Scheikunde OW 2012

Faculty of Science,
Utrecht University

QANU, October 2012

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This report was finalized on 10 October 2012

Report on the bachelor's programme Chemistry and the master's programme Chemical Sciences of Utrecht 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 Chemistry

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

Master's programme Chemical Sciences

Name of the programme:	Chemical Sciences
CROHO number:	
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	Nanomaterials: Chemistry and Physics, Molecular and Cellular Life Sciences
Location(s):	Utrecht
Mode(s) of study:	full time
Expiration of accreditation:	31-12-2013

The visit of the assessment committee Scheikunde OW 2012 to the Faculty of Science of Utrecht University took place on 7 June 2012.

Administrative data regarding the institution

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

Quantitative data regarding the programmes

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

Composition of the assessment committee

The committee that assessed the bachelor's programme Chemistry and the master's programme Chemical Sciences consisted of:

- Prof. dr. E. Schacht, Honorary Full Professor, Department Organic Chemistry, Polymer Chemistry & Biomaterials, Gent University, Belgium;
- Dr. G. van Lommen, senior director Medical Chemistry Galapagos N.V., Mechelen, Belgium;
- Prof.dr. P. Geerlings, professor conceptual and computational DFT with applications in organic, inorganic and biochemistry Free University Brussels, Belgium;
- Prof. dr. J. Heck, Professor Organometallchemie, Department Chemistry University Hamburg, Germany;
- M. Medic, master student Life Science and Technology, Leiden University.

The committee was supported by dr. B.M. van Balen, who acted as secretary.

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

Working method of the assessment committee

Preparation
The assessment of the bachelor's programme Chemistry and the master's programme Chemical Sciences of Utrecht University is part of a cluster assessment of 33 chemistry degree programmes offered by ten universities. The entire cluster committee consists of twelve members. 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. For each visit a sub committee was composed that ensures the necessary expertise to evaluate the programme. Furthermore the domain specific requirements and the most recent developments concerning the Chemistry domain were discussed. These domain specific requirements and the actual context form the starting point for the evaluation of the quality of the degree programmes.

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

In preparation of the assessment of the programme a self-assessment report was prepared by the programme management. This report was sent to QANU and, after a check by the secretary of the committee to ensure that the information provided was complete, forwarded to the committee members. The committee prepared the site visit by studying the self-assessment report and a number of Bachelor's and Master's theses. The secretary of the committee selected fifteen theses randomly and stratified out of a list of all graduates of the last two years per programme. The following stratification is used: five theses for each degree programme with low grades (6-6.5), five theses with middle ranged grades (7-8) and five theses with high grades. QANU asked the programmes to send the theses including the assessment by the supervisor and examinator and divided them among the sub committee members; each committee member therefore assessed three theses per programme.

When a thesis was assessed as questionable or unsatisfactory by a committee member, a reassessment was done by another committee member. In the case that more than 10% of the theses were assessed as questionable or unsatisfactory by two committee members the selection of theses for the programme was extended to 25.

Site visit
The Committee members formulated questions raised by studying the self-assessment report in advance. These questions were circulated in the committee.

The Committee visited the programme on 7 June 2012. The programme of the site visit was developed by the Committee's secretary in consultation with the programme management and the chair of the Committee. The Committee interviewed, next to students, teachers and alumni, the programme management and representatives of the Faculty Board, the Examination Board and the student and teacher members of the Programme Committee. An open office hour was scheduled and announced (but not used).

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

Report
The secretary wrote a draft report based on 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 Department for a check on facts. The comments by the Department were discussed in the committee, this discussion resulted in some changes in the report, and 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 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

Objectives
The Utrecht Chemistry department offers "undivided chemistry" in the bachelor's programme, meaning that bachelor's students acquire a thorough and broad basic knowledge of the discipline chemistry. Training to become a researcher is an important aspect of the programme.

The master's degree programme aims to involve students in challenging areas of chemistry research and is based on an interdisciplinary and international environment in the local research groups. The committee assessed two of the three master's specializations of Chemical Sciences: Nanomaterials: Chemistry and Physics (CHPH) and Molecular and Cellular Life Sciences (MCLS).

The committee has seen that the programmes have formulated clear intended learning outcomes that are in line with international requirements and has also established that the management of the programmes has a clear vision on education in Chemistry. In its assessment of standard 1, the strong unique profile of both Utrecht programmes is very much appreciated by the committee. The committee assessed this standard for both programmes as good.

Learning Teaching Environment
The bachelor's programme contains the full range of subjects, from biochemistry to physical and materials chemistry. The uniform major provides this subject-oriented basis as well as academic skills such as oral and written presentation skills, cooperation in projects and academic training. Starting from the second year, the student builds his or her own profile via electives. These may be within the student's own discipline and/or within other disciplines and can take the form of a minor. Practicals played an important role in the curriculum and in all three years of the programme students carry out projects within research groups. The education in the bachelor programme is delivered in lectures and tutorials, practicals, computer and wet lab practicals and (research) projects. In the first study year, the contact hours account for approx. 60% of the total study time.

The master curricula of CHPH and MCLS both consist of two main components; students follow courses and do research. There is in general no fixed order for students to select the programme components except for the internship or minor research project that can only be carried out after the (major) research project has been finished. The didactic concept of the master's programme is a research intensive education approach that teaches students to become scientist at a level corresponding to the start of a PhD study by the concept of learning by doing.

It is obvious to the committee that the contents and the structure of the bachelor's curriculum enable the students admitted to achieve the intended learning outcomes. The committee appreciates the strong relation between the programme and the research conducted in the department. The bachelor's programme offered is sound, coherent and of high quality. The programme offers the students ample opportunity to practice research. The tutoring system can and will be improved by combining the teacher-tutor with a student-tutor.

The committee has seen a master's degree programme that is obviously aimed at training the students in research. The emphasis on research in the programme is in line with the ambitions of the programme and in combination with the high quality of the teaching staff this enables the students very well to achieve a high level. The committee appreciates the way students are incorporated in the research groups as junior researcher and the possibilities offered to the students to do an internship abroad. The committee is of the opinion that the master's programme is good.

The committee is very positive about the quality of the teaching staff; this applies to their didactic skills as well as to their expertise in the broad range of Chemistry and related disciplines. The university's policy for didactic training of staff is very good and its implementation is ahead of the development in other universities.

Assessment and achieved learning outcomes
The committee has established that the programmes have an adequate assessment system and assessment procedures. The students finish each course with a test. During the programmes students are assessed by a variety of test methods. The committee studied a selection of 15 bachelor's theses and 15 master's theses to establish the achieved level of the students.

The committee is very positive about the assessment system used in the bachelor's programme and is impressed by the level achieved by the bachelor's students as demonstrated in the bachelor theses.

The implementation of the assessment system in the master's programme can be improved but is in general good. The level achieved by the master's students, as demonstrated in the master's theses is according to the committee also very good.

The committee assesses the standards from the Assessment framework for limited programme assessments in the following way:

Bachelor's programme Chemistry:

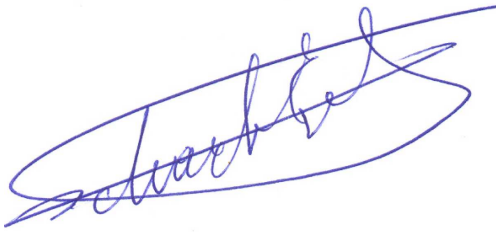
Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

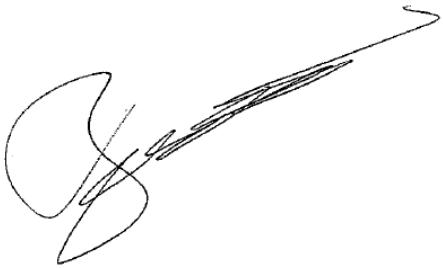
Master's programme Chemical Sciences:

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
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: 10 October 2012





prof. dr. Etienne Schacht

dr. Barbara van Balen

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

Bachelor
The Utrecht Chemistry department has chosen to offer "undivided chemistry" in the bachelor's programme. This way bachelor's students acquire a thorough and broad basic knowledge of the discipline chemistry. This vision on chemistry education and the choice the programme made is very much appreciated by the assessment committee. During the site-visit the management displayed its improvements in the programme. In order to improve the motivation of the first year students and therefore their study progress it introduced a problem centered project in the first period. Furthermore it introduced intake interviews with all first year students and matching interviews with pupils of secondary education to improve the matching and motivation of the students. In a number of cases the matching interviews result into an advice to the pupils to follow the summer course Mathematics before the start of the bachelor's programme. The third improvement the management introduced is the Honours programme. This programme enables a selection of best and motivated students to spend more time on specific courses, electives of their choice and on their bachelor thesis project. The committee appreciates these initiatives and considers them as an expression of a clear vision of the management on education in Chemistry.

During the site visit however the management also mentioned its plans to offer a molecular life science track in the bachelor's programme next to the chemistry track. The committee understands the emergency to secure a substantial inflow of students in the bachelor's programme and can see the advantages of a life sciences oriented track to attract more students. However molecular life sciences are offered at a number of other universities and the committee is not convinced that this extension will add to profiling the Utrecht programme.

Training to become a researcher is an important aspect of the programme. The research orientation of the bachelor's programme is according to the committee a strong aspect of the Utrecht profile. Students' choices of subjects and research projects determine the specific knowledge and skills they develop during their studies. The Department of Chemistry offers students a broad pallet of specialisms specific to Utrecht, ranging from a strong physical focus (condensed matter, colloids) to a more biophysical/biochemical focus (structural biology, protein folding, membrane biochemistry, proteomics) and a societal focus (chemistry didactics, sustainable development).

The committee has seen that the intended learning outcomes are described in terms of level and orientation and are in line with the domain specific framework and the international requirements for bachelor's programmes in Chemistry and Chemical Engineering.

The intended learning outcomes are presented in Appendix 3.

Master
The master's degree programme Chemical Sciences offers three specialisations. Each specialisation is cooperation with other disciplines. Two of these specialisations are involved in this assessment:

- Nanomaterials: Chemistry and Physics (CHPH), offered by Chemistry and Physics and Climate Science and
- Molecular and Cellular Life Sciences (MCLS), offered by Chemical Sciences, Biomedical Sciences and Biological Sciences.

The specialisation Drug Innovation (DINN) will be assessed in another cluster.

Utrecht University has organised the master's programmes and PhD trainings in graduate schools. The master's specialisation CHPH is part of the Graduate School of Natural Sciences and the master's specialisation MCLS is part of the Graduate School Life Sciences. Each graduate school provides training, teaching and research for master's students. Each graduate school has its own Board of Studies, Board of Examiners, Board of Admissions and Education Council.

The committee has seen that the masters' degree programme in Chemical Sciences at Utrecht University aims to involve students in challenging areas of chemistry research. The programme is based on an interdisciplinary and international environment in research groups, which belong to the top of chemistry research in the Netherlands, according to the Chemistry Research Assessment (QANU 2011). Chemistry students receive a training that fosters skills, provides knowledge and promotes attitudes essential to becoming a qualified scientist. They learn to work independently at a high professional level. A core concept in the philosophy of the master's degree programme in Chemical Sciences is the integration of research and course work which equips the student for success in a multi-disciplinary world.

Within the specialisation Nanomaterials: Chemistry & Physics, the aims are translated into a focus, both in teaching and research, on three key interrelated topics of the Debye Institute for Nanomaterials Science: Nanophotonics, Colloid Science and Catalysis. CHPH students acquire general knowledge in these three fields and in-depth knowledge in one of them. The master's students are guided in their search for new materials, the fundamental understanding of the properties of existing and new materials or processes for e.g. catalysis, solar cells, light manipulation and hydrogen storage. Depending on the chosen field of specialisation, the student opts for a monodisciplinary study programme in physics, an interdisciplinary study-programme at the cross-section of Physics and Chemistry or a monodisciplinary study programme in chemistry.

The aim of the specialisation Molecular and Cellular Life Sciences (MCLS) is to provide students with a theoretical background and research training in the fields of Structural Biology, Intracellular Membrane Processes, Biomembranes and Systems Biology. Molecular and Cellular Life Sciences is a rapidly developing research area at the crossroads of chemical, biological, physical and computational sciences focused on the understanding of molecular function at the (multi)-cellular level. The groups participating in the MCLS pursue insight into the relation -at the molecular level- between the structure and the function/activity of

bio molecules that are involved in key processes as regulatory processes in the cell and organism. The chemistry between bio molecules is studied by integrating advanced structural biology with biochemical and biomedical research. MCLS students are offered the opportunity to spend their major (51 ECTS) and/or minor (33 ECTS) research project in the MCLS groups, and to participate in bio molecular science under supervision of the scientific staff.

The committee has seen that the intended learning outcomes are described in terms of level and orientation and are in line with the domain specific framework and the international requirements for master's programmes in Chemistry and Chemical Engineering.

The intended learning outcomes of both specialisations are presented in Appendix 3.

Considerations
The committee has considered the vision of the programme's management on education in Chemistry in Utrecht, the profile of the Utrecht Chemistry programmes and the intended learning outcomes as described in Appendix 3.

The committee has noticed that the programmes have formulated clear intended learning outcomes that are in line with international requirements and has also established that the management of the programme has a clear vision on education in Chemistry. In its assessment of standard 1, the strong unique profile of both Utrecht programmes is very much appreciated by the committee. This appreciation concerns the choice for undivided chemistry of the bachelor's programme and the Nanomaterials: Chemistry & Physics as well as the Molecular and Cellular Life Sciences specializations of the master's degree programme.

Conclusion
Bachelor's programme Chemistry: the committee assesses Standard 1 as good.
Master's programme Chemical 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 programme
The bachelor's programme contains, in accordance with the vision of the Department to offer undivided chemistry, the full range of subjects, from biochemistry to physical and materials chemistry. An overview of the curriculum is presented in Appendix 4. The uniform major (135 EC) provides this subject-oriented basis as well as academic skills such as oral and written presentation skills, cooperation in projects and academic training through, for instance, the History of Chemistry course. Starting from the second year, the student builds his or her own profile via electives (45 EC). These may lie within the student's own discipline and/or within other disciplines and can take the form of a minor. Two 'tracks' help students

give direction to their choice of electives. These tracks, 'Molecules and Materials' and 'Molecules and Health', contain courses aimed at preparing the student for one of the master's programmes for chemistry bachelors. These include 'Nanomaterials: Chemistry and Physics', 'Molecular and Cellular Life Sciences', and 'Drug Innovation'.

The committee appreciates the important role of practicals in the curriculum and the fact that students carry out projects within research groups in all three years of the programme. In the practicals the theoretical concepts addressed in lectures and tutorials are applied directly and worked through in experiments. Similarly, the auxiliary subjects mathematics and physics are applied directly in physical chemistry, quantum chemistry and in molecular modelling. The training of academic skills in the bachelor's programme is very thorough; a significant part of the programme is dedicated to this training. Once students have learned the basics of chemistry in the first year, they can specialize to an increasing degree in the various chemistry disciplines in the second and third years. For instance, for students with an interest in the 'Molecules and Health' track, working towards the master's degree programmes of the Graduate School (GS) of Life Sciences, the third-year courses Viruses, Molecular Machines and Biomolecular Processes build upon the biochemistry courses in the Molecules and Life block of year two, which in turn builds upon the courses in the Chemistry and Life block of year one. The same applies to students with an interest in the 'Molecules and Materials' track, working towards the GS of Natural Sciences with regard to the Physical Chemistry courses in years 3, 2 and 1.

In the compulsory programme, there are thematic blocks in which theory subjects and practicals are well integrated. Students reported to the committee that they could use more training in Mathematics in the bachelor's programme, this is in particular useful for students aiming at the Nanomaterials: Chemistry & Physics track in the master's. The committee advises to implement such a Mathematics course in the third bachelor's year.

Master's programme
The master's curricula of CHPH and MCLS both consist of two main components with largely the same study load; students follow courses and do research. The study load for these components is variable, but students in both programmes can compose a study programme of about 30 ECTS devoted to theory and 90 ECTS to research. Within the MCLS programme the research is carried out in two projects: the minor and the major research project, while within the CHPH programme many students perform an internship project once they finished their research project within the university's research group.

There is in general no fixed order for students to select the programme components except for the internship or minor research project that can only be carried out after the (major) research project has been finished. Most students combine course work with research from day one. In each programme there is a substantial degree of freedom to choose courses that support the research projects theoretically, or that promote the personal interests and ambitions of students. It is evident that the master's degree programme is research oriented; students become a junior researcher in a research group. This is appreciated by the students the committee has interviewed during the site visit. According to the committee the content of the programme is well in line with the objectives and intended learning outcomes.

An overview of the curricula is presented in Appendix 4.

Learning teaching methods

The education in the bachelor programme is delivered in lectures and tutorials, practicals, computer and wet lab practicals and (research) projects. In the first study year, the contact hours account for approx. 60% of the total study time. Students are strongly advised to participate in all activities. Students reported to the committee that the first bachelor year is experienced as intensive and full. In fact, in the majority of courses in the bachelor's programme students experience a study load that is reasonably consistent with the 'hours of work'. Free study time is available for revising and learning. The content of the practicals is strongly connected with that of the lectures, which fosters the transfer of the acquired knowledge between contexts. The practicals are appreciated by the students. The students report enthusiastically about the ester project in the first period of year 1. The committee has established that the didactic concept is well in line with the content and the objectives of the bachelor programme. The committee appreciates the way students are confronted with research from day one in the first year of the bachelor's programme.

The didactic concept of the master's degree programme is a research intensive education approach that teaches students to become scientist at a level corresponding to the start of a PhD study by the concept of learning by doing. Courses enable students to obtain the theoretical framework needed for their research and career ambitions and give them a more in-depth theoretical background in the research field. All courses offer an interactive setting with a variety of teaching methods. The research groups provide a one-to-one relation between the PhD candidate/ supervisor and the master student. The students report to the committee that approximately half of them do their internship abroad. Students have to organise finances themselves but are well informed on how to find these finances. The committee is positive about the international orientation of the master's degree programme and the possibilities offered to the students.

Staff

The education in the bachelor's programme in Chemistry is delivered by professors and lecturers of the Faculty of Science. All lecturers are also researchers and hold at least the Basic Teaching Qualification (BKO) or are currently in training to acquire this qualification. Thirty lecturers hold the Senior Teaching Qualification (SKO). A few lecturers have completed the 'educational leadership' track at the Centre for Excellence in University Teaching (CEUT) at Utrecht University. The committee was impressed by the Utrecht University's policy aimed at professionalization of the teaching. The involved staff the committee has interviewed all seemed very motivated to improve their teaching skills and the quality of education.

The committee noticed that lecturers of the Department of Chemistry are very engaged with students. They are approachable and ready to help students who have a problem related to the subject they teach. The expertise of the lecturers includes the entire chemistry field from cell biology, biochemistry, structural biology and biophysics to organic, inorganic, physical and quantum chemistry and spectroscopy.

The teaching load for lecturers is relatively high. The lecturer–student ratio is currently in the order of 1:23 if only the FTEs available for teaching are taken into consideration (see Appendix 5).

All lectures involved in the master's degree programme have a combined research-teaching appointment and work in a research group, where students perform their research project. Teaching personnel comes from the Departments of Chemistry, Physics, Biology and the Utrecht Medical Centre (UMC).

Students
Students holding a VWO diploma with the Nature & Health subject cluster plus maths B and physics or the Nature & Technology subject cluster are unconditionally admitted to the bachelor's degree programme in Chemistry. Owing to the statutory intake requirement, students enter the programme with varying levels of knowledge of biology. This can prove problematic. Students who did not take a school-leaving examination in biology lack necessary knowledge when they start the degree in Chemistry. In the Chemistry of the Cell course taught in the first period of the bachelor's programme aims to bring all students up to the same level in terms of their biology knowledge. As study success can depend on good mathematics skills, students work on basic mathematical skills in the Mathematics 1A course. In the first year students apply these skills in the subjects Physical Chemistry, Mathematics 1B, Physics and Quantum Chemistry. All students who register for the bachelor programme are interviewed before the start of the programme.

Both master's specialisations are interdisciplinary and admit students with different backgrounds. All applicants send a motivation letter together with their bachelor results to their respective Board of Admissions. For some categories of students an additional proof is necessary before the Board of Admissions decides on their eligibility. Students who do not fulfil the admission requirements such as those coming from the HBO, can only be eligible for the master's programme after having successfully finished a premaster's course at bachelor's level of 5 months (September-January). Immediate admission to the master's programme (CHPH) is then foreseen in following February or September. Since 2010, MCLS admits highly motivated HBO students with high grades immediately into the master without a premaster's course. Instead of a premaster's course they follow the courses iCLS (Introduction into Cellular Life Sciences) and/or iMLS (Introduction into Molecular Life Sciences) in their master's programme depending on their background. The number of applicants from HBO to the premaster's course varies each year from 13 in 2002 to 0 in 2010.

Programme-specific facilities
The chemistry study advisor is for most bachelor students the primary contact for questions about or problems with finding their way through the bachelor programme. He is easily found in the education building. The study advisor supervises the tutors by signalling them when what to do for their students. This is most important during the first year when there are regular tutor interviews with students about their progress with respect to attaining the binding study advice limit (BSA, "bindend studieadvies") of 37.5 EC.

Most lecturers also act as tutor to a group of 6 to 8 bachelor students for a three-year period. Tutors are involved in their first-year students' education right from the first period (since 2011 with the supervision of the oral presentation training). In the first year, tutors are supposed to discuss study progress with their students at the end of each period. Tutors also have the formal task of supervising their students in a proper manner as they advance towards the BSA. In the second and third study years they are supposed to continue to be available to any of their students who need their assistance. Students report that the teacher-tutors are not very visible. For first year students just arriving at Utrecht University the distance between the teacher-tutors and themselves is too large. Students would prefer to combine the teacher-tutor with a student-tutor, whose experience with starting as a first year chemistry student would be fresh and very useful. During the site visit it was reported to the committee that this proposal will be realised in next academic year. The committee finds this a good development.

Programme directors and coordinators support master students in their individual choices and during their study. They are the first to be consulted by the students. Master students reported to the committee that they know where and to whom to go with questions and they experience no problems with guidance and supervision. The committee finds this support and guidance very adequate for master students.

In the Education Centre of the Went building, three labs are available for the chemistry practicals. During practicals the practicals' staff is responsible for the content and provides support. The content of a practical is determined by the leader of the practical and the lecturer in charge of the practical. Analysts provide the equipment and the supplies necessary for the practical and on occasion they also provide the student supervision. PhD candidates from the research groups and student assistants are deployed to supervise students during practicals. These all follow a training course in how to supervise students at their practicals. Students carry out research projects and a number of (biochemical) practicals in the second year within the research groups, where they can make use of the facilities available there. Since master students are considered junior researchers, they share the same facilities with the scientists. The committee has not visited the facilities but has noticed that the assessment committee visiting the chemistry programmes in 2007 was very positive about them. The students and teachers the committee has interviewed were also positive about the facilities, so the committee concludes that these are good.

Considerations

Bachelor's programme
Weighing the positive aspects of the programme and the aspects that can be improved the committee is of the opinion that Utrecht University offers an programme that meets the requirements of what can be expected of a bachelor's programme. It is obvious to the committee that the contents and the structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The committee appreciates the strong relation between the programme and the research conducted in the department. The programme offered is sound, coherent and of high quality. The programme offers the students ample opportunity to practice research. The tutoring system can and will be improved by combining the teacher-tutor with a student-tutor. The committee is very positive about the quality of the teaching staff. This applies to their didactic skills as well as to their expertise in the broad range of Chemistry and related disciplines. The university's policy for didactic training of staff is very good and its implementation is ahead of the development in other universities. The committee is however not convinced of the added value of the new track in the bachelor's programme aimed at molecular life sciences.

Master's degree programme
The committee has seen a master's degree programme that is obviously aimed at training the students in research. The emphasis on research in the MLCS and CPHP curricula is in line with the ambitions of the programme and this, in combination with the high quality of the teaching staff, enables the students very well to achieve a high level. The committee appreciates the way students are incorporated in the research groups as junior researchers and the possibilities offered to the students to do an internship abroad. The committee is of the opinion that the master's degree programme is good.

Conclusion
Bachelor's programme Chemistry: the committee assesses Standard 2 as satisfactory.
Master's programme Chemical Sciences: the committee assesses Standard 2 as good.

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

Board of Examiners
The Board of Examiners ('Examencommissie') monitors the proceedings relating to interim examinations and examinations. It is guided in its work by the Education and Examination Regulations (OER) and the related Rules & Guidelines. The Board of Examiners decides how the OER must be applied in all cases arising. Based on the organisation of the graduate school there are two Boards of Examiners responsible for the master's degree in Chemical Sciences. Both boards work according to the same rules and regulations and methods.
The committee met with representatives of the Boards of Examiners of the bachelor and master programmes during the site visit and established that an adequate quality assurance policy is in place, including a pro-actively monitoring of examinations and bachelor's and master's theses.

Bachelor's programme
The committee has noted that testing in the bachelor's programme takes various forms. Written testing (exams, reports, essays, research proposals, and scientific papers) is used for most subjects. Students are asked to apply the knowledge they have acquired during a course to solve problems or case studies. Students are at liberty to view and discuss the test results with the lecturer (to be done within 30 days from grading). Most courses also use interim testing, which involves testing students on part of the subject's material of the course. The written testing of the content of a course occurs twice a year: once at the end of a course and once in one of the resit periods. In accordance with the rules and guidelines of Utrecht University, a student is eligible to participate in the resits provided he/she has achieved a final result of at least 4.0 (out of 10). If the final mark is lower than this, the student should retake the subject. Students reported to the committee during the site visit that the tests and assignments are in line with the content of the courses and that they are adequately informed about the method of testing. Students did not report any complaints about the way they are assessed. The committee studied a selection of tests during the site visit and established that the tests represent a good proof of the level and achievement of the students in regard to the relevant learning outcomes. The committee has also seen that feedback on tests and assignments is provided in a structured and uniform way. The committee appreciates the model answers, which are available to assist the correction of written tests. The reliability and validity of the testing used is assured by the practice among lecturers of having another colleague to review their tests before the tests are presented to students. In order to better demonstrate the validity of tests, in 2011 a start was made on producing test matrices for subjects. A start was also made on the statistical analysis of test scores. The Assessment Advisory Committee ("Toets Advies Commissie") was appointed within the Faculty of Science in 2011. Representatives of the Boards of Examiners of the degree programmes sit in on the Assessment Advisory Committee.

In the assessment of research projects in the bachelor's programme (second year research project and bachelor thesis) students are assessed on many aspects. Lecturers use an assessment and feedback form that provides the student with clarity as to how the final grade came about. In addition, the student finds out how he/she has performed in the various aspects of the assessment by way of the feedback provided. In the assessment of these projects two staff members are always involved. For the bachelor thesis these are the immediate supervisor (usually a PhD student or postdoc) and a lecturer. In the opinion of the committee the bachelor's programme has a very adequate assessment system in place.

On average 84% of the graduates of the bachelor's programme progress directly to a master's degree programme.

The committee assessed fifteen recent bachelor's theses and established that all theses met the requirements for graduation. On average the theses are of quite high quality. The committee was impressed by the level achieved by the bachelor's students. The theses illustrate that the students have achieved the intended learning outcomes as formulated by the programme and more. Some of the bachelor's students even contribute to scientific publications. The theses assessment forms are used and give adequate information about the argumentation leading to the final mark. The committee is very positive about the assessment system used in the bachelor's programme and finds the level achieved by the bachelor's students very good.

Master's degree programme
In the assessment of master's research projects students are assessed on many aspects. Supervisors use an Assessment Form that provides the student with clarity as to how the final grade came about. Aspects that are written down in the Form are: a short description of the project and its aims, all kinds of agreements made between student and supervisor, the assessment criteria and signatures. Several feedback moments between student and his supervisor are included as well as comments arising from work discussions. Since 2011, supervisors in the CHPH programme also provide the student with a written feed-back on his research performance. A second reviewer who is not involved in the daily work of the student and appointed as examiner also assesses the (major) research report and if possible the oral presentation. The assessment of the minor research project/internship follows the same procedures, but the UU supervisor is responsible for the final grade. He/she assesses together with the student's supervisor at the host institution or company.

The committee assessed fifteen recent master theses and established that all theses met the requirements for graduation. On average the theses are of very good quality. The theses illustrate that the students have achieved the intended learning outcomes as formulated by the programme. The students have demonstrated to be able to deliver very good research. The theses assessment forms are used and give in general sufficient information about the argumentation leading to the final mark. The committee noticed a variation in the amount of feedback on the forms. It is recommend to strive for a more uniform way of completing the forms. The quality of the master's theses is also affirmed by the prizes the master's students received and the good number of publications the students contributed to. The programme has provided an overview of these achievements in the self-evaluation report. Most graduates of the Utrecht Chemistry degree programme continue their studies with a PhD traject (75%).

Considerations
As stated above, the committee is very positive about the assessment system used in the bachelor's programme and is impressed by the level achieved by the bachelor's students as

demonstrated in the bachelor theses. The committee considers the bachelor's programme on this standard as very good.

The implementation of the assessment system in the master's programme can yet be further improved but is in general good. The level achieved by the master's students, as demonstrated in the master's theses is according to the committee also very good. The committee considers the master's programme on this standard as good.

Conclusion
Bachelor's programme Chemistry: the committee assesses Standard 3 as good.
Master's programme Chemical Sciences: the committee assesses Standard 3 as good.

General conclusion

The committee members unanimously share the opinion that Utrecht University offers a very good bachelor's programme Chemistry. The programme is solid and coherent and has a strong link with the research in the Chemistry Department. The programme is taught by a staff of high quality and the programme specific facilities are adequate. The assessment system is very good and the bachelor's graduates demonstrated high level achievements.

The master's degree programme Chemical Sciences of the University Utrecht is in the opinion of the committee good. Students are thoroughly trained in research by very good teachers and in an attractive research environment. The master's students have achieved the intended learning outcomes of the programme on a quite high level.

Conclusion
The committee assesses the *bachelor's programme Chemistry* as good.
The committee assesses the *master's programme Chemical 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.

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).

Maja Medic BSc is master student Life Science and Technology University Leiden, Leiden. She received her bachelor degree Life Science and Technology (cum laude) from the University Leiden and Technical University Delft in 2011. In 2009 she received the 'Jong Talent' grant from the Royal Dutch Society of Sciences. She is student member of the master

programme committee Life Science and Technology (since 2011), member of the Symposium committee of the Study Association LIFE (since 2010) and was student member of the bachelor programme committee Life Science and Technology.

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.

Appendix 2: Domain-specific framework of reference

The 'VSNU Kamer Scheikunde' formulated, in consultation with the professional field, a Dutch qualification framework for the bachelor's and master's degree programmes Chemistry, Chemical Engineering, Molecular Life Sciences, Natural Sciences and (Bio-)Pharmaceutical Sciences. These programmes are denoted as 'Chemistry and related Molecular programmes'.

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 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 instelling, 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:

[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 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;
- 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;

[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

- Heeft kennis van de veiligheids- en milieuaspecten van de scheikunde en genetische modificaties;
- Is zich bewust van de rol van de scheikunde en (bio)technologie in de maatschappij en van het internationale karakter ervan.

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, evenals 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), evenals 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 opleidigingen in 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 eindkwalificaties 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 maseropleidingingen 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 procesproduct; (2) het minimaliseren van bijproduct- en afvalstromen; (3) bereidingsmethoden van klassen van moleculen en van producten;
- Dient kennis te hebben van de formulering van een aantal producten, de specificaties, de analysemethoden en de wisselwerking tussen de componenten en van voor de vervaardiging van chemische of biotechnologische producten belangrijke fysische en mechanische werkwijzen.

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

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

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

Appendix 3: Intended learning outcomes

De eindtermen van de bacheloropleiding Scheikunde zijn mede gebaseerd op doelen die in Europees verband binnen het ECTN-netwerk zijn opgesteld voor de undergraduatefase opleidingen in de chemie, op domeinspecifiek referentiekader van de kamer Scheikunde van de VSNU, en op de algemene doelstellingen die in UU-verband zijn ontwikkeld.

a. Vakinhoudelijke kennis, attitudes & vaardigheden
1. Bachelors kunnen de voornaamste anorganische, organische, fysisch-chemische, thermodynamische, biochemische en kwantumchemische basisconcepten hanteren in relatie tot een op te lossen wetenschappelijk en/of maatschappelijk probleem;
2. Bachelors zijn in staat om de voornaamste reacties van organisch, anorganische, fysisch-chemische en biochemische aard te observeren en te beschrijven in moleculaire termen;
3. Bachelors beheersen de voornaamste analytische en spectroscopische technieken en procedures;
4. Bachelors beheersen de voornaamste reken- en modelleermethodes noodzakelijk om moleculaire verschijnselen te kunnen voorspellen en berekenen;
5. Bachelors beschikken over kennis van de wiskunde, natuurkunde en de biologie, nodig voor begrip van chemische verschijnselen.

b. Onderzoekskennis, attitudes & vaardigheden
1. Samen met hun begeleider zijn bachelors in staat een onderzoeksvraag te formuleren teneinde een nog niet geheel verklaard verschijnsel te onderzoeken;
2. In het kader van empirisch chemisch onderzoek zijn bachelors in staat om een onderzoeksvraag in overleg om te zetten in een toetsbare hypothese;
3. In het kader van empirisch chemisch onderzoek zijn bachelors in staat om onder supervisie een experiment op te zetten volgens de vereiste condities;
4. Bachelors zijn in staat om over de resultaten van hun onderzoek adequaat te rapporteren en te presenteren aan (mede)onderzoekers en aan een breed publiek.

c. Instrumentele kennis, attitudes & vaardigheden
1. Bachelors zijn in staat om veilig om te gaan met chemische materialen en producten en daartoe rekening te houden met mogelijke risico's (toxiciteit, etc.);
2. Bachelors zijn in staat om in een laboratoriumomgeving zorgvuldig en verantwoord te werken op basis van daartoe ontwikkelde procedures;
3. Bachelors zijn in staat opstellingen te bedenken, metingen te verrichten en observaties uit te voeren conform de daarvoor bestaande richtlijnen en apparatuur;
4. Bachelors zijn in staat met de in de bachelor aanwezig computers en programmatuur de hen opgedragen taken efficiënt uit te voeren;

d. Academische kennis, attitudes & vaardigheden
1. Bachelors kunnen beargumenteerde standpunten innemen in het wetenschappelijk en maatschappelijk debat en effectief in teamverband samenwerken;
2. Bachelors zijn in staat om heldere presentaties en rapportages te geven bestemd voor een publiek van vakgenoten of niet-vakgenoten, in het Nederland en het Engels;
3. Bachelors hebben geleerd eigen veronderstellingen te onderzoeken, te leren van eigen 'fouten' en zelf doelen te stellen voor hun ontwikkeling;
4. Bachelors houden rekening met maatschappelijke en ethische standaarden op het terrein van wetenschap en samenleving;

e. Specifieke kennis, attitudes & vaardigheden

1. Bachelors beschikken over de kennis, attitudes en vaardigheden benodigd om zonder problemen in te stromen in het gekozen masterprogramma.

Exit-qualifications of the degree programme in Chemical Sciences in Utrecht University

• Actief en zelfstandig de nieuwe ontwikkelingen kunnen volgen op het terrein van het gekozen masterprogramma;
• In staat zijn snel een overzicht te verwerven betreffende de voornaamste onderwerpen en vraagstellingen op een specifiek (bio)chemisch onderzoeksgebied;
• Op basis van een algemene onderzoeksvraag en in de context van een algemeen chemisch onderzoeksprogramma een onderzoek(werk)plan kunnen opstellen;
• Effectief kunnen functioneren in een (onderzoeks)team, zowel in disciplinair als in interdisciplinair verband;
• Onder begeleiding van de staf wetenschappelijke experimenten kunnen ontwerpen en uitvoeren op het terrein van de eigen specifieke (bios)chemische expertise;
• Gegevens verkregen uit (chemisch) onderzoek correct kunnen analyseren en interpreteren en hieruit gerechtvaardigde conclusies kunnen trekken;
• Kunnen reflecteren op en discussiëren over de experimenteel verkregen resultaten vanuit het wetenschappelijke debat;
• Heldere onderzoeksrapporten kunnen schrijven over verricht onderzoek en de daarbij verkregen resultaten;
• In staat zijn als chemicus te functioneren in een wetenschappelijke resp. niet-wetenschappelijke werkomgeving, waar de verkregen (bio)chemische kennis en onderzoeksbekwaamheden worden ingezet;
• In staat zijn te reflecteren op rol en betekenis van de (bio)chemie voor het ontstaan van een 'duurzame samenleving';
• Bij kunnen dragen aan de maatschappelijke discussie over aan de (bio)chemie gerelateerde onderwerpen.

Programme Specific Learning Outcomes: Nanomaterials: Chemistry & Physics

The graduate of the master's programme: Nanomaterials: Chemistry and Physics

1a. Has knowledge of and insight into nanomaterials with an emphasis on colloids, catalysts, and condensed matter.
1b. Is able with this knowledge to contribute to scientific research in these areas using appropriate methods and instrumentation.
2a. Is aware of recent developments in the research of colloids, catalysis, and condensed matter.
2b. Understands the relevance of these developments for his/her scientific discipline.
3. Has the skills to understand the professional literature in the area of colloids, catalysis, and condensed matter and to relate this to his/her own research.
4. Is able to formulate together with the supervisor an original research question for the synthesis of nanomaterials, or for obtaining new knowledge of the chemical or physical properties of such materials.
5. Is able to design, under supervision of a member of the scientific staff, a research plan that addresses a research question and that conforms to the methodological and scientific standards of the discipline.
6a. Is able to carry out this research plan under the supervision of a member of the scientific staff according to the rules of good experimental practice and ethics.

6b. Is able to analyze and interpret the acquired materials and/or data according to scientific standards.
7. Is able to participate critically and constructively in the scientific debate in the research group.
8. Is able to indicate the relevance of his/her research for the advancement of the chemistry and physics of nanomaterials.
9. Is able to reflect critically upon his/her own contribution to nanomaterials research, and that of others.
10. Has the skills to discuss, both in spoken and written English and in Dutch, on the results of research, including the underlying knowledge and background.
11. Is able to function effectively in a possibly multidisciplinary team of experts working in the area of chemistry and physics of nanomaterials.
12. Has the skills to evaluate his/her own learning and development process and to adjust this process if necessary.
13. Displays a professional and academic work attitude that enables him/her to work in an area related to the research on nanomaterials.
14a. Has the qualifications to enrol in a PhD program in one of the research groups of the Debye Institute or of related institutes working in the area of colloids, catalysis, or condensed matter.
14b. Is qualified to acquire a research position in a (semi) public or commercial organization.

Programme Specific Learning Outcomes: Molecular and Cellular Life Sciences

The graduate of the master's programme: Molecular and Cellular Life Sciences:

1a. Students in the MCLS master's programme will be educated in the interdisciplinary field of Molecular and Cellular Life Sciences; this includes Biochemistry, Biophysics, Cell Biology, Chemical Biology, Developmental Biology, Structural Biology and Systems Biology.
1b. Have knowledge of the (structural and functional) characteristics of the bio molecules (e.g. DNA, RNA, lipids and proteins) and their mutual interactions.
1c. Have knowledge and understanding of the methods and (advanced) techniques that are used for research into structural, biochemical and biophysical characteristics of bio molecules.
1d. Have knowledge and understanding of the methods and (advanced) techniques that are used for research into the structure, function and dynamics of bio molecules in complex (model) systems and pathways, both at a molecular and cellular level, and in different unicellular and multi cellular organisms.
2a. Is aware of recent developments in the research of molecular and cellular life sciences.
2b. Understands the relevance of these developments for his/her scientific discipline.
3. Have the skills to read and understand professional literature from the interdisciplinary domain of molecular and cellular life sciences.
4a. Students have adequate understanding to contribute to the development and/or application of scientific concepts and methods, often in a research context.
4b. Have the skills to translate a problem from the area of molecular and cellular life sciences into a research question that is relevant for the development of science and/or products.
5a. Have the skills to design, under supervision of a member of the scientific staff, a research plan that addresses a research question and that conforms to the methodological and scientific standards in the discipline of molecular and cellular life sciences.
5b. Have the skills to estimate the feasibility of a research plan.
6. Have the skills to conduct research on their own strength and with the required precision to analyze, interpret and evaluate the empirical results correctly. The student takes into account the rules of experimental practice and other ethical aspects.

7. Students are able to discuss the results of empirical research and connect it with theory. Hereby the students can actively participate in the scientific debate at the research group.
8. Have the skills to indicate the relevance of the research for finding solutions to problems in the domain of molecular and cellular life sciences, also from a societal perspective.
9. Have the skills to critically evaluate his/her own results by references to comparable research from the field and can formulate a critical vision of the relevance of the research for society.
10. Have the skills to communicate the results of their research both orally and written to an international audience of specialists and non-specialists.
11. Have the skills to function effectively in a multidisciplinary team of researchers.
12. Have developed the skills to evaluate his/her own learning and development process and to adjust this process with help of the supervisor if necessary.
13 a. Have developed result-oriented methods to work effectively and independently on a competitive labour market.
13b. Have developed the skills to write a research proposal on a topic from the area of molecular and cellular life sciences that is eligible for financial support.
14a. Have developed the learning skills that can be used to progress into a PhD programme.
14b. Is qualified to acquire a research position in a (semi) public or commercial organization.

Appendix 4: Overview of the curricula

Bacheloropleiding (jaar 1-2-3)

<table>
<tr><th></th><th>P1</th><th>P2</th><th>P3</th><th>P4</th></tr>
<tr><td>J3</td><td>Chemie in context</td><td>Minor</td><td>Minor</td><td>Bachelorthesis</td></tr>
<tr><td rowspan="2">J2</td><td>Structuuranalyse</td><td rowspan="2">Moleculen en leven/ Moleculen en materialen</td><td rowspan="2">Moleculen en leven/ Moleculen en materialen</td><td>Researchproject</td></tr>
<tr><td>Moleculen en leven/Minor</td><td>Minor</td></tr>
<tr><td>J1</td><td>Chemie en leven</td><td>Energie en materie</td><td colspan="2">Structuur en binding</td></tr>
</table>

Scheikunde verplicht, Scheikunde keuze, Academische context keuze

Opbouw jaar 1

<table>
<tr><th>Periode 1</th><th>Periode 2</th><th>Periode 3</th><th>Periode 4</th></tr>
<tr><td rowspan="3">Chemie & Leven:
1. Organische chemie
2. Spectroscopie
3. Chemie van de cel 1
4. Esterproject
5. Wiskunde 1A</td><td rowspan="3">Energie & Materie:
• Fysische chemie
• Anorganische chemie
• Wiskunde 1B
• Natuurkunde
• Practicum Maken en Meten</td><td colspan="2">Structuur en binding: kwantumchemie en anorganische chemie</td></tr>
<tr><td colspan="2">Spectroscopie en analyse</td></tr>
<tr><td>Wiskunde 1B
Natuurkunde</td><td>Chemie van de cel 2</td></tr>
<tr><td colspan="2">Academische context:
• Geschiedenis van de scheikunde
Sectieproject</td></tr>
</table>

Opbouw jaar 2 en 3

<table>
<tr><th></th><th>Periode 1</th><th>Periode 2</th><th>Periode 3</th><th>Periode 4</th></tr>
<tr><td rowspan="2">j2</td><td>Structuuranalyse</td><td rowspan="2">Moleculen & Leven:
• Molecular modelling en wiskunde
Moleculen & materialen:
• Anorganische chemie (theorie)</td><td rowspan="2">Minor/
Moleculen & materialen:
• Organische chemie (praktijk)
• Anorganische en vastestofchemie (praktijk)</td><td>Researchproject</td></tr>
<tr><td>Moleculen & Leven: Gene expression and Protein Engineering</td><td>Minor/
• Practicum Analyse</td></tr>
</table>

	Minor Toegepaste thermodynamica	• Organische chemie (theorie) • Fysische chemie 2	• Moleculen & Leven: • Biofysica	• Toegepaste Dichtheidsfunctionaaltheorie
j3	**Chemie in context**: • Chemistry and Sustainable Development • Catalysis • Virusses • Nanomaterials	Minor • Solids and Surfaces • Advanced Superstructures: Scattering and Microscopy • Molecular Machines • Biomolecular processes • Energy Analysis • Life Cycle Assessment	Minor • Advanced Physical Chemistry • Advanced Organic chemistry • Medicinal Chemistry	Bachelorthesis

Master's programme Nanomaterials: Chemistry & Physics

<table>
<tr><th colspan="2">A. Mandatory course and primary electives (30)</th><th>B. Secondary Electives:
Courses/Work experience (30)</th></tr>
<tr><td colspan="2">Leerdoelen:
-allen: verwerving van essentiële inzichten en bekwaamheden op het terrein van de 'Nanoscience'
-afhankelijk van keuze: verwerving van meer specifieke / uitgebreidere kennis & onderzoeksbekwaamheden m.b.t. 'Photonics' e/o 'Colloid Science' e/o 'Catalysis'</td><td>Leerdoelen:
-optie 1: reparatie e/o verbreding e/o verdieping van relevante kennis & bekwaamheden
-optie 2: verwerving van relevante toegepaste e/o fundamenteel-wetenschappelijke kennis & bekwaamheden; oriëntatie op mogelijke toekomstig werkvelden; in samenhang hiermee: verwerving relevante sociaal-communicatieve bekwaamheden</td></tr>
<tr><td>Onderdeel</td><td>Werkvormen</td><td rowspan="4">optie 1: (30)
-cursussen noodzakelijk om te voldoen aan ingangseisen
-resterende cursussen uit A
-cursussen uit andere master programma's
-cursussen buiten de Graduate school
optie 2: (30)
-project van een half jaar in de industrie, in een onderzoeksinstituut of universitaire onderzoeksgroep
optie 3: (30)
combinatie:
-kort project in de industrie of aan een buitenlandse universiteit (15)
en:
-twee cursussen (15)</td></tr>
<tr><td><u>Topics in Nanoscience</u> (P/C) (7.5)</td><td>Hoorcolleges
Projectwerk
opdrachten
Literatuurstudie</td></tr>
<tr><td><u>Photonics:</u>
o Photon Physics (P)
o Nanophotonics (P)
o Advanced Spectroscopy of Nanomaterials (C)
o Plasma Physics (P)</td><td>Hoorcolleges
Werkcolleges
opdrachten
Excursies</td></tr>
<tr><td><u>Colloid Science:</u>
o Advanced physical chemistry(C)
o Soft condensed matter(P/C)
o Soft Condensed matter Theory (P)
o Computational materials science(P/C)</td><td>Hoorcolleges
werkcolleges
Opdrachten
Computeropdrachten</td></tr>
<tr><td><u>Catalysis/chemical synthesis</u>:</td><td></td></tr>
</table>

○ Synthesis of complex nanostructures(C) ○ Organometallic Chemistry & Homogenous Strategies (C) ○ Advanced Organic synthesis strategies(C) ○ Kinetics and diffusion(C) ○ Adsorption Kinetics and Catalysis ©	Hoorcolleges werkcolleges Literatuurstudie opdrachen	
○ Solids and surfaces(C) ○ Device physics(P)	Hoorcolleges werkcolleges Zelfstudie Opdrachtgen (weekly assigments, paper assigment)	**Werkvormen:** afhankelijk van optie

C. Research Project & Thesis (60)	
In een van onderstaande Debye-onderzoeksgroepen: -Condensed Matter and Interfaces (C) -Atom Optics and Ultrafast Dynamics(P) -Physical and Colloid Chemistry (C) -Soft Condensed matter and Biophysics(P) -Inorganic Chemistry and Catalysis (C) -Organic Chemistry and Catalysis(C)	**Leerdoelen:** -zelfstandig wetenschappelijk onderzoek leren doen m.b.t. alle aspecten daarvan (wetenschappelijk, methodologisch, technisch, sociaal, etc.) -verwerving diepgaande expertise incl. onderzoeksbekwaamheden m.b.t. het gekozen topic **Werkvormen:** -participerend leren -zelfstudie -onderzoek doen -data-analyse/rapportage -presentatie/discussie -literatuurscriptie

Master's programme Molecular and Cellular Life Sciences

A. Master Courses (10-13)	**B. Major Research Project (51)**
alle studenten verwerven een overzicht van het onderzoek in de moleculaire en cellulaire levenswetenschappen m.b.t. de hoofdonderzoeksgebieden: moleculaire herkenning, mebraanbiogenese, eiwitvouwing, intra cellulaire membraanprocessen etc.)	(deelname aan een project in een van de onderzoeksgroepen)
Leerdoelen: -overzicht lopend onderzoek -inzicht in actuele vraagstellingen -artikelen kritisch leren lezen -analyseren onderzoeksmethode, -resultaten, etc.	**Leerdoelen:** -hoogwaardig wetenschappelijk onderzoek te doen -actief te participeren aan lopend onderzoek -initiatief te nemen verantwoordelijkheid te dragen -te rapporteren en resultaten te presenteren
Werkvormen: -hoorcolleges -discussies -zelfstudie -opdrachten -cases	**Werkvormen:** -leren door zelf te doen -projectmatig werken -labwerk/experimenteren -data-analyse -rapporteren -presenteren

C. Minor Research Project (33)	D. Master Classes (2-5)	E. Electives (12)	F. Thesis (7.5)	G. LS Seminars (1.5)
onderzoeksproject op universiteit of in de industrie **of** cursussen volgens gekozen profiel uit FBE-programma, C/E-programma of drug regulatory sciences	praktische en theoretische cursussen op onderzoeksgebieden	-cursussen uit masteraanbod **of** -cursussen uit PhD-aanbod **of** -uitbreiding majorproject **of** -uitbreiding minorproject **of** -bijspijkeren door volgen Ba-cursussen	-literature review naar eigen keuze **of:** onderzoeksvoorstel	-maandelijkse seminars verzorgd door GS-Life Sciences
Leerdoelen: -bij keuze voor O-profiel: toegepast of fundamenteel onderzoek leren doen; vanuit een andere onderzoeksgroep een ander aspect van moleculaire en cellulaire levenswetenschappen onderzoeken -bij keuze voor M-profiel: verwerving bedrijfskundige en bedrijfseconomische kennis en vaardigheden (uit FBE-programma) -bij keuze voor CE-profiel: verwerving communicatieve en/of educatieve bekwaamheden (uit CE-programma)	**Leerdoelen:** -verwerven van specifieke c.q. diepergaande kennis & vaardigheden met het accent op techniek	**Leerdoelen:** -afhankelijk van betreffende optie	**Leerdoelen:** -verdere specialisatie resp. oriëntatie op vervolgstudie	**Leerdoelen:** -verbreding t.o.v. de eigen onderzoekprojecten -reflectie & ontwikkeling eigen oordeel
Werkvormen: afhankelijk van optie	**Werkvormen:** -college -labwerk -data-analyse -rapportage	**Werkvormen:** afhankelijk van optie	**Werkvormen:** -review/essay resp. onderzoeksvoorstel	**Werkvormen:** -seminars -opdrachten

Appendix 5: Quantitative data regarding the programmes

Data on intake, transfers and graduates

Bachelor's programme

Cohortomvang en samenstelling Bachelor						
B Scheikunde (56857) (voltijdse instroom)						
* Als de opleiding schakelstudenten inschrijft in de bachelorfase, is HBO incl. studenten in schakelprogramma/premaster						
Jaar	Cohortomvang met vooropleidingscategorie					Totaal
	VWO	HBO prop	HBO*	Buitenland	Overig	
02/ 03	39	0	0	0	1	40
03/ 04	37	1	1	0	1	40
04/ 05	58	0	0	1	1	60
05/ 06	80	1	2	1	0	84
06/ 07	82	0	1	0	6	89
07/ 08	76	2	3	0	5	86
08/ 09	62	1	1	5	3	72
09/ 10	78	1	0	0	2	81

Instroom (voorkomen 1 en totaal) uitgesplitst naar geslacht						
B Scheikunde (56857) (voltijdse instroom)						
Cohort	voorkomen 1			Totaal		
	Totaal Absoluut	Mannen	Vrouwen	Totaal Absoluut	Mannen	Vrouwen
		percentage			percentage	
02/ 03	40	58	43	47	62	38
03/ 04	40	70	30	44	70	30
04/ 05	60	70	30	74	64	36
05/ 06	84	62	38	94	62	38
06/ 07	89	72	28	97	71	29
07/ 08	86	58	42	91	56	44
08/ 09	72	60	40	78	60	40
09/ 10	81	59	41	93	60	40
Gem.		64	36		63	37

Uitval bachelorstudenten (VWO Instroom)					
B Scheikunde (56857)(voltijdse instroom)					
					* voorlopige cijfers op peildatum 1-oktober
Cohort	Vertrek bachelorstudenten bij de opleiding				
	Omvang cohort	na 1 jaar	na 2 jaar	na 3 jaar	Selectiviteit van 1e jaar
	absoluut	Percentage (cumulatief), wordt niet vermeld als het totaal kleiner dan 4 is			
02/ 03	39	21	23	28	73
03/ 04	37	19	19	22	88
04/ 05	58	12	16	22	54
05/ 06	80	23	28	29	78
06/ 07	82	16	18	21	76
07/ 08	76	11	24	*30	*35
08/ 09	62	29	*32		
09/ 10	78	*22			
Gem.		19	21	24	74

Bachelorrendement van herinschrijvers opleiding (en hoop binnen instelling)								
B Scheikunde (56857) (VWO Instroom) (voltijdse instroom)								
Cohort	Omvang herins.	% van totale cohort	Bachelorrendement van herinschrijvers					hoop /inst > 6 jaar
			na 3 jaar	na 4 jaar	na 5 jaar	na 6 jaar	> 6 jaar	
	absoluut	Percentage (cumulatief), wordt niet vermeld als het totaal kleiner dan 4 is						
02/ 03	31	79	39	71	81	84	87	87
03/ 04	30	81	47	80	97	97	97	97
04/ 05	51	88	31	63	75	80		
05/ 06	62	78	39	65	79			
06/ 07	69	84	39	67				
07/ 08	68	89	40					
08/ 09	44	71						
09/ 10	61	78						
Gem.		81	39	69	83	87	92	92

Ingeschrevenen naar onderwijsvorm en geslacht			
B Scheikunde (56857) Voltijdopleiding			
cohort	Ingeschrevenen		
	Totaal	mannen	vrouwen
02/ 03	82	50	32
03/ 04	127	80	47
04/ 05	189	122	67
05/ 06	231	157	74
06/ 07	250	173	77
07/ 08	288	190	98
08/ 09	289	195	94
09/ 10	288	180	108
10/ 11	223	136	87

Uitval bachelorstudenten naar bestemmingscategorie (VWO Instroom)								
B Scheikunde (56857) (voltijdse instroom)								
Cohort		Vertrek bachelorstudenten						
	Omvang cohort	Omvang Uitval	Binnen instelling		Binnen WO		Naar HBO	Uit HO
			Naar MA	Naar BA	Naar MA	Naar BA		
	absoluut	Percentage, wordt niet vermeld als het totaal kleiner dan 4 is						
02/03	39	11	9	27	9	9	18	27
03/04	37	8	0	50	0	13	0	38
04/05	58	13	0	54	0	8	31	8
05/06	80	23	0	17	4	26	35	17
06/07	82	17	0	41	0	41	6	12
07/08	76	23	0	30	0	17	26	26

Master's programme Nanomaterials: Chemistry and Physics

Intake

Cohort size and origin master's programmes UU, Nanomaterials: Chemistry and Physics

Source: Osiris

Total input per year, all intake moments, and all students in the programme. In brackets students Chemical Sciences (ChSc)

	Other universiy NL	Own university	HBO	outside HO (internati onal)	Total (ChSc)
2002	0	3	13	1	17(17)
2003	0	7	8	4	19(18)
2004	0	8	6	1	15(15)
2005	0	16	1	5	22(18)
2006	0	28	3	1	32(25)
2007	1	32	4	3	40(26)
2008	0	33	4	3	40(26)
2009	2	42	1	6	51(29)
2010	0	25	0	1	26(19)

	Other universiy NL	Own university	HBO	outside HO (internati onal)	Total
2002	0%	18%	76%	6%	100%
2003	0%	37%	42%	21%	100%
2004	0%	53%	40%	7%	100%
2005	0%	73%	5%	23%	100%
2006	0%	88%	9%	3%	100%
2007	3%	80%	10%	8%	100%
2008	0%	83%	10%	8%	100%
2009	4%	82%	2%	12%	100%
2010	0%	96%	0%	4%	100%

Throughput

Progresses in the master's programme Nanomaterials: Chemistry and Physics per cohort.

	Cohort size	From own university		From other university NL		From HBO		From outside HE (intern.)	
		Graduated	Still registered	Graduated	Still registered	Graduated	Still registered	Graduated	Still registered
2002	17	3	0	0	0	10	0	1	0
2003	19	7	0	0	0	5	0	4	0
2004	15	8	0	0	0	3	0	1	0
2005	22	16	0	0	0	1	0	4	0
2006	32	26	1	0	0	3	0	1	0
2007	40	32	1	1	0	4	0	3	0
2008	40	30	3	0	0	0	1	2	1
2009	51	42	23	1	1	0	1	4	2

	Cohort size	From own university (=100%)		From other university NL (=100%)		From HBO (=100%)		From outside HE (intern.) (=100%)	
		Graduated	Still registered	Graduated	Still registered	Graduated	Still registered	Graduated	Still registered
2002	17	100%	0%	-	-	77%	0%	100%	0%
2003	19	100%	0%	-	-	63%	0%	100%	0%
2004	15	100%	0%	-	-	50%	0%	100%	0%
2005	22	100%	0%	-	-	100%	0%	80%	0%
2006	32	93%	4%	-	-	100%	0%	100%	0%
2007	40	100%	3%	100%	0%	100%	0%	100%	0%
2008	40	91%	9%	-	-	0%	25%	67%	33%
2009	51	45%	55%	50%	50%	0%	100%	67%	33%

Output

Graduates and duration of stay in the master's programme Nanomaterials: Chemistry and Physics, per year. The duration of stay is in months.

	From own university BSc Chemistry		From own university BSc Physics and Astronomy		From HBO		International/ other UU and NL	
	Graduates	Duration of stay	Graduates	Duration of stay	Graduates	Duration of stay*)	Graduates	Duration of stay
2003	4	12	0	-	2	23	0	-
2004	4	13	0	-	6	30	2	23
2005	6	22	0	-	2	19	1	30
2006	6	21	0	-	1	50	2	34
2007	13	26	8	23	3	42	1/4	26/27
2008	12	27	9	22	5	30	3	21
2009	17	27	11	20	6	56	3/6	34/21
2010	26	29	11	25	0		5/1	25/23

*) incl. parttime students

Master's programme Molecular and Cellular Life Sciences

Input

Cohort size and origin master's programmes Molecular and Cellular Life Sciences

Total input per year, all intake moments, all students in the programme and (in brackets) students Chemical Sciences (ChSc) in the programme

	Other universiy NL	Own university	HBO	outside HO (internati onal)	Total (ChSc)
2002	5	4	2	1	12(6)
2003	6	6	2	3	17(14)
2004	9	10	3	7	29(23)
2005	2	31	0	9	42(15)
2006	0	20	5	7	32(21)
2007	0	16	3	4	24(4)
2008	5	19	9	5	38(7)
2009	2	21	7	7	37(9)
2010	0	37	5	8	50(8)

	Other universiy NL	Own university	HBO	outside HO (international)	Total (ChSc)
2002	0%	33%	50%	17%	100%
2003	0%	33%	47%	20%	100%
2004	4%	42%	33%	21%	100%
2005	3%	80%	0%	17%	100%
2006	0%	79%	3%	17%	100%
2007	0%	69%	6%	25%	100%
2008	3%	76%	14%	7%	100%
2009	0%	78%	11%	11%	100%
2010	0%	74%	10%	16%	100%

Throughput

Progress in the master's programme Molecular and Cellular Life Sciences. Absolute numbers and percentages.

	Cohort size	From own university (=100%)		From other university NL (=100%)		From HBO (=100%)		From outside HE (intern.) (=100%)	
		Graduated	Still registered	Graduated	Still registered	Graduated	Still registered	Graduated	Still registered
2002	12	4	0	5	0	1	0	1	0
2003	17	6	0	5	0	2	0	2	0
2004	29	10	0	7	0	3	0	7	0
2005	42	28	1	2	0	0	0	6	0
2006	32	18	1	0	0	5	0	5	0
2007	24	12	0	0	0	3	0	4	0
2008	38	12	7	3	1	7	2	5	0
2009	37	15	6	1	1	2	5	6	1

	Cohort size	From own university (=100%)		From other university NL (=100%		From HBO (=100%)		From outside HE (intern.) (=100%)	
		Graduated	Still registered	Graduated	Still registered	Graduated	Still registered	Graduated	Still registered
2002	12	100%	0%	100%	0%	50%	0%	100%	0%
2003	17	100%	0%	83%	0%	100%	0%	67%	0%
2004	29	100%	0%	78%	0%	100%	0%	100%	0%
2005	42	90%	3%	100%	0%	-	-	67%	0%
2006	32	90%	5%	-	-	100%	0%	71%	0%
2007	24	75%	0%	-	-	100%	0%	100%	0%
2008	38	63%	37%	60%	20%	78%	22%	100%	0%
2009	37	71%	29%	50%	50%	29%	71%	86%	14%

Output

Graduates and duration of stay in the master's programme Molecular and Cellular Life Sciences. The duration of stay is in months.

	From own university ba Biol. Biomed.		From own university ba Chem.		From HBO		Other	
	Graduates	Duration of stay	Graduates	Duration of stay	Graduates	Duration of stay	Graduates	Duration of stay
2003	2	23	0	-	0	-	4	23
2004	3	12	5	14	2	21	6	17
2005	6	9	6	18	2	25	7	27
2006	5	11	2	13	1	11	6	23
2007	16	23	6	27	3	31	6	32
2008	10	26	3	18	5	25	6	33
2009	20	24	9	28	8	28	7	29

Master's degree programme in Chemical Sciences

Input

Cohort size of master's degree programme in chemical sciences at Utrecht University including the master's programmes: Nanomaterals: Chemistry & Physics, Molecular and Cellular Life Sciences, Drug Innovation.

Total input per year, all intake moments, and all students Chemical Sciences
Source: VSNU, KUO

	Other universiy NL	Own university	HBO	outside HO (international)	Total
2002	2	11	12	5	30
2003	0	14	17	8	39
2004	4	24	13	6	47
2005	1	31	4	8	44
2006	0	53	4	6	63
2007	1	24	5	4	34
2008	1	34	3	1	39
2009	0	42	1	3	46

	Other universiy NL	Own university	HBO	outside HO (international)	Total (ChSci)
2002	7%	37%	40%	17%	100%
2003	0%	36%	44%	21%	100%
2004	9%	51%	28%	13%	100%
2005	2%	70%	9%	18%	100%
2006	0%	84%	6%	10%	100%
2007	3%	71%	15%	12%	100%
2008	3%	87%	8%	3%	100%
2009	0%	91%	2%	7%	100%

Universiteit Utrecht, O&O - Institutional Research

Throughput

Progress of the chemical science students in the master's degree programme in chemical sciences including the master's programmes: Nanomaterals: Chemistry & Physics, Molecular and Cellular Life Sciences, Drug Innovation.

Source: VSNU, KUO

	Cohort size	From own university (=100%)		From other university NL (=100%)		From HBO (=100%)		From outside HE (intern.) (=100%)	
		Graduated	Still registered	Graduated	Still registered	Graduated	Still registered	Graduated	Still registered
2002	30	64%	0%	50%	0%	100%	0%	60%	0%
2003	39	100%	0%	0%	0%	76%	6%	88%	0%
2004	47	88%	0%	100%	0%	54%	8%	100%	0%
2005	44	90%	0%	100%	0%	75%	0%	75%	0%
2006	63	68%	6%	0%	0%	100%	0%	50%	0%
2007	34	63%	21%	100%	0%	80%	20%	75%	0%
2008	39	29%	65%	100%	0%	0%	0%	0%	100%
2009	46	5%	90%	0%	0%	0%	0%	0%	100%

	Cohort size	From own university (=100%)		From other university NL (=100%)		From HBO (=100%)		From outside HE (intern.) (=100%)	
		Graduated	Still registered	Graduated	Still registered	Graduated	Still registered	Graduated	Still registered
2002	30	7	0	1	0	12	0	3	0
2003	39	14	0	0	0	13	1	7	0
2004	47	21	0	4	0	7	1	6	0
2005	44	28	0	1	0	3	0	6	0
2006	63	36	3	0	0	4	0	3	0
2007	34	15	5	1	0	4	1	3	0
2008	39	10	22	1	0	0	0	0	1
2009	46	2	38	0	0	0	0	0	3

Peildatum 1 oktober 2010. Percentages tellen niet altijd op tot 100%. Het verschil is de uitval.
Universiteit Utrecht, O&O - Institutional Research

Output

Graduates and duration of stay in the master's degree programme in chemical sciences including the master's programmes: Nanomaterals: Chemistry & Physics, Molecular and Cellular Life Sciences, Drug Innovation.

Source: VSNU, KUO

* The duration of stay is in months.

	From own university		From own university NL		From HBO		Other	
	Graduates	Duration of stay	Graduates	Duration of stay	Graduates	Duration of stay	Graduates	Duration of stay
2003	1	21	0		5	26	7	44
2004	8	63	1	72	15	27	7	43
2005	12	65	0		7	32	9	41
2006	12	66	1	21	6	31	8	50
2007	29	70	1	36	9	45	8	35
2008	22	71	0		5	32	4	22
2009	21	69	2	27	9	53	3	61

Teacher-student ratio achieved

Bachelor's programme

Students registered at the UU

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Gem.
Chemistry	296	258	271	259	268	278	263	260	210	196	255,9

Source: 1-cijfer HO, December count.

Number of Scientific Personnel Chemistry Department

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Gem.
Number of Scientific Personel	68	65	73	76	73	68	68	62	60	54	66,7

Source: Personeel en organisatie fac. Bètawetenschappen

Master's programme

Students enrolled in chemical sciences

	2002	2003	2004	2005	2006	2007	2008	2009	2010	Gem.
Nanomaterials	17	18	15	18	25	26	26	29	19	22

	2002	2003	2004	2005	2006	2007	2008	2009	2010	Gem.
Molecular and Cellular Life Sciences	6	14	23	15	21	4	7	9	8	12

Source: Osiris

WP size

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Gem.
WP size Chemistry	68	65	73	76	73	68	68	62	60	54	66,7

Source: Human Department: Faculty of Sciences

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

	Year 1 (Bachelor) Hours per student	Year 2 (Bachelor) Hours per student	Year 3 (Bachelor) Hours per student
Lectures	246	282	232
Tutorials (or projects, practice, training)	610	386	183
Supervision of internships		20	41
Tutoring (e.g. questions on the content, study problems, study development counseling, graduation)	44		
Assessments/exams	100	33	18
Other activities with physical guidance (e.g. excursions, field trips)			8
Total contact time	1000	701	461

Master's programme Nanomaterials: Chemistry & Physics

	WO Master 1 Hours per student	WO Master 2 Hours per student
Lectures	160	
Tutorials (or projects, practice, training)	80	
Supervision of internships	82	82
Tutoring (e.g. questions on the content, study problems, study development counselling, study plan, graduation) *	5	5
Assessments/exams	12	
Other activities with physical guidance (e.g. excursions, field trips)	8	
Total contact time	347	87

*the amount of tutoring hours highly depends on the origin of the student: e.g. premasters students speak their master's coordinator every other week in 1,5 hour sessions during 20 weeks.

Master's programme Molecular and Cellular Life Sciences

	WO Master 1 Hours per student	WO Master 2 Hours per student
Lectures	160	
Tutorials (or projects, practice, training)	80	
Supervision of internships	82	82
Tutoring (e.g. questions on the content, study problems, study development counselling, graduation) *	5	5
Assessments/exams	12	
Other activities with physical guidance (e.g. excursions, field trips)	8	
Total contact time	347	87

*the amount of tutoring hours highly depends on the origin of the student: e.g. premasters students speak their master's coordinator every other week in 1,5 hour sessions during 20 weeks.

Appendix 6: Programme of the site visit

08.30	09.30	**Opleidingsmanagement** Prof. dr. Rens Voesenek (vice-decaan onderwijs) Prof. dr. Andries Meijerink (onderwijsdirecteur scheikunde) Dr. Egbert Mulder (opleidingsmanager bachelor scheikunde) Dr. Paul van Bergen en Henegouwen (programmaleider Molecular and Cellular Life Sciences) Dr. Petra de Jongh (programmaleider Nanomaterials; Chemistry and Physics) Dr. Annik van Keer (programmacoördinator CHPH)
09.30	10.30	**Studenten (8-9)** Bachelor: 3e jaars: Thomas Hartman, Bart Saes; 2e jaars: Anne Steijn, Petra Keijzer; 1e jaars: Joost Kwakernaat, Master CHPH: Marthe van der Linden, Jacco Geugies Master MCLS: Laurens Kooijman, Dieudonné van de Willige
10.30	11.15	**Docenten (8-9)** Prof. dr. Willem Kegel (tevens hoofd departement) Prof. dr. Krijn de Jong Prof. dr. Daniel Vanmaeckelbergh Prof. dr. Antoinette Killian Dr. Eefjan Breukink Dr. Stefan Rudiger Dr. Astrid Bulte Dr. Stephan Jonker
11.15	11.30	Pauze
11.30	12.00	**Opleidingscommissie (5)** Prof. dr. Leo Jenneskens Dr. Ben Erné Dr. Erik Huizinga Anne-Eva Nieuwelink Elleke van Harten, BSc.
12.00	12.45	Lunch/inloopspreekuur
12.45	13.30	**examencie en studieadviseur (4-5)** Dr. Toon de Kroon (voorzitter EXC Scheikunde en lid EXC NS) Dr. Celso de Mello Donega Dr. Harry Bitter (lid facultaire toetscommissie) Prof. dr. Rolf Boelens (lid EXC-LS) Dr. Maria Zonderland (voorzitter EXC LS) Drs. Jos Koeckhoven (studieadviseur)
13.30	14.00	**Alumni (6)** Sonja Castillo (AIO FCC) Pascal Weijers (Windunie) Tessa Sinnige (AIO NMR) Arjen den Otter (AIO ACK) Remco Rodenburg (AIO K&S) Dominique Loete (werkzaam in de ICT)
14.00	14.30	Voorbereiden eindgesprek
14.30	15.30	Eindgesprek (met management zelfde als eerste gesprek)
15.30	17.30	Opstellen bevindingen

17.30	17.45	Mondelinge rapportage: locatie: DDW 1.30
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:

Bachelor:
0433683
3344037
3031950
3072487
3253988
3116425
3415503
3169154
3219844
3137708
3344274
3121623
3349225
3121631
3344312

Master:
3120643
0451517
3297748
3131963
3116395
0438065
0365742
0421863
0435023
3208583
3352633
3131947
3084019
3064738
0152811

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

- Course manuals
- Standard / basic books
- Tests, assessment criteria, assessment forms and answers
- Minutes of the Boards of Examiners 2009-2011
- Minutes of the Programme committee 2009-2011
- Assessment report on bachelor and master programme Cehmistry QANU 2007
- Assessment report on chemistry research, QANU, 2010

Appendix 8: Declarations of independence

nvao
nederlands-vlaamse accreditatieorganisatie

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: 

nvao
nederlands - vlaamse accreditatieorganisatie

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

nvao
nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Etienne SCHACHT

ADRES: Rysseveldstraat, 99
B-8840 STADEN, België

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

ZIE BIJLAGE

AANGEVRAAGD DOOR DE INSTELLING:

ZIE BIJLAGE

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

1

nvao
nederlands-vlaamse accreditatieorganisatie

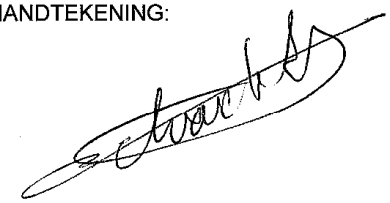
VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

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: Maja Medić

PRIVÉ ADRES: Rijnsburgerweg 124 G31
2333 AG Leiden

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

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;

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

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

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

PLAATS: Rotterdam DATUM: 22-03-2012

HANDTEKENING: maja medić

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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Prof. Dr. Jürgen Heck

PRIVÉ ADRES: Südervoogstieg 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;

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

PLAATS: Hamburg DATUM: 9.7.2012

HANDTEKENING:

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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Barbara van Balen

PRIVÉ ADRES:

Kleine Houtweg 8 2012 CH Haarlem

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

Scheikunde OW 2012
Leiden - Delft - Eindhoven - UvA - Utrecht

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;

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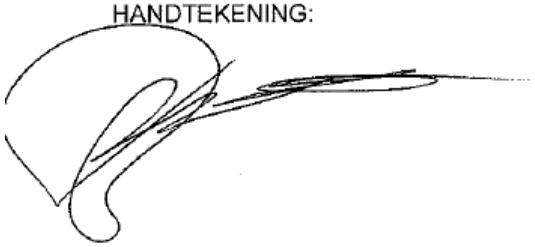
VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

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

PLAATS: Rotterdam DATUM: 23-8-2012

HANDTEKENING:



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