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# Translation of Subject Curriculum (Study Plan) for Third-cycle (PhD) Education

# Chemistry with specialisation in theoretical chemistry

**Swedish title: Kemi med inriktning mot teoretisk kemi**

TNKEMI15

Swedish curriculum adopted by the Board of the Faculty of Science and Technology (Third-cycle Educational Board) on 2016-06-01 revision on 2017-11-08. Translations approved on 2017-11-08.

The Study Plan for third-cycle studies consists of three parts: a general part, this subject specific study plan, and each doctoral student's individual study plan.

## Objective

Starting from basic education in the subject the third-cycle education shall give further insights into the important parts of the subject and more thorough knowledge of at least one sub subject. By supervision and thesis work the doctoral student shall become well prepared for critical and independent research activities or other professional work, where strong demands on thorough subject knowledge and research competence are formulated.

The doctoral student shall also be able to present her/his own goals and results both orally and in writing to different target groups in English and, in the case of Swedish-speaking doctoral students, in Swedish.

The doctoral student will be a part of a research group at the department. The doctoral program structure is specified in an individual study plan, which will be reviewed annually. The PhD/licentiate student shall follow the current scientific literature within their own research projects and actively participate in meetings and seminars in the research group and the Department of Chemistry – Ångström.

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## Subject description

Theoretical chemistry is a research area at the interface between chemistry, physics and scientific computing and ranges from applied calculations on chemical systems to method and theory development. Methods from quantum mechanics as well as classical and statistical mechanics are used. The choice of the research area of interest and the precise content of the studies is determined individually by each doctoral student in collaboration with the supervisor and examiner.

Information on the research areas that are relevant to the program can be obtained through seminars and lecture series and discussions with teachers in postgraduate education (www.kemi.uu.se/forskning/teoretisk-kemi).

### Basic Eligibility

The basic eligibility for third-cycle studies is described in the general part of the study plan.

### Special Eligibility

Note: According to Higher Education Ordinance, the special eligibility requirements demanded shall be indispensable for the student's ability to benefit from the studies.

The requirements may refer to knowledge gained from higher education or equivalent education, specific professional experience, and necessary language skills or other conditions imposed by the education.

A person meets the special eligibility requirements for doctoral studies in Chemistry, specializing in theoretical chemistry if she/he has passed examinations in courses in chemistry and physics or in courses in areas of relevance to theoretical chemistry, covering a minimum of 90 higher education credits, or if she/he has acquired the equivalent knowledge abroad. Details of the pre-requisites will be provided by the professor responsible for postgraduate specialization or graduate studies.

## Admission

Applicants for third-cycle studies in chemistry with specialization in theoretical chemistry must submit an application to the Head of the Department of Chemistry Ångström. Admission to doctoral studies takes place normally several times per year.

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Upon admission to postgraduate education, the Swedish title of the degree is to be specified in the application. According to decision (TEKNAT 2012/215), postgraduate education in chemistry with specialisation in theoretical chemistry shall lead to a *filosofie doktorsexamen.* The English rendering will be a licentiate/doctorate degree of philosophy.

At the time of admission, the department must provide a financial assistance plan demonstrating sufficient support to cover the maintenance of the applicant as well as her/his research.

## Program structure

At the time of admission, each doctoral student and her/his supervisor shall draw up an individual study plan after consultation with the professor in charge of third-cycle studies. The plan is to be approved by the Head of the Department (by delegation of the Faculty Board) at the time of admission.

The individual study plan shall be annually reviewed by the doctoral student and her/his supervisor jointly, and supplemented with a summary of the achieved results and the plans for the coming year. Significant changes as well as any disagreement on the individual study plan shall be reported to the Head of the Department or, if deemed necessary, to the Third-cycle Educational Board.

## Courses

The courses and literature studies are intended to provide wider insights into the subject as a complement to the specialist competence acquired in the research work. The courses included in the individual study plan may be selected from individual literature courses at the advanced level in chemistry, as well as from a range of doctoral/graduate courses given in Sweden or abroad.

Participation in international doctoral/graduate courses is especially encouraged. Literature courses (independent study) may also be included. Depending on the specialization, courses in related disciplines, for example physics, mathematics, biophysics and molecular biology could likewise be included. Courses at the advanced level (2nd cycle) may be approved in areas different from those required for the specific eligibility. The inclusion of these courses must be approved by the supervisor and the professor responsible for the third-cycle education and may amounts to a maximum of 15 higher education credits.

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A course in research ethics (of at least 2 higher education credits) is mandatory for licentiate and doctoral degree, as well as university educational theory for doctoral students who teach at basic or advanced level.

Other credit-bearing activities may include e. g. university teaching, introduction to graduate studies, active participation in seminars and conferences etc.

To be able to assimilate the topics discussed in the literature it is important to have a basic knowledge of mathematics, physics and chemistry relevant for theoretical chemistry. For individuals who have not yet acquired such knowledge during their undergraduate studies this training shall be included in the doctoral program. Appropriate additions are to be implemented in consultation with the supervisors based on the student's individual need.

## Requirements for doctoral degree

The requirements for the doctoral degree consist of passed examinations in the courses included in the approved individual study plan of each doctoral student, as well as a passed public defense of the degree project. The studies awarded a doctoral degree comprise 240 higher education credits (four years of full-time studies), of which the doctoral thesis comprises a minimum of 120 higher education credits and the course part a minimum of 40 higher education credits.

## Requirements for licentiate degree

A doctoral student who has acquired at least 120 higher education credits (two years of full-time studies) is eligible for a licentiate degree. The requirements consist of passing the examinations included in the program stage and receiving a passing grade on an academic paper of at least 60 higher education credits. The part of the course amounts to a minimum of 20 higher education credits.

## Other

The third-cycle education is primarily aimed at giving qualifications for a continued research career. In addition to this it is desirable for the doctoral student to acquire pedagogical skills during the studies.
An active participation in information and communication activities (the so-called “third task” in Swedish university legislation) is also desired.
Research in Chemistry with specialization in Theoretical Chemistry is pursued in extensive international collaborations and presumes a widespread global information exchange. It is therefore important that the

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doctoral student can make efficient use of scientific texts in English.

Further information can be obtained from the Department of Chemistry - Ångström, http://www.kemi.uu.se/.