciences, the natural sciences are used in a fundamental sense, with a focus on molecules and their chemical and physical properties in relationship to the environment in which they occur. The programme is broad, multidisciplinary, fundamental in character and thorough.

The assessment committee finds the intended learning outcomes well described in terms of level and orientation. They comply with the domain specific framework and international requirements. It is the opinion of the committee that the broad and interdisciplinary focus of the programme, with its emphasis on the Wageningen UR domain, is clear, unique in the Netherlands, and competitive in Europe.

The committee appreciates the strong and direct link between the learning outcomes of the bachelor's- and master's programmes and the research spearheads of Wageningen UR, leading to an openness of the programme to new evolutions in research. The attention for education in the learning outcomes of the programme is also highly valued by the committee.

Teaching learning environment
The assessment committee finds that the learning tracks in the bachelor's programme and the specializations in the master's programme enhance the coherence of the programme. The committee noticed that the teaching methods of the programme are rather traditional. Still, the committee values that practicals form an important teaching method and that the contact of students with the research groups is optimal.

The quality of the learning environment is very good. The lecturers are easily approachable and the facilities are up to standard. The programme has a unique character, attracting people from around the country and beyond. The assessment committee also found clear evidence of the fact that the programme aims at constant improvement. The programme has taken several actions to meet the remarks of the previous assessment committee.

The assessment committee values that the first two years of the bachelor's programme give a broad education that is uniform to all students, enabling students to orient on the field. From the third year onwards, ample space is given to the students to go into their preferred direction of specialization.

The committee is not convinced that the current layout of the academic year, with six short periods and courses that are offered in small blocks of 3 or 6 EC, is adequate in the bachelor's programme. The committee believes that an important drawback of this system is that the integrated thinking by students is weakened as there is less space to offer a global insight in the material. The committee recommends that the programme strives towards working with longer periods that allow for more time for the material to be absorbed by the students.

The assessment committee appreciates that the recruitment of students in the bachelor's programme has improved, but thinks there is room for improvement, for example by involving alumni in the recruitment policy. The committee agrees with the programme management that the feasibility and completion rates of the programme remain a point of attention. The committee advises the programme to make the first year more selective and to consider implementing a more stringent form of study advice (like the BSA).

The committee finds that the master's programme is well-focused and offers a well-balanced variety of courses. The committee values that a majority of students does the internship abroad. Students are given adequate guidance and support for their thesis.

The committee has the opinion that the influx of students in the master's programme can be improved upon by offering a set pre-master programme for students with a professional bachelor's degree in a related field. Another possible margin for improvement lies in attracting more international students for the master's programme.

The committee strongly appreciates that the programme offers an Education Variant that allows students to gain thirty of the required 60 EC for the first-level teachers certificate in chemistry. The committee feels more effort can be put into promoting this variant. Moreover, it is the opinion of the committee that the attractiveness of the variant can be enhanced by including a more substantial portion of the first-level teachers certificate in the master degree.

Assessment and achieved learning outcomes
Overall, the committee concludes that the existing assessment system, the level of the bachelor theses and the performance of graduates in the master's programme demonstrate that the achieved level of the bachelor's programme Molecular Life Sciences is adequate. Still, the committee has found that there is an important margin of improvement in the way multiple choice (MC)-exams are used in the bachelor's programme. The committee recommends that the programme looks for ways to improve the feedback system used for MC-exams. Possibilities include providing students with answer keys or increasing the amount of open question exams.

The committee also concludes that the quality of the master theses and the performance of graduates in the labour market and in PhD trajectories demonstrate that the achieved level of the master programme Molecular Life Sciences is high. The committee learnt that Wageningen graduates are well sought after at other research institutes in the Netherlands and abroad, which indicates that the achieved level of the master's programme is high.

As for the evaluation procedure of the theses, the committee appreciates that a uniform evaluation form is now in place. In a small minority of the theses the assessment committee evaluated, the supervisor had not motivated why a certain mark was given. The committee suggests that the Examination Board implements a system, which ensures that the evaluation forms are automatically screened in situations where this motivation is especially important. Examples are exceptionally high or low marks, or supervisors giving a mark that is not in accordance with the remarks made by external supervisors.

Bachelor's programme Moleculaire Levenswetenschappen:

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

Master's programme Molecular Life Sciences:

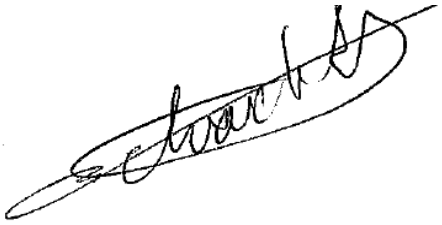
Standard 1: Intended learning outcomes	good

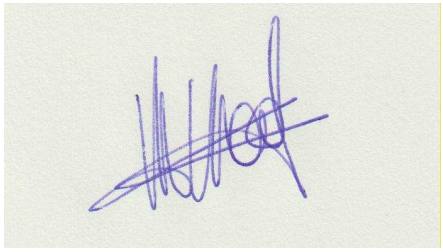
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	good

General conclusion good

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.

Wageningen University aims to be a 'University for Life Sciences'. The mission of Wageningen University and Research Centre (Wageningen UR) is to improve the quality of life. In order to do so, its research focuses on the domain of 'healthy food and living environment', with three interconnected core areas: Health, Lifestyle, Livelihood; Food and Food Production; and Living Environment. During the site visit, the programme management explained that the university policy is to attune the teaching activities directly to the research domains. As a consequence, new evolutions in research are fitted in the teaching programmes. New developments that are seen as promising for Molecular Life Sciences can be found especially in the fields of nanotechnology, systems biology, biobased chemistry and sustainability.

The bachelor's and master's programmes of Molecular Life Sciences have a fundamental approach to the natural sciences. The focus is on molecules and their chemical and physical properties in relationship to the environment in which they occur. The programme aims to be broad, multidisciplinary, fundamental in character and thorough. Students learn to become academics with domain knowledge, a multidisciplinary attitude and an interest in problem solving. During the interviews, students stressed that the broadness and multidisciplinarity of the programme were important factors in choosing for Wageningen University.

Bachelor's Programme
The bachelor's programme in Molecular Life Sciences provides students with a spectrum of professional and personal competencies needed to work under the supervision of an academic scientist (master's level) in fields related to fundamental molecular aspects of the 'University for Life Sciences' domains. The programme educates students in the basic disciplines of chemistry, physics and biology, and focuses on what is relevant for an interdisciplinary approach of life sciences in general and to the Wageningen UR domain in specific. The mail goal is to prepare for a master's programme. In addition, the programme provides the domain-specific knowledge to achieve a second-level teacher's certificate in chemistry if students follow the required additional training.

The learning outcomes of the bachelor's degree programme and their relationship to both the profile of the programme and the Dublin descriptors are presented in Appendix 3. After successful completion of this bachelor's programme, graduates are expected to be able to:

1. Clarify, explain, interpret and apply concepts from inorganic chemistry, cell biology, genetics and microbiology;
2. Apply mathematical knowledge, methods and techniques from linear algebra and calculus and use relevant software to solve mathematical problems, in the domain of the molecular life sciences;
3. Apply concepts from chemistry and physics, handle and derive formulas, do calculations, analyse and solve theoretical problems in the fields organic and physical chemistry, thermodynamics, colloid science, biophysics, quantum mechanics and spectroscopy;
4. Explain the relationships between structure and reactivity of molecules and apply concepts and theories in synthesis, catalysis and biochemistry and molecular biology;
5. Apply scientific experimental methods in the various fields of molecular life sciences including analytical, physical and organic chemistry, biochemistry, molecular biology, biophysics and spectroscopy;
6. Participate in group work and discussions;
7. Write and carry out a simple research plan under supervision of an academic (master-level) scientist in at least one of the domains of the molecular life sciences;
8. Process, present and discuss collected data, both orally and in writing;
9. Include safety, environmental, ethical, societal considerations that are intrinsically related to being active in the molecular-sciences domain in his activities;
10. Design and plan their own learning path in consultation with a study advisor;
11. Make a well-founded choice for a follow-up MSc programme or a position in the labour market.

Master's Programme
The main objective of the master's programme is to extend the scientific competencies of students and prepare them for a scientific career in molecular life sciences. The second objective is to provide students of the 'educational variant' of the programme not only with the educational qualifications but also with the domain-specific knowledge necessary to achieve a first-level teacher's certificate in chemistry.

In the master's programme, even more focus is put on what is relevant for the Wageningen UR domain. The programme offers five specializations, that each gives students a different focus: Biomedical Research, Biomedical Chemistry, Physical Biology, Physical Chemistry and Environmental Chemistry. The first and the last specialization span a broad range of disciplines, whereas the other three combine two basic disciplines.

The learning outcomes of the master's degree programme and their relationship to the Dublin descriptors are presented in Appendix 3. As the learning outcomes are formulated in a generic way, they apply to all the specializations. Still, a distinction is made in the learning outcomes between a 'main' variant and an 'educational' variant of the programme. Compared to the learning outcomes of the bachelor's programme, the master's programme puts more emphasis on acquiring competencies and skills required to function relatively independently as a scientific investigator in the field of molecular life sciences.

After successful completion of the main variant of the master's programme, graduates are expected to be able to:

1. Apply various advanced research methods in the field of chemistry, physics and / or molecular biology in a research project;

2. Accomplish tasks that may be part of a research job including determination of project aims, execution of various team functions, defence of points of view and conclusions, assess the contribution of other team members and give feedback in writing and verbally;
3. Properly function in an academic research setting outside Wageningen University;
4. Keep up with the scientific literature and utilize new developments in his specialized domain, participate in a research team and discussions, write a scientifically sound report;
5. Respond to environmental, ethical, societal and global considerations in practicing his profession;
6. Implement strategies in the field of molecular sciences that are compatible with a sustainable society;
7. Participate successfully in research under supervision of a PhD-level scientist and to be able to write and carry out a small research plan, to report the results and to evaluate the findings in view of existing literature in his own field of specialization.

A graduate of the master's programme Molecular Life Sciences of Wageningen University in the Educational variant is expected to attain the same learning outcomes as students in the main variant, with the exception of learning outcomes 2 and 3. Instead of reaching the latter goals, the graduate is expected to be able to do a reduced educational master to become a fully licensed secondary school teacher in chemistry ('ingedaalde lerarenopleiding').

Considerations

The assessment committee finds that the profile of both the bachelor's and master's programme is in line with the mission statement of Wageningen University. The intended learning outcomes are well described in terms of level and orientation and they comply with the domain specific framework and international requirements.

It is the opinion of the committee that the broad and interdisciplinary focus of the programme, with its emphasis on the Wageningen UR domain, is clear, unique in the Netherlands, and competitive in Europe. The committee has found that students and alumni are highly appreciative of this focus. Having better determined its uniqueness, the programme has met an important recommendation of the previous assessment committee.

The committee appreciates the strong and direct link between the learning outcomes of the bachelor's- and master's programmes and the research spearheads of Wageningen UR. This link leads to an openness of the programmes to new evolutions in research.

The committee values highly that explicit attention is given to education in the learning outcomes of the educational variant of the master's programme.

Conclusion
Bachelor's programme Moleculaire Levenswetenschappen: the committee assesses Standard 1 as **good.**
Master's programme Molecular Life Sciences: the committee assesses Standard 1 as **good.**

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

Bachelor's curriculum

In order to improve the coherence of the bachelor's programme, there are three mandatory learning tracks during the first two years:

- Track 1: Physical properties of molecules (32 EC);
- Track 2: Molecules at work in living systems (36 EC);
- Track 3: Chemical principles of living systems (36 EC).

Track 1 starts by providing the mathematical and physical basis for the programme and ends by making well-founded choices between various spectroscopic techniques in order to answer questions related to physical and chemical properties of molecules. Students also obtain a background in mathematics, quantum mechanics and chemical bonding. Track 2 teaches students where and how (bio)molecules do their work in living systems. Track 3 consists of two sub-tracks: one in physical chemistry and another in (bio)organic chemistry. Most bachelor courses can be attributed to one of these three tracks. However, the curriculum also contains courses that are specifically designed to integrate the different disciplines.

During the site visit, the Programme Committee explained that it continuously monitors and improves the coherence of the programme. In course evaluations, students are explicitly asked whether disturbing overlap between courses exists. Currently, the student-members of the Programme Committee are in the process of making an inventory of each track in order to improve the curriculum and avoid overlap.

Appendix 4 provides an overview of the curriculum. Students share most of their courses with adjoining programmes in the first year, which makes switching to other programmes at the end of the first year relatively easy. The first two years are filled almost completely with compulsory courses. The third year includes a thesis of 20 EC and student-driven course selections of 36 EC.

Students can use the student-driven course selections for broadening, deepening, preparing for a specific master's or filling gaps before starting a bachelor's thesis in a Chair Group (laboratory) of choice. The courses are selected individually by the students, following the guidelines in the study guide. Students can opt for the off-the-shelf minors the university offers (24 EC). The selection of courses is done in consultation with the study adviser and needs approval of the Examination Board. If students' choices are deviant from the proposed framework, the board will check formally whether the intended programme is still in line with the learning outcomes. During the site visit, the Examination Board explained that this happens on a regular basis. They also mentioned that students' choices are mostly well thought through and thoroughly motivated.

One of the minors is the 'Education' minor. Completion of this programme leads to a second-level teacher's certificate. During the site visit, students mentioned that although the courses that are offered in the off-the-shelf minors have improved in recent years, courses in some fields, like biomedical sciences or organometallic chemistry, remain under-represented. This is why some students follow courses or minors at other universities. The students expressed their appreciation for the space the programme provides to choose the desired direction of specialization.

The new bachelor thesis concept has been put in practice since the academic year 2010-2011 and aims to meet some of the recommendations of the previous assessment committee. Students work individually on a subject related to current research activities of a Chair Group under supervision of a PhD-student and under the responsibility of one or more Chair Holders. In general, the subjects have a multidisciplinary character. Students have to define objectives, formulate a model or hypothesis, make and execute a work plan and report both orally and in writing on the results. An instruction and assignment on finding papers in the scientific literature is part of the course. In addition, the student's ethics portfolio is discussed and assessed.

Academic skills are addressed in several courses, where they have a natural link with the content. With this approach, the programme meets one of the remarks of the previous assessment committee.

Master's curriculum
The master's programme consists of 120 EC, scheduled over two years. Appendix 4 provides a detailed overview of the curriculum.

The coherence of the programme is enhanced by introducing the five specializations. In the specialization of 'Biomedical Research' students are explicitly prepared to deal with medical-research subjects. The specialization of 'Biological Chemistry' focuses on the (bio)chemical properties of molecules in living systems. In 'Physical Biology', students obtain detailed knowledge on the biogenesis, properties and function of supramolecular structures in plants, animals and micro-organisms. The specialization of 'Environmental Chemistry' offers a fundamental approach to environmental issues.

Each individual specialization consists of preparatory courses (15 EC specialization-specific courses and 27 EC student-driven-course selection), a 36-credit thesis and a 30-credit internship. The programme concludes with the Academic Master Cluster (AMC, 12 EC), in which academic skills are further developed. During the site visit, students explained to the committee that most of them actually follow the AMC at the end of the first master year. This order makes more sense, as students prefer acquiring the academic skills while still working on their master thesis.

For the thesis, students use their acquired knowledge, skills and attitude to work in a Chair Group on topics that are in the frontier of science. Emphasis is put on writing a research protocol, execution of the protocol, writing a report or paper and giving a presentation. The thesis is done at one of the Chair Groups that are listed with the specialization the student has chosen. The internship is a thesis that is done outside of Wageningen University. Students are encouraged to do their internship abroad and about eighty percent does so, which is remarkable.
During the site visit, students mentioned that in the past, it was not always clear how to proceed in order to find a Chair Group and a thesis subject. Recently, a yearly thesis fair has

been set up, during which the Chair Groups present the opportunities for theses. This is very much appreciated by the students.

Students also remarked that, although the orientation towards an academic career is given ample attention in the programme, there is still room for improvement to orient students towards a career in industry. Representatives from industry do give guest lectures, but acquiring information on internships or careers in industry is left to the initiative of individual students.

Students following the Educational Variant replace the AMC and the internship by courses that prepare them for their educational master's degree in chemistry. The internship is done through the 'Education and Competence Studies' group as part of the first-level teaching programme.
During the site visit, it became apparent that students, by following the educational variant, obtain 30 EC of the 60 EC required to become a fully licensed secondary school teacher in chemistry. The remaining 30 EC have to be completed after finishing the master's programme. The programme management pointed out that on average, one student chooses to follow this variant per year. The committee spoke with a lecturer from the 'Education and Competence Studies' group, who explained that promotion of the Educational Variant is the responsibility of each separate programme and that a more proactive information policy may increase the influx of interested students. The programme management mentioned that the existence of an educational minor at the bachelor's level may help raise the interest in the Educational Variant at the master's level, but that the reality is that the majority of students do not start the Molecular Life Sciences programme with the plan of becoming a teacher.

Teaching concept and teaching formats
The programme works with small student groups, in which interaction between students and lecturers is stimulated. During the site visit, the students explained that this small-scale education was an important element in their decision to choose for Wageningen University. In order to stimulate an active learning attitude, a variety of teaching methods is used. Students are prepared to work both individually and in multidisciplinary teams. The programme includes many practical classes. More details on the contact hours for the bachelor's and the master's programme can be found in Appendix 5.

In the bachelor's programme, practicals, tutorials, lectures and group work are used as teaching methods. Lectures are a well-established teaching method in a significant amount of courses. They have been reintroduced in the first year of the bachelor's programme. During these lectures, lecturers often start from a specific context before touching on the essentials or giving integrated views. This is in line with the modern didactic approach of secondary school. Tutorials are offered in addition to the lectures, giving students the opportunity to work on assignments in groups of thirty or forty students under the supervision of an instructor. They are not compulsory, yet on average 60-80% of students attend them.
Practicals make up an important part of the teaching in the bachelor's programme and are compulsory. Students often work in pairs and are guided by a supervisor, who is in charge of eight to twelve students. In practicals, students acquire experimental skills, learn to work in a safe and environment friendly way, and acquire reporting skills. In the second year, students become increasingly responsible for the design and execution of their practicals.
Over 30% of the compulsory part of the bachelor's programme consists of courses combined with practicals. During the site visit, lecturers explained how practicals are used to generate more insight in the theory given in the lectures. Conversely, students sometimes do a practical

first in order to make them more receptive for the theory given in a subsequent lecture. The student-interviewees expressed their appreciation of the interactivity of the practicals.

The teaching methods in the master's programme are chosen pragmatically. The specialization courses are built up of lectures, tutorials and projects in small groups. Their aim is to ensure that students have sufficient domain-specific knowledge to start their thesis and internship. All advanced courses are strongly linked with current research.

During the site visit, students explained that courses are given in English, except for the first year of the bachelor's programme and one course in the second year. If all attending students speak Dutch, lecturers often generally switch to this language.

The academic year is divided over two semesters of equal length. Both semesters consist of a short period (4 weeks, 6 EC) and two longer periods (8 weeks, 12 EC). This division is new and has replaced a five period-system. The new structure makes it easier for students to spend a semester abroad or do a minor at another university. On being asked by the committee, students explained that this new structure, with exams at the end of every period, makes the material for the exam more digestible. A few lecturers mentioned that a possible drawback of the new system is that students have less time to assimilate the learning material in order to gain insight. This is especially the case in the two shorter, 4-week periods. Other lecturers and the programme management stressed that within the learning tracks, the courses build one upon the other. There is room for repetition and throughout the track, the understanding of and insight in the subject is deepened by treating subjects from different points of view. Students found that the most important drawback of the system is that missing a practical often implies a delay in finishing the study, as some courses are not repeated until the next academic year.

During the site visit, students mentioned that the orientation towards industry can be improved throughout the programme.

Student admission and recruitment

National rules and regulations regarding student admission apply to the bachelor's programme. Since the visit of the previous assessment committee in 2006, student intake in the bachelor's programme has risen from 14 in the academic year 2006-2007 to 44 in the academic year 2011-2012. Detailed information on intake, transfers and graduates can be found in Appendix 5. Following remarks on the student intake by the previous committee, effort has been put into improving the quantity and quality of the information about the bachelor's programme. The name of the programme has been changed from 'Molecular Sciences' to 'Molecular Life Sciences' and an information campaign has been set up. The programme management remarked that these actions, in combination with more introduction days, have significantly contributed to the increased intake. On being asked, the programme management explained that although alumni are present in the External Advisory Board, there is no alumni organization at the level of the Molecular Life Sciences programme. Consequently, alumni are not yet involved adequately enough in the recruitment policy of the programme.

Students with degrees from the bachelor's programmes Biotechnology or Molecular Life Sciences from Wageningen University or students with a Dutch bachelor's diploma in Chemistry or Chemical Technology can enter the master's programme automatically. Other students can enter the programme if their degree is comparable and if they have a grade-point average of 70%. Applicants are evaluated by the Master's Admission Committee.

Students already holding a professional bachelor's degree (HBO) in a related field can also start with the master's programme after an interview on admission, during which their domain-specific knowledge and motivation is assessed. During the site visit, the programme management explained that they have chosen not to work with a set pre-master programme. Interested HBO-students are often highly motivated and do an internship or minor at Wageningen University as part of their professional bachelor. This makes them well prepared for the master's programme and gaps in knowledge can be remedied on an individual basis. The HBO-student present during the site visit expressed her appreciation for the thorough intake and extensive information on possible obstacles in the programme and mentioned that although some courses were tough at first, she was now handling the subject matter well.

Student intake in the master's programme has been unpredictable over the past years, with 14 students entering the programme in the academic year 2007-2008 and 28 in 2010-2011 (see appendix 5 for more detailed information). The programme aims at a steady intake of 40-50 students annually.
The amount of students that enter the master's programme without having followed the bachelor's programme at Wageningen University has increased from 2 in 2007 to 17 in 2011. The influx of international students at master level has risen from zero in 2007to 13 in 2011. The programme wants to put more effort into attracting international students at master level by enhancing its communication.

Feasibility of the programme
Few students complete their bachelor's programme in three years. After four years, the portion of students that have obtained their degree is 37% for the students that started in 2007-2008. Dropout rates are high (21% of students started in 2007-2008 and 10% of students that started in 2008-2009 had dropped out by 1 October 2010). Detailed information on intake, transfers and graduates can be found in Appendix 5.

The data show that the master's programme is more feasible and that the dropout level is low. A significant part of the students obtain their degree after two years of study (62% of students that started in 2008-2009). After three years, this portion has risen to 94% for the 2006-2007 generation and 93% for the 2007-2008 generation.

The data on the study duration and the completion rates are blurred by the fact that many students already follow master courses before having finished the bachelor's programme. This means they can obtain their bachelor's and master's degree one after the other in a short period of time, making bachelor duration longer than it actually is and master duration shorter. This situation will change as the so-called 'harde knip' has been introduced for students starting their studies in the academic year 2010-2011 and onwards. The 'harde knip' requires that students complete their bachelor's programme before entering a master's programme.

During the site visit, the programme management stressed that one of its greatest challenges is improving the study duration and the percentage of students finishing the programme. It is expected that the 'harde knip' will influence the bachelor's success rate in a positive way. In order to improve the feasibility of the programme, other measures have been taken. As mentioned above, Wageningen University works with a six-period system. The programme aims to spread out the study load evenly over the periods. In the first year of the bachelor's programme, extra-curricular support courses are offered for chemistry, physics and mathematics. Furthermore, the programme provides different paths for different kinds of

students to achieve the learning outcomes of the mathematics education. All students are followed closely by the student advisers (see also 'Programme-specific services and facilities').

As the previous assessment committee also noticed, the second year of the bachelor's programme is more selective than the first. As a consequence, the programme has been restructured and the second year now has a set-up of physics and chemistry courses with a mainly theoretical nature paired to courses with a more practical nature, with a biological intermezzo halfway. This restructuring of the programme, so the programme management mentioned, has not had the desired effect as the study load remains high.

During the interviews, it became apparent to the committee that there are no plans to implement the so-called 'binding recommendation for continuation of studies' (BSA) as a tool to enhance the selectivity of the first year. With BSA, students receive a negative study advice at the end of the first year if they have not gained a required amount of credits. A negative advice means they cannot re-enrol. Instead of giving a binding recommendation based on grades, the student advisers monitor students very closely. In this way, students that struggle in the first year but that have the necessary capacity and motivation, can still develop into promising scientists.

Teaching staff
Lecturers in the bachelor- and master programmes of Molecular Life Sciences are required to be both scientific experts and skilled lecturers. Nearly all lecturers combine education with research tasks, hold a PhD and are members of a graduate school. Wageningen University gives an equal weight to education and research in the budget and in its selection and evaluation procedures. For new and permanent staff, a University Teaching Qualification is required. Lecturers receiving consistent negative remarks in student evaluations are required to follow tailored-made courses offered by the university.

In the bachelor's programme, the student-staff ratio in the 2011-2012 academic year is 5,17 (total personnel costs of the programme in fte, divided by the number of students, also taking into account 45% time expenditure to education by lecturers). PhD-students also do teaching tasks. Evaluations show that students are satisfied with this supervision. In the master's programme, the student-staff ratio is 4,64.
On being asked, the programme management indicated that they are well aware of the fact that the intensity of the education is high. In the bachelor's programme, this is a consequence of the regular use of practicals and tutorials. In the master's programme, the staff participation is high due to the amount of project-based work. Not all of the five specializations the master's programme offers are equally popular, but the programme is determined to improve the popularity of those courses that have a direct link to the research that is at the heart of the programme, like the courses in the field of physical chemistry. During the interviews, the programme also stressed that Wageningen University has a policy of investing the funds that are not specifically earmarked for either education or research, in education.

During the site visit, it became apparent that the students are very satisfied with the quality of the teaching staff. The openness and availability of lecturers was an important factor in choosing for Wageningen University. Students explained that the Wageningen approach leads to a unique atmosphere, which appeals to students. As a consequence, students from all around the Netherlands choose for the programme.

Programme-specific services and facilities
All teaching facilities at Wageningen University are centralized around its new campus, which is still in the process of being built. Students use specific chemistry labs. By 2013, the rooms for the practicals will be housed in a new building. Students also use the specialized facilities available at the Chair Groups. The access to high-end research facilities increases as students progress in their studies.

The evaluation committee that visited the Molecular Life Sciences programmes of the Wageningen University in 2006 assessed the building, facilities and laboratories as satisfactory. The domain-specific facilities, like the laboratories, have not changed since the last site visit and new facilities are still being built. This is why this 2012 evaluation commission did not have a reason to visit the building and facilities and adopted the 2007 assessment.

Wageningen University encourages and supports the study performance of each individual student through the Students Service centre, web-based information and study advice. Study advisors help students in the bachelor to choose their optional courses and thesis. Throughout the bachelor's programme, there is a structured schedule for study advice. Several sessions are foreseen, either in groups or individually, to help the students plan their study career and to keep track of their study progress. Also, the student advisor can invite individual students at any moment when the study results indicate that this is necessary. From November onwards, talks start with students who have missed their start. In January, talks with all students are scheduled. Next to this, the students are introduced to a tutor system in the course 'Introduction to Molecular Life' in the first bachelor year. Senior students (mostly second- and third-year students) introduce first-year students to study-related issues.

During the master's programme, the study advice concentrates on helping the students to compose their optimal individual programme. Student advisors also advise students to carefully manage the time spent on their thesis, which was a concern of the previous panel. There is also a structured schedule of study advice, ensuring that students meet with the student adviser at least five times during the maser programme, either individually or in group.

In the interviews, the students expressed their appreciation for the study guidance.

Considerations

The committee first goes into the considerations that are common for both the bachelor's and the master's programme. Next, the specificities of each programme will be discussed.

The assessment committee finds that the learning tracks in the bachelor's programme and the specializations in the master's programme make the programme coherent. It values that the coherence is a special point of attention for the Programme Committee.

The committee noticed that the teaching methods of the programme are rather traditional. Still, the committee values that practicals form an important teaching method and that the contact of students with the research groups is optimal. The committee has found that there is a firm link to research in the bachelor's as well as the master's programme and that the academic training receives ample attention throughout the programme. The committee has received a suggestion from the students that the orientation towards industry can be improved throughout the programme and advises the Education Committee to take this into account.

The quality of the learning environment is very good. The lecturers are easily approachable and the facilities are up to standard. The committee appreciates that attention is given to performance in education of the lecturers, next to achievements in research. The co-operation between lecturers and students is valued highly by the students. The programme has a unique character, attracting people from around the country and beyond.

The committee values the involvement of the students in the programme and was impressed by the maturity of the student-members of the Programme Committee. The committee has seen that the students draw attention to possible problems in the curriculum as soon as they arise. The smooth interaction between students and lecturers and the active membership of the student-members in the Programme Committee makes this possible. The assessment committee found clear evidence of the fact that the programme aims at constant improvement. The programme has also taken several actions to meet the remarks of the previous assessment committee. One example is Organic Chemistry that has been restructured and is now back on track.

Bachelor's programme
The assessment committee values that the first two years of the bachelor's programme give a broad education that is uniform to all students and that enables students to orient on the field. From the third year onwards, ample space is given to the students to go into their preferred direction of specialization. Students consider this room for their individual interests to be an important strength of the programme.

The committee learnt during the site visit that students wanting to specialize in the direction of biomedics or organo-metallic chemistry are confronted with a lower quantity of electives. The latter electives appear moreover to be unevenly distributed over the different periods of the academic year. Still, the committee values that students are actively supported to complement their profile by following courses and minors elsewhere.

The committee is not convinced that the current layout of the academic year, with six short periods and courses that are offered in small blocks of 3 or 6 EC, is adequate. It is true that the students do not have to assimilate large quantities of study matter and that this enhances the feasibility of the programme. Still, the committee feels that the integrated thinking of students is weakened by using this system as there is less space to offer a global insight in the material. The committee is moreover not convinced that this problem is completely solved by using learning tracks, in which the different blocks build one upon the other. The committee recommends that the programme strives towards working with longer periods that allow for more time and for a more extended set of the study material to be absorbed by the students.

The assessment committee appreciates that the recruitment of students in the bachelor's programme has improved, but thinks there is room for improvement, for example by involving alumni in the recruitment policy. The committee agrees with the programme management that the feasibility and completion rates of the programme remain a point of attention. On the one hand, the programme has taken measures to make the first year more feasible, and this is a positive evolution. On the other hand, the committee is not convinced that the current methods of study advice will lead to more selectivity in the first year, leaving the actual selection to the second bachelor year. This has a negative effect on the study duration and completion rates. The committee advises the programme to make the first year more selective and to consider implementing a more stringent form of study advice (like the BSA).

Master's programme
The committee finds that the master's programme offers a well-balanced variety of courses. The committee noticed, however, that the position of the AMC in the programme is not clear. Although the AMC is planned at the very end of the master's programme, it makes more sense to have students acquire academic skills before or while working on their master thesis. The committee saw that most master students already follow the course at the end of the first master year. The committee asks the programme to either adapt the formal planning of the course to this reality, or to communicate more clearly that students can follow the AMC earlier in their curriculum.

The committee has the opinion that the programme gives the students adequate guidance and support for their thesis and appreciates that a thesis market is now in place.

The committee values highly that a vast majority of students (80 %) does the internship abroad. The internationalization of the programme is also enhanced by the increasing number of international students that enter the master programme. The committee agrees with the Programme Committee that communication towards this target group can be improved in order to attract more students to the master programme.

The committee has the opinion that the influx of students in the master's programme can also be improved upon by offering a set pre-master programme for students with a professional bachelor's degree in a related field. In this way, the possibility to follow a master's programme at Wageningen University will be clearer for this target group. Imposing a pre-master programme would also make sense, as the learning outcomes of professional bachelor's degrees are very different from those of academic bachelor's degrees.

The committee strongly appreciates that the programme offers an Education Variant and that this allows students to gain 30 of the required 60 EC for the first-level teachers certificate in chemistry. Still, the problem remains that not many students choose for this option. The committee thinks this can be improved upon by raising the awareness of the existence of the variant. The committee recommends that the programme thinks about ways to stress the intrinsic value of this variant in its communication to future students. The committee also believes that the attractiveness of the Educational Variant would be enhanced if a more substantial portion of the first-level teachers certificate could be obtained together with the master degree. The committee urges the programme to take action in this respect.

Conclusion
Bachelor's programme Moleculaire Levenswetenschappen: the committee assesses Standard 2 as **satisfactory**.
Master's programme Molecular Life 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 committee first goes into the findings that apply for both the bachelor's and the master's programme. Next, the specificities of each programme will be discussed.

The assessment committee has read the education and 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.

The assessment strategy of the programme is explained to the students in the course guide. Different methods of assessment are used (for details see separate findings bachelor's and master's programme). Lecturers enhance the reliability of the assessment by explaining which elements in the answers of students lead to a certain mark. For multiple-choice questions, lecturers work with an answer-key. Model-answers are used for open questions. The programme also provides assessment criteria or rubrics for the evaluation of assignments. Sometimes a second assessor is required in order to enhance the reliability of the assessment.

In the critical self-reflection report it is stated that the current practice of assessment is fairly close to what is aimed at with the assessment strategy. Providing transparency and validity is an issue the Examination Board is currently working on, both via interim-course exams and assessment of research placements and theses. The Examination Board has recently started to visit the Chair Groups to verify the quality of the courses provided, including their assessment, and aims to do so on a regular basis in the future.

The programme is scheduled in six periods per academic year. Exams are foreseen after each period. None of the students present at the interview found the high frequency of exams a disadvantage. There are two possibilities for resitting an examination in the same academic year, and individual arrangements can be made for other course elements.

Bachelor's programme
In the common first two years of the bachelor's programme, different assessment types are used: open questions, multiple-choice questions, practical skills assessment, oral and written presentations and computer skills assessment. In many courses, a mix is used. Feedback sessions are held after the written exams.

Some courses in the bachelor's programme use multiple-choice (MC) exams. As is mentioned in the critical self-study, this is mainly for reasons of efficiency and reliability. Typically, MC-exams focus on testing knowledge and reproductive skills. Therefore, they are often always used in combination with other types of assessment and are thus only used for a subset of the learning outcomes. The programme has introduced an extended MC-system in the courses on General Chemistry, which aims to make gambling unprofitable and to approach the characteristics of an open exam. During the site visit, the Examination Board explained that

the twenty most probable answers are included in the MC. The correct answer receives the full score and most others zero. Some alternatives receive part of the maximum score, if they are based on less severe errors or obvious calculation mistakes. In this way the lecturers can follow the reasoning of the student. The Examination Board stressed that it attaches great importance to the valid use of MC-questions.

The bachelor's thesis is assessed in a final discussion between the student, the thesis supervisor and the relevant bachelor-thesis examiner (professor). A standard assessment form is used and a standardized rubric with specific criteria for grading is provided to ensure a uniform grading across different theses.

The majority of the graduated bachelors continue their study in the master's programme at Wageningen University. Details given in the critical self-reflection (based on an inquiry with 40 respondents) indicate that 85,7% does so. Some continue their study in another programme at Wageningen University (5%) and others leave for other universities (7,5%).

Master's programme
In the master's programme, the assessment types used for the course-part of the programme is comparable to that of the bachelor's programme. During the site visit, students mentioned that MC-questions are only used very exceptionally at the master level.

For the Academic Consultancy Training an extensive assessment format is used to assess each student's individual contribution to the end product and the collaborative process. Also, a rubric is provided. In this way, the programme tries to ensure that grading reliability is assured across students and years.

The master's thesis is evaluated in the same way as the bachelor's thesis. During the site visit, it became apparent that although a template for evaluation exists, the Chair Groups have the freedom to weigh the assessment criteria differently (within a certain range), thus accommodating for different types of research. The Examination Board stressed in their interview that although the template can be filled in differently, the exact manner in which students are to be evaluated is discussed with the student before starting the thesis and written down in a contract. The Examination Board also explained that it attaches great importance to the feedback that is given to students on the grade they have received. A feedback moment is foreseen and on the assessment form supervisors are expected to make their motivation explicit. As no complaints have been received in the exit-survey all graduated students fill in, the Examination Board considers this procedure to work well.

For the internship, an assessment form is used that is common to the university as a whole. An external and an internal supervisor are appointed. Whereas the external assessor advises on the quality of the performance of the student, the internal supervisor gives the grade, based on the report. The final responsibility lies with the lecturer from Wageningen University.

In the critical self-reflection, the programme indicates that a majority of the master students finds a job before graduating. Roughly 70% of the graduates start a PhD after their master studies. During the site visit, some alumni mentioned that their internship had led to acquiring a PhD-position, either in Wageningen or at another university.

Considerations

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

Overall, the committee concludes that the existing assessment system, the level of the bachelor theses and the performance of graduates in the master's programme demonstrate that the achieved level of the bachelor's programme Molecular Life Sciences is adequate.
Still, the committee has found that there is an important margin of improvement in the way MC-exams are used in the bachelor's programme. As academic years are divided in six periods at Wageningen University, students often have exams. This high frequency of exams may enhance the feasibility of the programme for students, but it is the opinion of the committee that it may also lead to an undesired increased use of MC-exams for reasons of efficiency. The committee is not convinced that the frequent use of MC-exams in the bachelor's programme is adequate and desirable, even in the new form that is used in the General Chemistry courses. The most important disadvantage of the system is that lecturers cannot follow the reasoning of students, which makes it difficult to give feedback. Consequently, it is hard for students to learn from their mistakes. The committee recommends that the programme looks for ways to reduce the number of MC-exams and to improve the feedback system used for MC-exams. Possibilities include providing students with answer keys (already in use to enhance the reliability of the assessment system) or increasing the amount of open question exams.

The committee concludes that the quality of the master theses and the performance of graduates in the labour market and in PhD trajectories demonstrate that the achieved level of the master programme Molecular Life Sciences is high.
The committee was very pleased with the level of the graduates. During the site interviews, the committee was impressed with the enthusiastic alumni that speak highly about the education they received at Wageningen University. The committee learnt that Wageningen graduates are well sought after at other research institutes in the Netherlands and abroad, which indicates that the achieved level of the master's programme is high. As most students have done an international internship, they have a solid international profile.

As for the evaluation procedure of the theses, the committee appreciates that a uniform evaluation form is now in place. The committee finds a variation between Chair Groups in how they apply the assessment criteria acceptable. The committee agrees with the Examination Board that supervisors should motivate the mark they have given on the assessment form. This was not the case in a small minority of the sample the committee saw. The committee finds that the presence of this motivation is especially important in cases where supervisors give very high or low marks, or where the supervisor gives a mark that is not in accordance with the remarks made by external supervisors (the latter applies mostly for internships). The committee therefore suggests that the Examination Board implements a system that ensures that the evaluation forms are automatically screened if this situation occurs. An even more thorough approach would be that the Examination Board screens all evaluation forms of theses and internships.

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

General conclusion

It is the opinion of the committee that the broad and interdisciplinary focus of the bachelor's and master's programme, with its emphasis on the Wageningen UR domain, is clear, unique in the Netherlands and competitive in Europe. The assessment committee finds the intended learning outcomes well described in terms of level and orientation. The committee concludes that they meet the international requirements and are in accordance with domain specific framework.

The committee is of the opinion that the teaching-learning environment offered by the programme enables students to achieve the intended learning outcomes. The lecturers are approachable and the facilities are up to standard. The structure of both the bachelor's and the master's programme is coherent and well balanced.

The committee concludes that the existing assessment system, the level of the theses and the performance of graduates demonstrate that the achieved level of the bachelor's programme is adequate, whereas that of the master's programme is good. Improvement at bachelor's level is possible by amending the use of MC-questions in written exams. The committee was very impressed by the level achieved by the master graduates.

Conclusion
The committee assesses the *bachelor's programme Moleculaire Levenswetenschappen* as **satisfactory.**
The committee assesses the *master's programme Molecular Life Sciences* as **good.**

Appendices

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

Prof. dr. Paul Geerlings is full Professor at the Free University of Brussels (Vrije Universiteit Brussel), where he obtained his Master's (1972), Ph.D. (1976) (both Summa Cum Laude) and Habilitation (with unanimous votes in 1983). He currently heads a research group involved in conceptual and computational DFT with applications in organic, inorganic and biochemistry. He is the author or co-author of about 400 publications in International Journals or as book chapters, and has about the same number of contributions to International Conferences with many invited lectures or presentations. He edited several books in the field. Besides research, Paul Geerlings has always strongly been involved in teaching, among others the Freshman General Chemistry and Quantum Chemistry courses in the Faculty of Science. During the period 1986-1990 and 2005-2010, he has been the head of the Department of Chemistry of the Faculty of Sciences, in the period 1995-1996 and 2010-2011 Vice Dean of the Faculty of Sciences. During the period 1996-2000 he has been the Vice Rector for Educational Affairs of his University and in the period 1998-2000 he has been a Member of the Interuniversity Council of the Flemish Community. Since 2011 he is Dean of the Faculty of Science and Bio-Engineering Sciences of the VUB.

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. 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).

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.

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*'.

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 veiligheid- 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.

[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; evenals het aangeven van alternatieven voor deelstappen;
- Dient inzicht te hebben in (1) de relatie proces-product; (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 programme Molecular Life Sciences: Learning outcomes and Dublin descriptors

	Dublin descriptors				
Learning outcome: After successful completion of this bachelor programme, graduates are expected to be able to:	Have knowledge and understanding	Apply knowledge and understanding	Making judgments	Communication	Learning skills
clarify, explain, interpret and apply concepts from inorganic chemistry, cell biology, genetics and microbiology	x				
apply mathematical knowledge, methods and techniques from linear algebra and calculus and use relevant software to solve mathematical problems, in the domain of the molecular life sciences;		x			
apply concepts from chemistry and physics, handle and derive formulas, do calculations, analyse and solve theoretical problems in the fields organic and physical chemistry, thermodynamics, colloid science, biophysics, quantum mechanics and spectroscopy;		x			
explain the relationships between structure and reactivity of molecules and apply concepts and theories in synthesis, catalysis and biochemistry and molecular biology;		x			
apply scientific experimental methods in the various fields of molecular life sciences including analytical, physical and organic chemistry, biochemistry, molecular biology, biophysics and spectroscopy;		x	x		
participate in group work and discussions;			x	x	
write and carry out a simple research plan under supervision of an academic (master-level) scientist in at least one of the domains of the molecular life sciences;	x	x	x		x
process, present and discuss collected data, both orally and in writing;				x	x
include safety, environmental, ethical, societal considerations that are intrinsically related to being active in the molecular-sciences domain in his activities;	x	x	x	x	
design and plan their own learning path in consultation with a study advisor;					x
make a well-founded choice for a follow-up MSc programme or a position in the labour market.			x		x

Master's programme Molecular Life Sciences: Learning outcomes and Dublin descriptors

	Dublin descriptors				
Learning outcome: After successful completion of this master's programme, graduates are expected to be able to:	Have knowledge and understanding	Apply knowledge and understanding	Making judgments	Communication	Learning skills
apply various advanced research methods in the field of chemistry, physics and / or molecular biology in a research project	x	x	x		
accomplish tasks that may be part of a research job including determination of project aims, execution of various team functions, defense of points of view and conclusions, assess the contribution of other team members and give feedback in writing and verbally (M);				x	x
properly function in an academic research setting outside Wageningen University (M);		x	x	x	
do a reduced educational master's to achieve a first-level teachers certificate in chemistry (E);	x	x	x	x	x
keep up with the scientific literature and utilize new developments in their specialized domain, participate in a research team and discussions, and write a scientifically sound report;				x	x
respond to environmental, ethical, societal and global considerations in professional practice;	x	x	x		
implement strategies in the field of molecular sciences that are compatible with a sustainable society;		x	x		
participate successfully in research under supervision of a PhD-level scientist, write and carry out a small research plan, report the results and evaluate the findings in view of existing literature in their own field of specialization;	x	x	x	x	x

Note: In learning outcomes 2 and 3, 'M' and 'E' refer to Main Variant and Educational Variant, respectively.

Appendix 4: Overview of the curricula

Bachelor's curriculum

Course	Name	EC	CS/RO	Year	Lectures	Tutorials	Practical	Excursions	Group work
BPE-10806	Introduction Molecular Life Sciences and Biotechnology	6	CS	B1	7	24	36		9
PCC-12303	General Chemistry 1	3	CS	B1	6	12	24		
CBI-10306	Cell Biology	6	CS	B1	12		48		12
PCC-12403	General Chemistry 2	3	CS	B1		18	24		
MIB-10306	Microbiology & Biochemistry	6	CS	B1	38	8	24		
ORC-12803	Bio-organic Chemistry I	3	CS	B1	4	18	24		
BIC-10306	Practical Biological Chemistry	6	CS	B1	10	6	90		
ORC-12903	Bio-organic Chemistry II	3	CS	B1		18	24		
PCC-11803	Inorganic Chemistry	3	CS	B1	24				
BIC-10807	Molecular Life Sciences	7	CS	B1	4		120	16	50
BIP-10303	Physics MLS	3	CS	B1	24	12			
PCC-21802	Introductory Thermodynamics A	2	CS	B1		24			
MAT-14803	Mathematics 1	3	RO1A	B1		35			
MAT-14903	Mathematics 2	3	RO1A	B1		32	6		
MAT-15003	Mathematics 3	3	RO1A	B1		32	6		
MAT-15303	Statistics 1	3	RO1B	B1		25	12		
MAT-14903	Mathematics 2	3	RO1B	B1		32	6		
MAT-15003	Mathematics 3	3	RO1B	B1		32	6		
MAT-14903	Mathematics 2	3	RO1C	B1		32	6		
MAT-15003	Mathematics 3	3	RO1C	B1		32	6		
BIP-23303	Theory of Relativity	3	RO1C	B1		24			
BIP-20306	Introductory Quantum Mechanics	6	CS	B2		60			
ORC-11806	Analytical Methods in Organic Chemistry	6	CS	B2	19	16	70		
ORC-20306	Organic Chemistry	6	CS	B2	15	15	72		
PCC-20306	Thermodynamics	6	CS	B2	18	18			14
BIC-20806	Enzymology	6	CS	B2	24		72		
BIC-20306	Cell Physiology and Genetics	6	CS	B2	42		18		
BIP-20806	Principles of Molecular Structure	6	CS	B2	24	24			
PCC-20806	Colloid Science	6	CS	B2	24		80		
BIP-31306	Spectroscopy	6	CS	B2	12	12	80		
MOB-20306	Gene Technology	6	CS	B2	18		80		
YML-80321	BSc Thesis MLS Part 2	21	CS	B3					
YML-80303	BSc Thesis MLS Part 1: Philosophy	3	CS	B3	6		40		

Note: Students with vwo Mathematics A take RO1A. Students with vwo Mathematics B take RO1B. Students with vwo Mathematics D choose in consultation with their study adviser RO1A or RO1B or RO1C.

Master's curriculum

The common part of the master's curriculum.

Course	Name	EC	CS/RO	Year	Lectures	Tutorials	Practical	Group work	Individual paper
YMC-60303	Modular Skills Training (MOS)	3	RO1A	M1/2	1		0		
YMC-60809	Academic Consultancy Training	9	RO1A	M1/2	6				
ECS-20806	Didactic Skills	6	RO1B	M1	1		48		2
ECS-32306	Teaching as a Profession	6	RO1B	M1	2		24		
MOB-31812	Toolbox Molecular Biology	12	RO2	M1/2	1				
MIB-30303	Research Methods Microbiology	3	RO2	M1/2	3		64		
ORC-31303	Research Methods in Organic Chemistry	3	RO2	M1/2	3		72		
PCC-31303	Research Methods Biomolecules and Interfaces	3	RO2	M1/2	3		70		
BIC-30803	Advanced Methods in Biochemical Research	3	RO2	M1/2	4		60		
BIP-32803	Biophysical Imaging	3	RO2	M1/2	4		64		
BIC-31312	Systems@Work: A Toolbox of Systems Biology	12	RO2	M1/2	5				
BPE-21801	International Excursion Biotechnology	1	RO3	M1/2	1				
BIP-23303	Theory of Relativity	3	RO3	M1/2	4	24			
BIC-70430	MSc Internship Biochemistry	30	RO4	M2	1				
BIP-70430	MSc Internship Biophysics	30	RO4	M2	1				
GEN-70430	MSc Internship Genetics	30	RO4	M2	1				
MIB-70430	MSc Internship Microbiology	30	RO4	M2	1				
MOB-70430	MSc Internship Molecular Biology	30	RO4	M2	1				
ORC-70430	MSc Internship Organic Chemistry	30	RO4	M2	1				
PCC-70430	MSc Internship Physical Chemistry and Colloid Science	30	RO4	M2	1				
PPH-70430	MSc Internship Plant Physiology	30	RO4	M2	1				

RO1B-courses are only to be chosen by students from the Educational Variant. Other students choose the RO1A-courses. Students choose at least one course from RO2. Students choose optionally from RO3. Students choose one internship from the RO4-list according to their specialization. In consultation and agreement with their study adviser, Dutch students who want to achieve a first-level teachers certificate in chemistry ('eerstegraadsbevoegdheid scheikunde') may choose RO1B instead of RO1A, and choose ECS-70430 instead of the specialization-related internship. In this way, the extent of the postgraduate teacher-education programme is significantly reduced. If you choose RO1B you must choose ECS-70430 but not necessarily vice versa.

Specialization Biomedical Research.

Course	Name	EC	Year	Lectures	Tutorials	Practical	Group work	Individual paper
HNE-35206	Human Pathology	6	M1	27		24		
HNE-35306	General Medicine	6	M1	24			12	
ABG-30306	*Genomics*	6	M1	15	13	76		
MOB-30306	*Control of Cellular Processes and Cell Differentiation*	6	M1	36		4	6	
PCC-31806	*Advanced Soft Matter*	6	M1	24		14	18	
SSB-20306	*Bioinformation Technology*	6	M1	12		105		
HNE-25306	*Food Components and Health*	6	M1	40				
VIR-30306	*Molecular Virology*	6	M1	24		30	12	
BIP-32803	*Biophysical Imaging*	3	M1			64		
MOB-31303	*Molecular Development*	3	M1	16		16		
TOX-30306	*Food Toxicology*	6	M1	24	20	44		
CBI-30806	*Immunotechnology*	6	M1	18	10	40	12	
HAP-30806	*Integrated Neuroendocrinology*	6	M1	26	14	12	7	
ORC-31806	*Bionanotechnology: from Chemistry to Devices*	6	M1		24	72		
BIC-80436	MSc Thesis Biochemistry	36	M1/2					
BIP-80436	MSc Thesis Biophysics	36	M1/2					
CBI-80436	MSc Thesis Cell Biology and Immunology	36	M1/2					
GEN-80436	MSc Thesis Genetics	36	M1/2					
HNE-81036	MSc Thesis Nutrition and Pharmacology	36	M1/2					
HNE-82436	MSc Thesis Metabolism and Nutrienomics	36	M1/2					
MIB-80436	MSc Thesis Microbiology	36	M1/2					
MOB-80436	MSc Thesis Molecular Biology	36	M1/2					
ORC-80436	MSc Thesis Organic Chemistry	36	M1/2					
PCC-80436	MSc Thesis Physical Chemistry and Colloid Science	36	M1/2					
TOX-80436	MSc Thesis Toxicology	36	M1/2					
VIR-80436	MSc Thesis Virology	36	M1/2					
XEU-80324	MSc Thesis Molecular Medicine - part B	24	M1/2					
XEU-80336	MSc Thesis Molecular Medicine - part A	36	M1/2					

Note: Students choose one of the first two courses on the list. They have to choose six EC from the courses that are in italics. Also, they choose a thesis on one of the subjects listed. If they choose for the Msc Thesis Molecular Medicine, they have to choose both part A and part B. In that case, there is no need to do a separate internship.

Specialization Biological Chemistry.

Course	Name	EC	Year	Lectures	Tutorials	Practical	Group work	Individual paper
MOB-30306	Control of Cellular Processes and Cell Differentiation	6	M1	36		4	6	
ABG-30306	*Genomics*	6	M1	1	15	13	76	
SSB-20306	*Bioinformation Technology*	6	M1	1	12		105	
MIB-30806	*Applied Molecular Microbiology*	6	M1	2	36			12
ORC-30806	*Structure and Reactivity*	6	M1	2	32	12		
MOB-31303	*Molecular Development*	3	M1	4	16		16	
HAP-30806	*Integrated Neuroendocrinology*	6	M1	5	26	14	12	7
MOB-30806	*Regulation of Plant Development*	6	M1	5	44	2	2	
BIC-80436	MSc Thesis Biochemistry	36	M1/2	1				
GEN-80436	MSc Thesis Genetics	36	M1/2	1				
HNE-82436	MSc Thesis Metabolism and Nutrigenomics	36	M1/2	1				
MIB-80436	MSc Thesis Microbiology	36	M1/2	1				
MOB-80436	MSc Thesis Molecular Biology	36	M1/2	1				
ORC-80436	MSc Thesis Organic Chemistry	36	M1/2	1				
PPH-80436	MSc Thesis Plant Physiology	36	M1/2	1				
TOX-80436	MSc Thesis Toxicology	36	M1/2	1				

Note: Students choose six EC from the courses in italics. They choose one thesis of the Biological Chemistry subjects listed.

Specialization Physical Biology

Course	Name	EC	Year	Lectures	Tutorials	Practical	Group work	Individual paper
INF-22306	Programming in Python	6	M1	1	12		94	
MAT-23306	*Multivariate Mathematics Applied*	6	M1	1		48	12	
MOB-30306	*Control of Cellular Processes and Cell Differentiation*	6	M1	1	36		4	6
PCC-31806	*Advanced Soft Matter*	6	M1	1	24		14	18
BIP-32306	*Biophotonics and Photosynthesis*	6	M1	2	24		14	18
BIP-31806	*Advances in Magnetic Resonance*	6	M1	5	24	12	36	
MOB-30806	*Regulation of Plant Development*	6	M1	5	44	2	2	
BIC-80436	MSc Thesis Biochemistry	36	M1/2	1				
BIP-80436	MSc Thesis Biophysics	36	M1/2	1				
MIB-80436	MSc Thesis Microbiology	36	M1/2	1				
MOB-80436	MSc Thesis Molecular Biology	36	M1/2	1				
PCB-80436	MSc Thesis Plant Cell Biology	36	M1/2	1				
PCC-80436	MSc Thesis Physical Chemistry and Colloid Science	36	M1/2	1				

Note: Students choose at least six EC from the list marked in italics. They choose one thesis of the Physical Biology subjects listed.

Specialization Physical Chemistry

Course	Name	EC	Year	Lectures	Tutorials	Practical	Group work	Individual paper
INF-22306	*Programming in Python*	6	M1	12		94		
PCC-31806	*Advanced Soft Matter*	6	M1	24		14	18	
BIP-32306	*Biophotonics and Photosynthesis*	6	M1	24		14	18	
ORC-30806	*Structure and Reactivity*	6	M1	32	12			
PCC-32306	*Environmental Physical Chemistry*	6	M1	24		14	18	
BIP-31806	*Advances in Magnetic Resonance*	6	M1	24	12	36		
ORC-31806	*Bionanotechnology: from Chemistry to Devices*	6	M1		24	72		
BIP-80436	MSc Thesis Biophysics	36	M1/2					
ORC-80436	MSc Thesis Organic Chemistry	36	M1/2					
PCC-80436	MSc Thesis Physical Chemistry and Colloid Science	36	M1/2					

Note: Students choose at least two courses from the list marked in italics. They choose one thesis of the Physical Chemistry subjects listed.

Specialization Environmental Chemistry

Course	Name	EC	Year	Lectures	Tutorials	Practical	Group work	Individual paper
BPE-21306	Bioreactor Design	6	M1	12		85		
ETE-21306	*Water Treatment*	6	M1	24		33		1
MIB-31306	*Microbial Ecology*	6	M1	33		25	4	
ETE-30306	*Biological Processes for Resource Recovery*	6	M1	24		18	6	
PCC-32306	*Environmental Physical Chemistry*	6	M1	24		14	18	
AEW-30806	*Chemical Stress Ecology and Risk Assessment*	6	M1	10		60		
ETE-30806	*Advanced Water Treatment and Re-use*	6	M1	24	20		12	
ORC-30306	**Applied Biocatalysis**	6	M1	22		20	8	
PCC-31806	**Advanced Soft Matter**	6	M1	24		14	18	
SOQ-22306	**Chemical Processes in Soil, Water, Atmosphere**	6	M1	30	30			
ETE-80436	MSc Thesis Environmental Technology	36	M1/2					
MIB-80436	MSc Thesis Microbiology	36	M1/2					
ORC-80436	MSc Thesis Organic Chemistry	36	M1/2					
PCC-80436	MSc Thesis Physical Chemistry and Colloid Science	36	M1/2					
SOQ-81336	MSc Thesis Soil Chemistry and Chemical Soil Quality	36	M1/2					

Note: Students choose the first course if the study adviser thinks this is necessary. They choose at least one course from the courses marked in italics. Also, they choose one course from the list marked in bold. One thesis subject is chosen.

Appendix 5: Quantitative data regarding the programmes

Data on intake, transfers and graduates

Table 1: intake numbers bachelor programme per student category (VSNU numbers)

Year	Size of cohort per student category					Total
	VWO	HBO prop	HBO	International	Other[5]	
07/ 08	19	0	0	1	0	20
08/ 09	19	0	0	6	0	25
09/ 10	33	0	1	4	0	38

Note: If the programme enrols pre-master students in the bachelor phase, HBO-numbers include these students

Table 2: Student dropouts in bachelor programme (VSNU numbers)

Cohort	Student dropouts				
	Cohort size	after 1 year	after 2 years	after 3 years	Selectivity of 1st year
	absolute	**percentage** (cumulative), is not displayed if total smaller than 4			
07/08	19	5	11	21*	25*
08/09	19	16	26*		
09/10	33	9*			

* Preliminary data based calculated October 1st

Table 3: Bachelor graduates per study duration (VSNU numbers).

Cohort	Size	% of	% students completing their Bachelor**				
	Re-enrol.	total co-hort	after 3 years	after 4 years	after 5 years	after 6 years	> 6 year
07/08	18	95	0				
08/09	16	84					
09/10	30	91					

* Preliminary data based calculated October 1st

** Percentage (cumulative), is not displayed if total smaller than 4

[5] Students transferring from other university bachelor's programs.

Table 3B: Success rates of the bachelor's Molecular Life Sciences (data taken from the WU-monitor)

	2003	2004	2005	2006	2007	2008	2009	2010
intake number	23	21	20	14	23	25	43	54
number of re-enrolment in year 2	18	16	14	13	19	21	32	
diploma after 3 years (%)	17	25	21	22	0			
diploma after 4 years (%)	28	38	43	46	37			
diploma after 5 years (%)	39	50	64					
diploma after 6 years (%)	61	75						
diploma after 7 years (%)	72							
dropouts by 1-10-2010 (%)	17	19	14	15	21	10		

Note: There are two important differences between the data presented in table 3B and that in table 3. The first is that the current programme Molecular Life Sciences and its predecessor, Molecular Sciences are regarded as one and the same programme. As of 1 September 2007 students who started with Molecular Sciences, graduate in Molecular Life Sciences. The second major difference is that the intake after 1 October counts to that of the next year.

Table 4: Bachelor students registered per student category and sex (VSNU-numbers)

	Registered			Full time			Part time	Dual
	Tot.	Men	Women	Total	Men	Women	Total	Total
07/08	82	47	35	82	47	35	0	0
08/09	92	57	35	92	57	35	0	0
09/10	111	61	50	111	61	50	0	0
10/11	141	78	63	141	78	63	0	0

Table 5: Cohort size and origin of Master's intake (VSNU-numbers)

Cohort size and origin of Master's intake					
Year	WU	Other universities NL	HBO	Outside HBO	Total
08/ 09	13	0	4	1	18
09/ 10	20	1	3	3	27

Table 6: Study duration master's programme for different student categories in the master programme

Study duration								
	WU		Other universities NL		HBO		Outside HBO	
	Number of graduates	Study duration	Number of graduates	Study duration	Number of graduates	Study duration	Number of graduates	Study du-ration
Graduation year	absolute	Average[6]	absolute	average	absolute	average	absolute	average
08/ 09	9	14			2	28	1	70
09/ 10	10	20			1	31	1	34

Table 6 B. Success rates of the master's Molecular Life Sciences (data taken from the WU-monitor).

	2003	2004	2005	2006	2007	2008	2009	2010
intake number	10	6	24	17	14	13	23	23
number of re-enrolment in year 2	50	67	83	88	57	62		
diploma after 3 years (%)	80	100	92	94	93			
diploma after 4 years (%)	80	100	92	94				
diploma after 5 years (%)	80	100	92					
dropouts by 1-10-2010 (%)	10	0	0	6	0	0	4	

Note: There are two important differences between the data presented in table 6B and the VSNU-data. The first is that the current programme Molecular Life Sciences and its predecessor, Molecular Sciences are regarded as one and the same programme. As of 1 September 2008 students who started with Molecular Sciences, graduate in Molecular Life Sciences. The second major difference is that the intake after 1 October counts to that of the next year.

Table 7: Total length of stay at WU of master graduates (for different student categories)

Length of stay at WU corresponding to different students' origins								
	WU		Other universities NL		HBO		Outside HBO	
	Number of graduates	Length of stay	Number of graduates	Length of stay	Number of graduates	Length of stay	Number of graduates	Length of stay
Graduation year	absolute	Average[7]	absolute	average	absolute	average	absolute	average
08/ 09	9	78			2	28	1	70
09/ 10	10	71			1	31	1	34

[6] In months.
[7] In months.

Table 8: Master students registered per student category and sex (VSNU-numbers)

	Registered			Full time			Part time	Dual
	Tot.	Men	Women	Total	Men	Women	Total	Total
08/09	33	17	16	33	17	16	0	0
09/10	44	23	21	44	23	21	0	0
10/11	47	22	25	47	22	25	0	0

Teacher-student ratio achieved

Table 9: Bachelor's programme

Ba - total	5.17
Ba-1	4.88
Ba-2	4.21
Ba-3	7.47

Note (table 9 and 10): Estimate made by the programme. All ratios refer to 'students per fte'. This figure is calculated by expressing the total personnel costs of the programme in full-time equivalents (fte), and taking into account a 45% time expenditure to education. As it is an estimate, the programme did not provide more details on student numbers and fte personnel.

Table 10: Master's programme

Ma - total	10.32
Ma-1	6.71
Ma-2	18.86

Average amount of face-to-face instruction per stage of the study programme

Table 11: Amount of contact hours in the bachelor's programme

	Contact hours							Hours	
Phase	HC	WC	Pract.	WG	IT	Thesis	Exc	Self study	Total
Ba-1	129	233	408	71	24		16	719	1600
Ba-2	196	145	472	14				773	1600
Ba-3	110	118	328	26	8	70	5	935	1600

HC Hoorcollege (lectures)
WC Werkcollege (tutorials)
Pract. Practicum (practicals)
WG Werkgroepen/projectwerk (Group work/project learning)
IT Computerondersteund (IT supported learning)
Exc Excursie (excursion)
Thesis Afstudeervak (thesis work)
Stage Stage (internship)

Table 10: Amount of contact hours in the master's programme

	Contact hours						Hours	
Phase	HC	WC	Pract.	WG	Thesis	Stage	Zelfstudie	Totaal
Ma-1	161	46	239	49	20		1105	1600
Ma-2					100	5	1495	1600

HC	Hoorcollege (lectures)
WC	Werkcollege (tutorials)
Pract.	Practicum (practicals)
WG	Werkgroepen/projectwerk (Group work/project learning)
IT	Computerondersteund (IT supported learning)
Exc	Excursie (excursion)
Thesis	Afstudeervak (thesis work)
Stage	Stage (internship)

Appendix 6: Programme of the site visit

Visitatie Moleculaire Levenswetenschappen, Wageningen University

14 mei 2012, Forumgebouw (102), VIP-rooms

8.30 – 9.30	**Management** Prof. dr. Pim Brascamp; directeur Onderwijsinstituut Prof. dr. Sacco de Vries; leerstoelhouder Biochemie Dr. Joan Wellink; lid dagelijks bestuur opleidingscommissie Dr. Peter Barneveld; opleidingsdirecteur
9.30 – 10.30	**Studenten** Matthijs Oosterbeek; student (BSc-1) Erik Nonhebel; student (BSc-2) Marjolein ter Laak; student (BSc-3) Berend van der Meer; student (BSc- 3) Christine Bruggeman, BSc; student (MSc- 1) Maartje Geerlings, BaSc; student (MSc-1) Carel Fijen, BSc; student (MSc-2) Hanne van der Kooij, BSc; student (MSc-2) Tim Wezeman, BSc; student (MSc-2)
10.30 – 11.15	**Docenten** Prof. dr. Herbert van Amerongen; leerstoelhouder Biofysica Dr. Henk Franssen; universitair docent Moleculaire Biologie Prof. dr. Hans de Jong; hoogleraar Erfelijkheidsleer Dr. Marleen Kamperman; universitair docent Fysische chemie en Kolloidkunde Dr. Sander van der Krol; universitair hoofddocent Plantenfysiologie Prof. dr. Martin Mulder, leerstoelhouder Educatie- en competentiestudies Prof. dr. John van der Oost; hoogleraar Microbiologie Dr. Dolf Weijers; universitair hoofddocent Biochemie Dr. Tom Wennekes; universitair docent Organische Chemie
11.15 – 11.30	**Pauze**
11.30 – 12.00	**Opleidingscommissie** Dr Walter van Dongen; universitair docent Biochemie Ilse van Hees; student (BSc-3) Yuval Mulla, BSc; student (MSc-1) Prof. dr. John van der Oost; hoogleraar Microbiologie Lisa van Sluijs; student (BSc-2) Frank Vergeldt, MSc; universitair docent Biofysica
12.00 – 12.45	**Lunch**
12.45 – 13.30	**Examencommissie en studieadviseurs** Prof. dr Peter Groot Koerkamp; lid examencommissie Dr. Klaas Swart; secretaris examencommissie Levenswetenschappen Dr. René Hoogendam; studieadviseur

Dr. Joan Wellink; studieadviseur

13.30 – 14.00 **Alumni**
Bas van den Berg, MSc; *AIO bij Organische Chemie, Wageningen University*
Eline van der Hagen, MSc; *AIO bij Ion Transport Group, UMC St. Radboud*
Aniek Jongerius, MSc; *AIO bij (Planten)celbiologie, Wageningen University*
Patrick Wijten, MSc (oud HBO-doorstromer); *AIO bij Biomolecular Mass Spectrometry and Proteomics, Universiteit Utrecht*

14.00 – 14.30 **Voorbereiden eindgesprek**

14.30 – 15.30 **Eindgesprek met management**
Deelnemers: zie 8.30 – 9.30u

15.30 – 17.30 **Opstellen bevindingen**

17.30 – 17.45 **Mondelinge rapportage**

17.45 – 18.15 **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:

Bachelortheses
900927136070
900129609080
890327757020
890420020100
900210675130
910703314040
880903432110
870210664030
900418014080
920227057100
900803369050
910123397040
900101896070
870722901100
900116972040

Mastertheses
860326297090
800907623100
840914987120
870104409070
851223050080
850704765040
860912819130
850718759020
860609979060
860906886060
851109361050
840829979080
860210558090
870118157090
841230880100

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)

- Document with detailed overview of learning tracks bachelor's programme;
- Course manuals bachelor's and master's programme;
- Standard/basic books;
- Tests, assessment criteria, assessment forms and answers;
- Minutes of the Board of Examiners;
- Minutes of het Programme Committee;
- Minutes of External Advisory Committee;
- Recent course evaluations 2010-2011;
- Recent curriculum evaluations;

- Effectivity dashboard Wageningen UR;
- Profile and performance agreements Wageningen UR.

Appendix 8: Declarations of independence

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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: GEERLINGS PAUL

PRIVÉ ADRES: TERMIJKELAAN 4

2530 BOECHOUT

BELGIE

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

SCHEIKUNDE

AANGEVRAAGD DOOR DE INSTELLING:

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

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: Rotterdam DATUM: 22/03/2012

HANDTEKENING:

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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: VAN LOMMEN 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;

1

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: Rotterdam DATUM: 22/3/2012

HANDTEKENING:

2

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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;

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nederlands-vlaamse accreditatieorganisatie

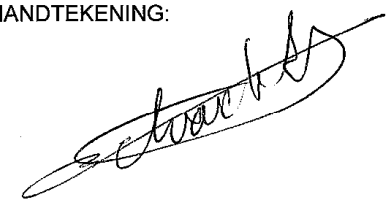
VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

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: Rotterdam DATUM: 22/03/2012

HANDTEKENING:



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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Prof. Dr. Jürgen Heik

PRIVÉ ADRES: Siderooglief 17
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;

1

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: Ham Sung DATUM: 9.7.2012

HANDTEKENING:

2

nvao
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;

1

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: Rotterdam DATUM: 22-03-2012

HANDTEKENING:

nvao

nederlands-vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM:
Jeje De Graaf

PRIVÉ ADRES:
Doenerstraat 17
2600 Berchem
België

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

Bachelor Moleculaire Levenswetenschappen &
Master Molecular Life Sciences

AANGEVRAAGD DOOR DE INSTELLING:

Wageningen Universiteit

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

nvao

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: Berchem DATUM: 16/04/2012

HANDTEKENING:

2