

Assessment report  
Limited Framework Programme Assessment

**Bachelor Molecular Life Sciences**

Wageningen University

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## 1. Executive summary

In this executive summary, the panel presents the main considerations which led to the assessment of the quality of the Bachelor Molecular Life Sciences programme of Wageningen University. The programme was assessed according to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

The panel considers the programme objectives to be sound and relevant. The programme intends to offer students knowledge and understanding in chemistry, physics and biology to study molecular life sciences subjects. The programme is directed towards fundamental knowledge and understanding. Although the objectives are formulated in definite terms, the panel advises to state the programme vision in clearer and more pronounced terms.

The objectives of the programme are within the boundaries of the domain-specific reference framework for academic chemical sciences programmes. The panel appreciates the efforts by the joint programmes in chemical sciences in the Netherlands to draft this framework and regards this to be a sound and up-to-date description of this domain. The profile of this Wageningen University programme may be clearly distinguished within the framework and this profile is considered by the panel to be valuable.

The panel understands and supports the programme position to educate students to continue their studies at master level and not so much to enter the labour market. The objectives have been appropriately aligned with professional field requirements, among others, through discussions with the Professional Field Committee. The panel appreciates students being given opportunities to become grade-two qualified teachers in Chemistry in secondary education in the Netherlands.

The objectives have been well translated into the intended learning outcomes of the programme. These are well articulated and conform to the bachelor level.

The panel regards the number of incoming students in the programme to be favourable, understanding programme management's decision to put a cap on the number of incoming students.

The curriculum matches the intended learning outcomes of the programme. The panel appreciates the contents of the curriculum, as both relevant theoretical understanding of the disciplines involved and relevant practical skills are addressed. The learning tracks ensure the curriculum coherence. The curriculum is strongly research-based. The panel recommends to strengthen the application of theory as well as the training in academic skills.

The panel considers the lecturers in the programme to be very education-driven and to be very motivated. They are practically all PhDs and they are engaged in current, relevant research. Their educational capabilities are up to standard, although the proportion of BKO-certified lecturers may be increased. The students appreciate the educational capacities of the lecturers. The panel welcomes the Wageningen financing model, as this promotes the quality of education, but suggests to (re)distribute educational capacity and courses across Chair Groups to accommodate new Chairs and to stimulate curriculum innovation.

The entry requirements and admission procedures of the programme are appropriate. The panel advises to impose mathematics B as one of the entry requirements.

The educational concept and the study methods of the programme are adequate, promoting student-activating learning. The students-to-staff ratio and the number of hours of face-to-face education are favourable. Despite the sizeable student numbers, programme management succeeds in offering small-scale education. The panel appreciates innovative computer-based study methods being introduced. The study guidance by lecturers, mentors and study advisors is up to standard, as is the system for designing individual study plans. The panel regards the study load of the programme to be challenging but doable. As the student success rates are rather disappointing, the panel proposes to improve these.

The panel considers the examination and assessment policies for the programme to be appropriate, these meeting the Wageningen University rules and regulations. The position and authority of the Examining Board are adequate, the Board being in control of the examinations and assessments of the programme.

The panel approves of the examination methods adopted in the programme, noting these are consistent with the goals and the contents of the courses. The supervision and assessment procedures of the Bachelor theses are adequate. The panel recommends to formalise involving examiners from other Chair Groups in the assessment procedures. The panel also advises to add more extensive written comments to the scoring forms to substantiate the grades. The measures taken to ensure the validity, reliability and transparency of examinations and assessments are adequate. The panel appreciates the Examining Board inspecting the quality of the examinations and assessments. The fraud and plagiarism formalities are up to standard.

The course examinations are up to standard. The panel supports the grades for the Bachelor theses. The theses are scientifically high level. Students were challenged in the theses and most of them performed very well. Some of the theses could have been better structured and could have been less lengthy.

The panel is convinced the students having completed the programme reached the intended learning outcomes and regards the programme graduates to be very well prepared to continue their studies at master level in this domain.

The panel that conducted the assessment of the Bachelor Molecular Life Sciences programme of Wageningen University assesses this programme to meet the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, judging the programme to be satisfactory. Therefore, the panel recommends NVAO to accredit this programme.

Rotterdam, 7 December 2018

Prof. dr. M.A. Cohen Stuart  
(panel chair)

drs. W. Vercouteren  
(panel secretary)

## 2. Assessment process

The evaluation agency Certiked VBI received the request by Wageningen University to support the limited framework programme assessment process for the Bachelor Molecular Life Sciences programme of this University. The objective of the programme assessment process was to assess whether the programme would conform to the standards of the limited framework, as laid down in the NVAO Assessment framework for the higher education accreditation system of the Netherlands, published on 20 December 2016 (Staatscourant nr. 69458).

Management of the programmes in the assessment cluster WO Scheikunde convened to discuss the composition of the assessment panel and to draft the list of candidates.

Having conferred with management of the Bachelor Molecular Life Sciences programme of Wageningen University, Certiked invited candidate panel members to sit on the assessment panel. The panel members agreed to do so. The panel composition was as follows:

- Prof. dr. M.A. Cohen Stuart, professor emeritus, chair of Physical Chemistry & Colloid Chemistry, Wageningen University, professor emeritus of Physical Surface Chemistry, University of Twente, professor East China University of Science and Technology, Shanghai, China (panel chair);
- Prof. dr. A.H.T. Boyen, associate professor emeritus, Faculty of Sciences and Bio-engineering Sciences, Faculty of Medicine and Pharmacy, Vrije Universiteit Brussel (panel member);
- Prof. dr. R.M.J. Liskamp, professor, chair Chemical Biology and Medicinal Chemistry, School of Chemistry, University of Glasgow, United Kingdom, professor of Molecular Medicinal Chemistry, Utrecht University (panel member);
- Drs. O. de Vreede, head Innovation and Human Capital, VNCI, Association of the Dutch Chemical Industry (panel member);
- L. Büller BSc, student Master Life Science and Technology, Delft University of Technology (student member).

On behalf of Certiked, drs. W. Vercoouteren served as the process coordinator and secretary in the assessment process.

All panel members and the secretary confirmed in writing being impartial with regard to the programme to be assessed and observing the rules of confidentiality. Having obtained the authorisation by the University, Certiked requested the approval of NVAO of the proposed panel to conduct the assessment. NVAO have given their approval.

To prepare the assessment process, the process coordinator convened with management of the programme to discuss the outline of the self-assessment report, the subjects to be addressed in this report and the site visit schedule. In addition, the planning of the activities in preparation of the site visit were discussed. In the course of the process preparing for the site visit, programme management and the Certiked process coordinator regularly had contact to fine-tune the process. The activities prior to the site visit have been performed as planned. Programme management approved of the site visit schedule.

Well in advance of the site visit date, programme management sent the list of final projects of graduates of the programme of the most recent years. Acting on behalf of the assessment panel, the process coordinator selected the theses of 15 graduates from the last two years. The grade distribution in the selection was ensured to conform to the grade distribution in the list, sent by programme management. In the selection, the distribution across the Chair Groups was taken into account.

The panel chair and the panel members were sent the self-assessment report of the programme, including appendices. In the self-assessment report, the student chapter was included. In addition, the expert panel members were forwarded a number of theses of the programme graduates, these theses being part of the selection made by the process coordinator.

Several weeks before the site visit date, the assessment panel chair and the process coordinator met to discuss the self-assessment report provided by programme management, the procedures regarding the assessment process and the site visit schedule. In this meeting, the profile of panel chairs of NVAO was discussed as well. The panel chair was informed about the competencies, listed in the profile. Documents pertaining to a number of these competencies were presented to the panel chair. The meeting between the panel chair and the process coordinator served as the briefing for panel chairs, as meant in the NVAO profile of panel chairs.

Prior to the date of the site visit, all panel members sent in their preliminary findings, based on the self-assessment report and the final projects studied, and a number of questions to be put to the programme representatives on the day of the site visit. The panel secretary summarised this information, compiling a list of questions, which served as a starting point for the discussions with the programme representatives during the site visit.

Shortly before the site visit date, the complete panel met to go over the preliminary findings concerning the quality of the programme. During this preliminary meeting, the preliminary findings of the panel members, including those about the theses were discussed. The procedures to be adopted during the site visit, including the questions to be put to the programme representatives on the basis of the list compiled, were discussed as well.

On 11 June 2018, the panel conducted the site visit on the Wageningen University campus. The site visit schedule was as planned. In a number of separate sessions, the panel was given the opportunity to meet with Board of Education representatives, programme management, Examining Board members, lecturers and final projects examiners, and students and alumni.

In a closed session at the end of the site visit, the panel considered every one of the findings, weighed the considerations and arrived at conclusions with regard to the quality of the programme. At the end of the site visit, the panel chair presented a broad outline of the considerations and conclusions to programme representatives.

Clearly separated from the process of the programme assessment, the assessment panel members and programme representatives met to conduct the development dialogue, with the objective to discuss future developments of the programme.

The assessment draft report was finalised by the secretary, having taken into account the findings and considerations of the panel. The draft report was sent to the panel members, who studied it and made a number of changes. Thereupon, the secretary edited the final report. This report was presented to programme management to be corrected for factual inaccuracies. Programme management were given two weeks to respond. Having been corrected for these factual inaccuracies, the Certiked bureau sent the report to the University Board to accompany their request for re-accreditation of this programme.

### 3. Programme administrative information

Name programme in CROHO: B Molecular Life Sciences  
Orientation, level programme: Academic Bachelor  
Grade: BSc  
Number of credits: 180 EC  
Specialisations: N.A.  
Location: Wageningen  
Mode of study: Full-time (language of instruction Dutch and English)  
Registration in CROHO: 21PI-59304

Name of institution: Wageningen University  
Status of institution: Government-funded University  
Institution's quality assurance: Approved



## 4. Findings, considerations and assessments per standard

### 4.1 Standard 1: Intended learning outcomes

The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

#### *Findings*

Wageningen University is a one-faculty University. The Rector is assisted by the Dean of Research and the Dean of Education. The Dean of Education is the technical chair of the Board of Education. This Board, being composed of four professors and four students, is responsible for all programmes of the Faculty. The Dean of Education is also the head of the Department of Education and Student Affairs, being in this capacity responsible for facilitating education within the University. For this programme as for each of the other programmes of the Faculty, the Programme Committee is responsible for the contents and the quality of the programme. The Programme Committee is composed of an equal number of staff members and students. This responsibility is subject to the approval of the Board of Education. For each of the programmes, the programme director is responsible for the day-to-day management and support activities of the programme. Courses within the programme are part of the programme curriculum, but all of the courses are taught by Chair Groups within the University. Chair Groups are part of one of the five Science Groups of the University. In Chair Groups, expertise on specific subjects is clustered. The programme director maintains contacts with Chair Groups regarding design, contents and quality of the courses they deliver. The learning goals, contents, teaching methods and assessment methods are subject to the approval of the Programme Committee and the Board of Education. Each year, in the Education Modification Cycle, these are discussed. For all of the programmes of the University, four Examining Boards are in place. For this programme as well as for a number of other bachelor and master programmes, the Examining Board Technology and Nutrition has the authority to ensure the quality of examinations and assessments.

The programme is a three-year, research-based, fundamental, multi-disciplinary bachelor programme in the molecular life sciences domain.

The programme objectives are to educate students in the disciplines of chemistry, physics and biology to allow them to study the molecular life sciences domain multi-disciplinary, from the perspectives of these three disciplines. The programme does not intend to acquaint students with all dimensions of these disciplines, but to the extent they may be able to study molecular life sciences subjects. Chemistry may be regarded to be the core of the programme. In line with the Wageningen University profile, the programme intends to educate students to apply their chemical and physical knowledge and understanding to biological subjects.

The objectives of the programme conform to the domain-specific Frame of Reference Chemical Sciences in the Netherlands, which has been drafted by the joint programmes of this assessment cluster in the Netherlands. In this domain-specific framework, reference has been made to international frameworks and benchmark statements. This Wageningen University programme may be regarded to be placed at the intersection of the chemistry and molecular life sciences sub-domains of the chemical sciences. This programme is more chemistry- and physics-oriented than other programmes in the molecular life sciences sub-domain. In addition, the programme may be regarded to be in one of the middle positions on the continuum from technically/physically-oriented to medically-oriented chemical sciences programmes in the Netherlands.

The programme aims to educate students to continue their studies at master level. Programme graduates are unconditionally admitted to Wageningen University Master Molecular Life Sciences, Bioinformatics and Biotechnology programmes. The programme does not primarily train students to enter the labour market. Programme management discusses on a regular basis the programme objectives and curriculum with the Professional Field Committee, being composed of industry representatives. The Professional Field Committee does not see the Bachelor programme directly preparing students for the professional field. Students may opt, however, to become grade-two qualified teachers in Chemistry in secondary education in the Netherlands.

The programme objectives have been translated into the intended learning outcomes of the programme. The intended learning outcomes specify, among others, knowledge and understanding of inorganic chemistry, cell biology, genetics and microbiology, application of mathematical methods and techniques, application of concepts from chemistry and physics in molecular life sciences sub-domains, application of scientific experiments in molecular life sciences sub-domains, research skills, environmental, ethical and societal awareness in this domain and knowing how to plan the study path in the bachelor programme and to select the follow-up education.

Programme management drafted a table from which the correspondence of the intended learning outcomes to the Dublin descriptors for bachelor programmes may be inferred.

#### *Considerations*

The panel considers the programme objectives to be sound and relevant. The programme intends to offer students knowledge and understanding in chemistry, physics and biology to study molecular life sciences subjects, clearly relating chemistry and physics to biology. The programme is more directed towards fundamental knowledge and understanding than to applying this knowledge and understanding. Although the objectives are formulated in definite terms, the panel advises to state the programme vision in clearer and more pronounced terms.

The objectives of the programme are within the boundaries of the domain-specific reference framework for academic chemical sciences programmes. The panel appreciates the efforts by the joint programmes in chemical sciences in the Netherlands to draft this framework and regards this to be a sound and up-to-date description of this domain. The profile of this Wageningen University programme may be clearly distinguished within the framework and this profile is considered by the panel to be valuable.

The panel understands and supports the programme position to educate students to continue their studies at master level and not so much to enter the labour market. The panel welcomes the regular discussions by programme management with the Professional Field Committee to align the programme with the professional field requirements. The panel appreciates students being given opportunities to become grade-two qualified teachers in Chemistry in secondary education in the Netherlands.

The objectives have been well translated into the intended learning outcomes of the programme. They cover the programme objectives appropriately. They are well articulated and are stated in clear terms.

The intended learning outcomes conform to the bachelor level. This is exemplified by the Dublin descriptors criteria for bachelor level programmes matching the intended learning outcomes.

*Assessment of this standard*

These considerations have led the assessment panel to assess standard 1, Intended learning outcomes, to be satisfactory.

## 4.2 Standard 2: Teaching-learning environment

The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

### *Findings*

The number of incoming students in the programme has risen considerably, going from about 40 students per year from 2010 to 2012 to about 80 to 90 students per year in 2016 and 2017. In 2017, programme management introduced the *numerus fixus*, limiting the influx to a maximum of 100 students to ensure sufficient numbers of staff and sufficient lab facilities for the incoming students.

The curriculum has a study load of 180 EC and takes three years to complete. Programme management presented a table, mapping the intended learning outcomes to the curriculum components. The curriculum has been organised along three separate learning tracks, being *Physical Properties of Molecules*, *Molecules at Work in Living Systems* and *Chemical Principles of Living Systems*. The first two years of the curriculum consist of compulsory courses, each of these courses being part of each of these learning tracks. The first track addresses the chemical and physical properties of molecules and includes courses on physics, quantum mechanics, atomic structure and spectroscopy. In the second track, students are taught how (bio)molecules work in living systems. The track is composed of courses on, among others, cell biology, microbiology and biochemistry, enzymology and gene technology. In the third track, students study physical chemistry and (bio)organic chemistry. Courses in this track include general chemistry, organic chemistry, thermodynamics, soft matter and bio-organic chemistry. In a number of courses, students are offered integrative perspectives on the molecular life sciences domain, approaching subjects from molecular, biological, chemical or genetic perspectives. Courses may be co-productions of Chair Groups, leading to integration as well. In the third year, students are allowed 36 EC of elective space, which they may use to broaden their profile, to deepen their knowledge in certain fields, to spend part of the curriculum abroad or to prepare for specific master programmes. Students may also take the educational minor to become grade-two qualified teachers in Chemistry in Dutch secondary education. Students discuss their choices with the study advisor and have to submit the courses to the Examining Board for approval. In earlier years, only few students went abroad. In 2017, eleven students did so. In a number of courses in the curriculum, students are trained in academic skills, such as presentation, writing and reflective skills. They are trained to reflect on ethical issues in, among others, the *Philosophy of Science and Ethics* course, the course introducing students to the Bachelor thesis. In this Bachelor thesis (21 EC), students are to conduct an individual research project. Students may take the Wageningen University-wide honours programme.

About 48 lecturers are involved in the programme. As has been indicated, courses are offered by Chair Groups. Lecturers in the programme are active researchers, doing research within their Chair Group. About 94 % of the lecturers in the programme are PhDs. About 67 % of the lecturers are members of one of the Wageningen Research Schools. Research is emphasised in the courses. The proportion of lecturers being BKO-certified is 60 %. Students expressed to be appreciative of the teaching qualities of the lecturers and their being easily contacted. Guest lecturers from industry take part in the courses.

The entry requirements are the Dutch pre-university secondary school (vwo) diploma, having completed either the Nature & Technology or Nature & Health profiles. The latter profile should include the subjects of physics or mathematics and nature, life & technology. Other applicants are admitted, if their prior educations meet these requirements. Applicants coming from abroad have to be proficient in Dutch. The applications of the latter categories of students are reviewed by the programme Admission Committee. Students may have had Mathematics A in their prior education. These students have the right to be admitted. They are offered a course on mathematics in the first part of the curriculum to bridge the gap to mathematics B.

The programme educational concept is to promote active learning on the part of the students, taking into account students' different learning styles. The average number of hours of face-to-face education in the programme is 22 hours per week. The study methods adopted in the programme are selected in line with the educational concept and include lectures, tutorials, lab practicals and computer practicals. Group work is very limited. In lectures, theory is addressed and current research is referred to. Lectures may be large-scale. Tutorials include working on assignments in groups of twenty to forty students. In lab practicals, students are trained in practical skills and in reporting orally and in writing about their work. In addition, environmental and safety issues are addressed. Computer practicals serve to analyse data, derived in the lab practicals. About 50 % of the hours of face-to-face education are practicals, whereas 20 % are lectures and another 20 % are tutorials. Lecturers in the programme adopt innovative computer-based study methods, such as knowledge clips and interactive software to support students in lab work. Student groups in labs are about ten students per supervisor, supervisors being either staff members, PhD students or student assistants. The overall students-to-staff ratio is 11 : 1. In the first year, students have to report 36 EC. If they do not succeed, they will have to leave the programme. In the first periods of the first year, students are guided by student mentors. The mentors may also be contacted later in the programme. Students meet the study advisors in the programme, to select their electives, choose their thesis subject or discuss their study pace or study problems. Being advised by the study advisor, the Examining Board approves the individual study programmes of students. Students regard the study load of the programme challenging but manageable. The proportion of drop-outs in the first year is about 20 % to 25 %. The student success rates are on average 43 % after three years (figures for 2011 to 2013 cohorts) and on average 66 % after four years (figures for 2011 to 2012 cohorts).

### *Considerations*

The panel regards the number of incoming students in the programme to be favourable, understanding programme management's decision to put a cap on the number of incoming students.

The curriculum matches the intended learning outcomes of the programme. The panel appreciates the contents of the curriculum, as both relevant theoretical understanding of the disciplines involved and relevant practical skills are addressed. The learning tracks ensure the clear organisation and the coherence of the curriculum. The curriculum is strongly research-based. The panel recommends to strengthen the application of theory. The panel also advises to foster the training in academic skills, promoting students' capabilities to write substantial academic texts at the completion of their studies.

The panel considers the lecturers in the programme to be very education-driven and to be very motivated. They are practically all PhDs and they are engaged in current, relevant research, referring to their research in the lectures. Their educational capabilities are regarded by the panel to be up to standard, although the proportion of BKO-certified lecturers may be increased. The panel notes the educational capacities of the lecturers to be appreciated by the students. The panel welcomes the Wageningen financing model covering Chair Groups education costs, as this promotes the quality of education. At the same time, the panel suggests that the Education Board takes initiative to (re)distribute educational capacity and courses across Chair Groups to accommodate new Chairs and to stimulate curriculum innovation.

The entry requirements and admission procedures of the programme are appropriate. The panel advises to impose mathematics B as one of the entry requirements.

The panel finds the educational concept and the study methods of the programme adequate, promoting student-activating learning. The students-to-staff ratio and the number of hours of face-to-face education in the programme are favourable. Despite the sizeable student numbers, programme management succeeds in offering small-scale education, especially in the practicals. The panel appreciates innovative computer-based study methods being introduced. The study guidance by the lecturers, the mentors in the first periods of the programme and the study advisors is appropriate, as is the system for designing individual study plans. The panel feels 36 EC in the first year is rather low. The panel regards the study load of the programme to be appropriate. The student success rates are rather disappointing, in particular the success rates after 4 years. The panel proposes to improve these figures, informing students about the negative impact of long study duration on their career chances. The panel is pleased to see students' input being taken very seriously by programme management.

#### *Assessment of this standard*

These considerations have led the assessment panel to assess standard 2, Teaching-learning environment, to be satisfactory.

### 4.3 Standard 3: Student assessment

The programme has an adequate system of student assessment in place.

#### *Findings*

The examinations and assessments in the programme are governed by the Education and Examination Regulations of Wageningen University and the Rules and Regulations of the Examining Boards of the University. As has been indicated, the Examining Board Technology and Nutrition has the authority to ensure the quality of examinations and assessments of the programme.

Most of the courses in the programme include multiple examinations, to allow for different course goals to be adequately assessed. Examination methods are written examinations with open-ended, closed or multiple-choice questions, written reports, laboratory performance and oral presentations. Examination methods are selected to conform to the course goals.

The Bachelor thesis is an individual research project. Students select the Chair Group to do their research, choosing primarily from a predetermined list of Chair Groups. Students may select other Chair Groups only upon approval by the Examining Board. Chair Groups present topics for the thesis projects on the yearly thesis market or through other channels. Thesis processes are monitored by thesis coordinators of the Chair Groups. Students are entitled to their individual supervisor. Day-to-day supervisors may be PhD students or postdocs, acting under the responsibility of supervisors. The theses are assessed on the basis of research competencies, experimental skills, written report, oral presentation and thesis defence. The weights of these components in the final grade are determined at the start of the thesis project and depend upon the type of project. The thesis is assessed by the supervisor and the second reader, using both a scoring form and a rubrics form. The chair of the group is always involved in the thesis assessment. The supervisor and second reader may add comments to the scoring form. There is no standard evaluation by and examiner outside the Chair Group.

In the programme, measures are being taken to ensure the validity, reliability and transparency of examinations and assessments. The Examining Board appoints the examiners, who should be involved in the courses as lecturers or coordinators and who should be BKO-certified. Every four to five years, the Examining Board reviews the examinations and assessments of each of the Chair Groups, contributing to the programme, to verify if these meet quality requirements. The Examining Board will inspect the examinations, assessment specification tables and answering models as well as the theses and the thesis scoring forms. Fraud or plagiarism cases in the programme are handled by the Examining Board. The number of cases in this programme has been very low.

#### *Considerations*

The panel considers the examination and assessment policies for the programme to be appropriate, these being in line with the Wageningen University rules and regulations. The position and authority of the Examining Board for this programme are appropriate, the Board being in control of the examinations and assessments of the programme.

The panel approves of the examination methods adopted in the programme, noting these are consistent with the goals and the contents of the courses.

Students are offered appropriate supervision of the Bachelor theses by the Chair Group coordinators and supervisors. The assessment processes are up to standard, involving two examiners and being conducted using elaborate scoring and rubrics forms. The panel recommends to formalise involving examiners from other Chair Groups in the assessment procedures. The panel also advises to add more extensive written comments to the scoring forms, e.g. referring to the rubrics, to substantiate the grades.

The measures taken to ensure the validity, reliability and transparency of examinations and assessments are adequate. The panel appreciates the Examining Board inspecting the quality of the examinations and assessments of the Chair Groups. The fraud and plagiarism formalities are up to standard.

*Assessment of this standard*

The considerations have led the assessment panel to assess standard 3, Student assessment, to be satisfactory.



#### 4.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

##### *Findings*

The panel studied the examinations of a number of courses of the programme.

The panel also reviewed the Bachelor theses of fifteen graduates of the programme with different grades.

In the Bachelor thesis, students have to demonstrate to be able to conduct an individual research project within the domain of the programme, the project being conducted at one of the Chair Groups involved in the programme. The average grade of the theses of the graduates of the last two years is 8.0.

As has been indicated, students are admitted to Wageningen University Master Molecular Life Sciences, Bioinformatics and Biotechnology programmes. Students are also admitted to master programmes of other Dutch universities, such as Master Chemical Engineering and Science Communication and Education programmes. Students having taken the educational minor, may become grade-two qualified teachers in Chemistry in Dutch secondary education.

The lecturers of the Chair Groups involved in the programme consider the students of this programme to be good to very good students.

##### *Considerations*

The panel regards the course examinations, which were reviewed by the panel members, to be up to standard.

The panel supports the grades awarded to the Bachelor theses by the programme examiners. The panel considers the theses to be good to very good research projects and to be scientifically high level, students adopting a wide range of state-of-the-art research methods and techniques. Students were clearly challenged in the research projects and most of them performed very well. Some of the theses could have been better structured and could have been less lengthy.

The panel is convinced that students having completed the programme reached the intended learning outcomes and regards the graduates of this programme to be very well prepared to continue their studies at master level in this domain. The panel is positive about the range of master programmes graduates are admitted to.

##### *Assessment of this standard*

The considerations have led the assessment panel to assess standard 4, Achieved learning outcomes, to be good.

## 5. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Satisfactory
Standard 2: Teaching-learning environment	Satisfactory
Standard 3: Student assessment	Satisfactory
Standard 4: Achieved learning outcomes	Good
Programme	Satisfactory

## 6. Recommendations

In this report, a number of recommendations by the panel have been listed. For the sake of clarity, these have been brought together below.

- To state the programme vision in clearer and more pronounced terms.
- To strengthen the application of theory in the curriculum.
- To foster the training in academic skills in the curriculum, allowing students to write substantial academic texts at the completion of their studies.
- To (re)distribute educational capacity and courses across Chair Groups to accommodate new Chairs and stimulate curriculum innovation.
- To impose mathematics B in the prior education of incoming students as one of the entry requirements.
- To improve the student success rates, informing students about the negative impact of long study duration on their career perspectives.
- To formalise involving examiners from other Chair Groups in the Bachelor thesis assessment procedures.
- To add more extensive written comments to the scoring forms of the Bachelor theses to substantiate the grades.