

General syllabus for third-cycle courses and study programmes in

CHEMISTRY

Kemi

This syllabus was approved on 4 May 2007 (reg. no. CF 62-264/2007)¹, ². It was last approved on 10 June 2014 (reg. no. ORU 5.1-1826/2014)³.

By virtue of the Higher Education Ordinance, Chapter 6, Section 26 (1993:100), Örebro University prescribes the following.

1 Subject description

Within the subject area of chemistry, the structure and properties of elements and compounds are studied, as are their reactions with one another. Research and research studies in chemistry is a basic precondition for the operations within a number of industrial sectors and for the continued development within sectors focusing on the processing and manufacture of technical materials, food-stuffs, pharmaceuticals, fuels etc. Chemical basic research is also a necessary prerequisite for the development of new applications within chemical engineering and biotechnology. Growing sectors with a strong and increasing link to chemistry are for instance the forensics, environmental and energy fields. Chemical research is required for society's development towards sustainability and towards optimal utilisation of raw materials, and it is a precondition for the minimisation of waste flows and the limitation of adverse effects on the living environment caused by the presence and activities of man.

Research studies are offered with the following specialisations.

- Analytical chemistry/Environmental chemistry
- Biochemistry
- Inorganic chemistry/Bio-geochemistry

Within the subject, a research study programme is also offered with a specialisation in life science, in collaboration with the biology department, as well as a programme with an environmental science specialisation.

¹ Faculty Board of Natural Sciences and Technology

² The English translation of this general syllabus was last amended on 17 November 2015.

³ Faculty Board of Business, Science and Engineering

2 Outcomes

The intended learning outcomes for the award of the degree, the qualitative targets, are evident from [annex 1](#) to this syllabus. The different components of the third-cycle study programme shall together equip the research student to meet all intended learning outcomes⁴. The intended learning outcomes are referred to in more detail in the degree requirements in sections 5 and 6.

3 Admission to the programme – entry requirements and selection etc.

Provisions on entry requirements and selection can be found in [annex 2](#) to this syllabus. For information on admission in other respects, see the admission regulations for Örebro University.

4 Programme organisation – general information⁵

There are two types of third-cycle, or research, study programmes – one concluding with the doctoral degree (240 credits, corresponding to four years of full-time study) and one concluding with the licentiate degree (120 credits, corresponding to two years of full-time study).

The programmes mainly consist of courses and the writing of a doctoral or licentiate thesis. The programme components are assessed by means of course examination and the public defence of the thesis respectively. The research student is expected to take an active part in seminars and other auxiliary components during his/her period of study. The student is further recommended to take advantage of the opportunities offered to attend guest lectures etc. at the university, and to attend and contribute to national and international conferences.

For each research student, a minimum of two supervisors will be appointed, supporting the student during his/her studies⁶. One of them will be nominated principal supervisor. The detailed organisation of the programme shall be determined in an individual study plan.

In addition to the requirements laid down in this general syllabus, there may be special requirements for the doctoral student's programme, such as courses that are compulsory within the framework of a research school, which must be specified in the individual study plan. The credit distribution between courses/examinations and thesis should nevertheless be in accordance with the programme organisation as laid down in this general syllabus.

⁴ Under the new higher education system in Sweden, and in accordance with the terminology recommended by the Swedish Council for Higher Education, courses and study programmes on the research/doctoral level are referred to as *third-cycle courses and study programmes*. In this document, the terms *research* and *third-cycle* are used interchangeably as prefixes to terms related to studies on the research/doctoral level and they should therefore be considered synonymous [translator's comment].

⁵ Higher Education Ordinance, Chapter 6, Sections 4, 5, 28 and 29 and local guidelines on the organisation of third-cycle courses and study programmes

⁶ The Higher Education Ordinance stipulation that at least two supervisors be appointed for each research student does not apply to research students who commenced their studies before 1 July 2007. Instead, the older provision of at least one supervisor applies (point 18, transitional provisions of SFS 2006:1053).

Credit overview

Overview of programme organisation and degree requirements		Courses/examinations, credits		Thesis, no. of credits	Total no. of credits
		Compulsory	Elective		
Doctoral degree	Students within the subject in general	7.5	22.5-52.5	180-210	240
	Students with a specialisation in environmental science	15	15-45	180-210	240
	Students with a specialisation in life science	15.5	15-45	179.5-209.5	240
Licentiate degree	Students within the subject in general	7.5	15-22.5	90-97.5	120
	Students with a specialisation in environmental science	15	7.5-15	90-97.5	120
	Students with a specialisation in life science	11.5	7.5-18.5	90-101	120

5 Degree requirements for the Degree of Doctor, 240 credits

For the Degree of Doctor, the research student must

- have received a passing grade in the examinations⁷ of the 30-60 and 30.5-60.5 credits respectively generated by the courses listed below,
- have received a passing grade on a scholarly dissertation (doctoral thesis) corresponding to 180-210 and 179.5-209.5 credits respectively. The thesis is to be defended orally at a public defence event⁸.

Compulsory courses, total of 7.5 credits

Research and Thesis Planning in Science and Technology, 7.5 credits

The course and examination shall refer to outcomes D2, D3, D4, D7, D9 and D10, annex 1.

Elective courses, total of 22.5-52.5 credits

Which course/courses a research student shall take is determined based on an assessment of what courses will enable him/her to meet the intended learning outcomes. The research student plans, in consultation with the supervisor, which courses should be part of his/her programme. The selection is then laid down in the individual study plan.

Block I: Methodology courses, 7.5-15 credits

The courses and examinations included in this block shall refer to outcome D2, annex 1.

The courses discuss methods used in chemistry research but also provide a more general understanding of methods such as statistical methods, planning and evaluation of experiments.

An example of courses in this block is Multivariate Statistics and Experimental Planning (Multivariat statistik och försöksplanering), 7.5 credits.

⁷ Higher Education Ordinance, Chapter 6, Section 32

⁸ Higher Education Ordinance, Chapter 6, Sections 5 and 33

Block II: *Specialised and complementary courses*, 7.5-37.5 credits

The courses and examinations included in this block shall refer to outcomes D1, D2, D3 and D4, annex 1.

The courses in this block fall within chemistry or other relevant subject areas and are geared towards the specific thesis project and the specific knowledge needs of the individual student.

An example of courses in this block is Advanced Organic Mass Spectrometry (Avancerad organisk masspektrometri), 7.5 credits.

Doctoral thesis and public defence, 180-210 credits

At the public defence event, the assessment of the doctoral thesis and the public defence thereof shall refer to all intended learning outcomes specified for the award of the doctoral degree, particularly, however, outcomes D5, D6, D7, D8 and D10, annex 1.

Specialisation in environmental science - Degree of Doctor

For students with a specialisation in environmental science, specific degree requirements apply:

Compulsory courses, total of 15 credits

Research and Thesis Planning in Science and Technology, 7.5 credits

The course and examination shall refer to outcomes D2, D3, D4, D7, D9 and D10, annex 1.

Preparatory Paper (Problemnotat), 7.5 credits

The course and examination shall refer to outcomes D1, D2, D3, D4 and D10, annex 1.

Elective courses, total of 15-45 credits

Block I: *Methodology courses*, 7.5-15 credits

Block II: *Specialised and complementary courses*, 7.5-30 credits

For outcomes and examples of courses etc., see above under degree requirements for the Degree of Doctor for students within the subject in general.

Doctoral thesis and public defence, 180-210 credits

At the public defence event, the assessment of the doctoral thesis and the public defence thereof shall refer to all intended learning outcomes specified for the award of the doctoral degree, particularly, however, outcomes D5, D6, D7, D8 and D10, annex 1.

Specialisation in life science – Degree of Doctor

For students with a specialisation in life science, specific degree requirements apply:

Compulsory courses, total of 15.5 credits

Research and Thesis Planning in Science and Technology, 7.5 credits

The course and examination shall refer to outcomes D2, D3, D4, D7, D9 and D10, annex 1.

Life Science Seminars I (Livsvetenskap seminarieriserie I), 4 credits

The course and examination shall refer to outcomes D1, D3, D6, D7, D9 and D10, annex 1.

Life Science Seminars II (Livsvetenskap seminarier II), 4 credits
The course and examination shall refer to outcomes D1, D3, D6, D7, D9 and D10, annex 1.

Elective courses, total of 15-45 credits

Block I: *Methodology courses*, 7.5-15 credits

Block II: *Specialised and complementary courses*, 7.5-30 credits

For outcomes and examples of courses etc., see above under degree requirements for the Degree of Doctor for students within the subject in general.

Doctoral thesis and public defence, 179.5-209.5 credits

At the public defence event, the assessment of the doctoral thesis and the public defence thereof shall refer to all intended learning outcomes specified for the award of the doctoral degree, particularly, however, outcomes D5, D6, D7, D8 and D10, annex 1.

6 Degree requirements for the Degree of Licentiate, 120 credits

The licentiate degree is the degree awarded to those who have been admitted to and successfully completed a licentiate programme. Students who have been admitted to the programme concluding with the doctoral degree have the right to apply for the award of a licentiate degree, as a half-way degree⁹. The degree requirements in this section apply to the licentiate degree both as a final and as a half-way degree.

For the licentiate degree, the research student must

- have received a passing grade in the examinations¹⁰ of the 22.5-30 and 19-30 credits respectively generated by the courses listed below,
- have received a passing grade on a scholarly paper (licentiate thesis) corresponding to 90-97.5 and 90-101 credits respectively¹¹.

For courses and course blocks that are identical for the licentiate and doctoral degrees, please see outcomes and descriptions in section 5. For any other courses and course blocks, see below¹².

Compulsory courses, total of 7.5 credits

Research and Thesis Planning in Science and Technology, 7.5 credits

Elective courses, total of 15-22.5 credits

Which course/courses a research student shall take is determined based on an assessment of what courses will enable him/her to meet the intended learning outcomes. The research student plans, in consultation with the supervisor, which courses should be part of his/her programme. The selection is then laid down in the individual study plan.

Block I: *Methodology courses*, 7.5-15 credits

⁹ Örebro University's local regulations on qualifications

¹⁰ Higher Education Ordinance, Chapter 6, Section 32

¹¹ Higher Education Ordinance, Chapter 6, Section 5

¹² Since the licentiate degree may constitute a half-way degree on the road to a doctoral degree, the courses intended for a licentiate degree should, in conformity with the courses intended for a doctoral degree, be linked to the outcomes for the doctoral degree, see further in the guidelines for general syllabuses for third-cycle courses and study programmes.

Block II: *Specialised and complementary courses*, 7.5-15 credits

Licentiate thesis, 90-97.5 credits

On the examination of the licentiate thesis, the assessment shall refer to all intended learning outcomes specified for the award of the licentiate degree, especially, however, outcomes L4, L6, L8, L9, L10 and L11 annex 1.

Specialisation in environmental science – Degree of Licentiate

For students with a specialisation in environmental science, specific degree requirements apply:

Compulsory courses, total of 15 credits

Research and Thesis Planning in Science and Technology, 7.5 credits
Preparatory Paper (Problemnotat), 7.5 credits

Elective courses, total of 7.5-15 credits

Block I: *Methodology courses*, 7,5-15 credits

Block II: *Specialised and complementary courses*, 0-7.5 credits

Licentiate thesis, 90-97.5 credits

On the examination of the licentiate thesis, the assessment shall refer to all intended learning outcomes specified for the award of the licentiate degree, particularly, however, outcomes L4, L6, L8, L9, L10 and L11, annex 1.

Specialisation in life science – Degree of Licentiate

For students with a specialisation in life science, specific degree requirements apply:

Compulsory courses, total of 11.5 credits

Research and Thesis Planning in Science and Technology, 7.5 credits
Life Science Seminars I (Livsvetenskap seminariekurs I), 4 credits

Elective courses, total of 7.5-18.5 credits

Block I: *Methodology courses*, 7.5-15 credits

Block II: *Specialised and complementary courses*, 0-10 credits

Licentiate thesis, 90-101 credits

On the examination of the licentiate thesis, the assessment shall refer to all intended learning outcomes specified for the award of the licentiate degree, particularly, however, outcomes, L4, L6, L8, L9, L10 and L11, annex 1.

7 Further information

Further information about provisions for research study programmes can be found on the university website. Documents there include the admissions regulations for Örebro University and other information on national and local regulations.

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Entry-into-force and transitional provisions

This general syllabus shall be in effect from 1 July 2007.

Research students who have commenced their studies before 1 July 2007

Research students who have commenced their studies on the programme before 1 July 2007 shall continue their studies according to the new provisions for third-cycle courses and study programmes. As a principal rule, the research students will be awarded their qualification from the new programme¹³.

These research students have however the right, should they require, to complete their studies and obtain their qualification pursuant to the earlier provisions for third-cycle courses and study programmes. This right exists until, but no later than, the end of June 2015 (point 5, transitional provisions of SFS 2006:1053).

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Amendments to the general syllabus approved on 14 April 2008 referring to the life science specialisation shall take effect on 15 May 2008.

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Amendments to the general syllabus approved on 29 April 2009 shall take effect on 1 May 2009. These amendments refer to changes to the required number of credits for courses and the thesis respectively. They also concern the course requirements for the award of the licentiate degree with a specialisation in life science. Research students already admitted to the programme may be awarded their degree if they meet either the new or the old degree requirements.

Amendments to the general syllabus approved by the vice-chancellor on 19 October 2010 shall take effect on 1 January 2011. These are a result of amendments to the Higher Education Ordinance, but do not lead to any factual alterations in the general syllabus.

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Amendments to the general syllabus approved on 10 June 2014 shall take effect on 1 August 2014. These amendments refer to changes in the subject description (section 1), changes to the course requirements (sections 5 and 6), and that a specialisation in environmental science will be offered (sections 1, 5 and 6). The life science specialisation no longer refers to the Life Science Research School, instead it refers to a collaboration with the biology department. Further, changes have been made to the specific entry requirements (annex 2). The amendments also refer to an adaptation of the general syllabus to the new template, through which, among other things, the different components of the programme are more clearly linked to the different intended learning outcomes (primarily sections 5 and 6).

Research students admitted to the programme before 1 February 2014 shall complete their studies in accordance with the previous degree requirements. If requested by a research student and it is deemed appropriate, provisions may be made in the individual study plan for the student to complete his/her studies in accordance with the new degree requirements.

¹³ Point 1, transitional provisions for SFS 2006:1053

Outcomes¹⁴

Outcomes for the DEGREE OF DOCTOR	Outcomes for the DEGREE OF LICENTIATE
For the Degree of Doctor, the third-cycle student shall	For a Degree of Licentiate, the third-cycle student shall
<i>Knowledge and understanding</i>	<i>Knowledge and understanding</i>
D1 demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field, and	L1 demonstrate knowledge and understanding in the field of research including current specialist knowledge in a limited area of this field as well as specialised knowledge of research methodology in general and the methods of the specific field of research in particular.
D2 demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.	L2 (for the equivalent to D2, see L1, second part)
<i>Competence and skills</i>	<i>Competence and skills</i>
D3 demonstrate the capacity for scholarly analysis and synthesis as well to review and assess new and complex phenomena, issues and situations autonomously and critically,	L3 (no direct equivalent to D3)
D4 demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work,	L4 demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake a limited piece of research and other qualified tasks within predetermined time frames in order to contribute to the formation of knowledge as well as to evaluate this work,
D5 demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research,	L5 (no direct equivalent to D5, refer however to L4, second part)
D6 demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and in dialogue with the academic community and society in general,	L6 demonstrate the ability in both national and international contexts to present and discuss research and research findings in speech and writing and in dialogue with the academic community and society in general, and
D7 demonstrate the ability to identify the need for further knowledge, and	L7 (comp. L11)
D8 demonstrate the capacity to contribute to social development and support the learning of others both through research and education and in some other qualified professional capacity.	L8 demonstrate the skills required to participate autonomously in research and development work and to work autonomously in some other qualified capacity.
<i>Judgement and approach</i>	<i>Judgement and approach</i>
D9 demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics, and	L9 demonstrate the ability to make assessments of ethical aspects of his or her own research,
D10 demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.	L10 demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
	L11 demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning (comp. D7).

¹⁴ Extract from the Qualifications ordinance, annex 2, Higher Education Ordinance (1993:100)

Admission to research studies – entry requirements

1 Admission requirements – Higher Education Ordinance

The Higher Education Ordinance stipulates that the number of research students that may be admitted by the university may not exceed the number that can be offered supervision and otherwise acceptable conditions for study and whose studies are funded pursuant to the provisions in the Higher Education Ordinance¹⁵.

The requirements for admission to third-cycle courses and study programmes are that the applicant

1. meets the general and specific entry requirements that the university may have laid down, and
2. is considered in other respects to have the ability required to benefit from the course or study programme¹⁶.

2 Entry requirements

2.1 General entry requirements

A person meets the general entry requirements for third-cycle courses and study programmes if he or she

1. has been awarded a second-cycle qualification,
2. has satisfied the requirements for courses comprising at least 240 credits of which at least 60 credits were awarded in the second-cycle, or
3. has acquired substantially equivalent knowledge in some other way in Sweden or abroad.

The higher education institution may permit an exemption from the general entry requirements for an individual applicant, if there are special grounds¹⁷.

Transitional provisions

a) A person with *credits or qualifications from undergraduate programmes under the previous higher education system* corresponding to the entry requirements above will also be eligible¹⁸. Exemptions from the entry requirements may be made also in these cases, if there are special grounds.

b) A person who *meets the general entry requirements* for research study programmes (120 credits from undergraduate programmes or corresponding knowledge¹⁹), *before 1 July 2007* will also be considered to meet the general entry requirements for third-cycle courses and study programmes after that, however, until no later than the end of June 2015²⁰. Exemptions from this provision are not permitted.

¹⁵ Higher Education Ordinance, Chapter 7, Section 34

¹⁶ Higher Education Ordinance, Chapter 7, Section 35

¹⁷ Higher Education Ordinance, Chapter 7, Section 39

¹⁸ Point 10, transitional provisions for SFS 2006:1053

¹⁹ A person who has completed an undergraduate programme of at least 120 credits, or in some other way, in Sweden or abroad, has acquired substantially corresponding knowledge

²⁰ Point 11, transitional provisions for SFS 2006:1053

2.2 Specific entry requirements

A person meets the specific entry requirements for third-cycle courses and study programmes in the subject if he or she has received a passing grade in courses of at least 120 credits, including an independent project at the advanced course level²¹ or on the second cycle, in chemistry alternatively in a related subject area. The provision that a related subject area may provide access to the programme only applies on admission to the programme specialisations in life science or environmental science. A person who has acquired substantially corresponding knowledge, in Sweden or abroad, also meets the specific entry requirements.

Transitional provisions

A person with credits or qualifications from undergraduate programmes under the previous higher education system corresponding to the entry requirements in the previous paragraph will also be eligible²².

In such cases, 120 credits as described above shall correspond to 80 credits, including an independent project at the advanced course level/60 credits level or at the higher advanced course level/80 credit level, in chemistry alternatively in a related subject area under the older provisions.

2.3 Ability in other respects to benefit from the course or study programme

The assessment whether the applicant has such ability in other respects to benefit from the programme shall be made based on prior courses and programmes taken by the applicant, on other previous activities, as well as on the essays and other independent projects of a scholarly nature that have been submitted by the applicant (compare assessment criteria in accordance with the university's regulations on the selection of research students below).

3 Selection from among the applicants

In selecting between applicants, their ability to benefit from the programme shall be taken into account. The higher education institution determines which assessment criteria shall be used in determining the ability to benefit from the programme.

However, the fact that an applicant is considered able to transfer credits from prior courses and study programmes or for professional or vocational experience may not alone give the applicant priority over other applicants²³.

²¹ The "advanced course level" refers to the same level of progression as under the previous higher education system. With the new credit system, the advanced course level thus refers to 61-90 credits within the main field of study.

²² Point 10, transitional provisions for SFS 2006:1053

²³ Higher Education Ordinance, Chapter 7, Section 41

Assessment criteria for selection²⁴

The criteria A - B aim at facilitating an examination of the applicant's ability to benefit from the programme. They should therefore be relevant to the applicant's ability to later achieve the learning outcomes of the programme. The outcomes are described in annex 1 to this general syllabus.

A Courses, study programmes and other previous activities – formal qualifications

The assessment is based on submitted certificates and transcripts as well as on degree certificates and/or course certificates.

Completed courses and study programmes and experience contributing to the applicant's ability to successfully benefit from the programme applied for are considered an additional qualification.

- Courses and study programmes

Special emphasis is given to the scope, depth and grades of the applicant's prior courses and study programmes within the subject area applied for, particularly the grades on written independent projects.

Emphasis is also given to the scope, depth and grades of prior courses and study programmes within other fields of great relevance to the subject area applied for.

- Other previous activities

Special emphasis is given to long and independent professional and/or vocational experience of great relevance to the subject area applied for.

B Capability – demonstrated knowledge, competence and skills

The assessment is based on a consideration of the applicant's submitted essays and other written independent projects of a scholarly nature. For those applicants who at this stage are considered to be most qualified, and if it is deemed necessary, references will be taken and interviews will be carried out.

It is considered an additional qualification if the applicant demonstrates such knowledge, competence and skills that contribute to his/her being successfully able to benefit from the programme applied for. These are for example

- sound theoretical, analytic and methodological knowledge;
- sound ability to discuss, in writing and in speech, issues and conclusions;
- intellectual independence; and
- sound ability to carry out advanced tasks within given time frames.

Special emphasis is given to the applicant's ability to

- identify and formulate realistic and productive research problems;
- integrate knowledge and experience and apply these in ways and in contexts where they have not previously been used; and
- conduct a dialogue characterised by independence as well as by an ability to cooperate.

²⁴ Local regulations on the selection of research students to third-cycle courses and study programmes etc.

C Weighing up qualifications

The fact that an applicant is considered able to transfer credits from prior courses and study programmes or for professional or vocational experience may not alone give the applicant priority over other applicants (Higher Education Ordinance, Chapter 7, Section 41).

When weighing up the assessment criteria A and B, the greatest emphasis is placed on criteria B, Capability.

D Gender equality

If, followed from the above, applicants are found to have equal qualifications, preference will be given to applicants of the sex that is underrepresented among the research students within the subject area²⁵. The underrepresented sex here refers to if and when the share of either female or male students enrolled on the subject area's third-cycle study programme amounts to less than 40 per cent.

²⁵ Higher Education Act (SFS 1992:1434), Chapter 1, Section 5, second paragraph and other provisions