Master's Program in Chemistry

Master of Science

Program Educational Objectives

Chemistry is a discipline that elucidates the structure and reaction of materials at the electron and molecular level to deepen the understanding of natural phenomena and that researches the fabrication of new materials and the expression of their new functionalities. The Master's Program in Chemistry is designed to cultivate human resources who can make the most of their ingenuity from a global view in this area. Particularly, the Master's Program cultivates those who will be a pillar of research in various areas associated with chemistry as highly specialized professionals.

Graduate Profile	He or she should have the clear intention and sincere attitude to contribute to the world through chemistry, and the ability to seek to solve problems by research that is contributory to social development, as well as communication ability and linguistic skill capable of negotiating in the international society.

Diploma Policy

The degree of Master of Science is commenced to those who have fulfilled the requirements for the completion of the Master's programs, as set out in the Graduate School Regulations of the University of Tsukuba and related university regulations, and who are deemed to have the following competences.

	Competences	Evaluation perspectives
Knowledge and Skills	1. Knowledge application competence: Ability to contribute to society with advanced knowledge	①Can you apply knowledge gained through research and other activities in society? ②Can you identify new problems, even in other fields of expertise, based on broad knowledge?
	2. Management competence: Ability to appropriately address challenges from broad standpoints	①Can you take on major tasks with systematic planning? ②Can you understand and solve problems from multiple perspectives?
	3. Communication competence: Ability to accurately and clearly communicate expert knowledge	①Are you capable of efficient communication for research purposes? ②Can you discuss research or research-specific knowledge with experts from your own field and from other fields?
	4. Teamwork competence: Ability to work with a team and actively contribute to the achievement of goals	①Do you have experience cooperatively and actively working on challenges as part of a team? ②Have you helped promote projects and activities other than your own research?
	5. Internationality competence: Willingness to contribute to international society	①Are you aware of making contributions to international society and getting involved in international activities? ②Have you obtained the linguistic skills necessary for international information collection and action?
	6. Specialized chemical knowledge: Theoretical and practical knowledge about physical chemistry, organic chemistry and inorganic/analytical chemistry, and the ability to put it into use in actual research scenes	If theoretical and practical knowledge about physical chemistry, organic chemistry and inorganic/analytical chemistry, and the ability to put it into use in actual research scenes were gained
	7. Logical thinking and problem-solving ability: Ability to analyze and solve problems by logical thinking	If the ability to analyze and solve problems by logical thinking was gained

	Competences	Evaluation perspectives
Knowledge and Skills	8. English proficiency specialized in chemistry: Ability to use English in carrying out a presentation and question-and-answer session and writing a paper as to chemical research	If the ability to use English in carrying out a presentation and question-and-answer session and writing a paper as to chemical research was gained
	9. Ability to drive research forward: Ability to set up research tasks and draw up long-term and short-term research plan	If the ability to set up research tasks and draw up long-term and short-term research plan was gained
	10. Research ethical view of good quality: Ability to appropriately handle and store research data and to appropriately cite other researchers' findings	If research data are appropriately handled and stored and if other researchers' findings are appropriately cited
Guidelines for Assessing Learning Outcomes	At the time of submitting the master's thesis, all academic supervisors will verify and evaluate the student's attainment of competences stipulated in the diploma policy, based on the “Achievement Evaluation Sheet”. For the oral presentation at the master's thesis defense in the final year, all academic supervisors will assess the student's acquisition of competences specified in the diploma policy, using a rubric. One year after admission, an achievement evaluation is conducted. Following confirmation and guidance from individual supervisors, all research supervisors verify and evaluate the results.	

Evaluation Criteria for Degree Theses/ Dissertations	【Review board members】 A thesis review board, which is set up with a chief reviewer (supervisory faculty member) and two sub-reviewers, is launched. The chief and sub-reviewers must be doctor's degree holders. In addition, the chief reviewer must belong to Tsukuba (including the Cooperative Graduate School System), and the sub-reviewers, to Tsukuba (including the Cooperative Graduate School System) or a research institution approved by the professor meeting in the chemical field. 【Review method】 The chief and sub-reviewers review the submitted master's thesis. A master's thesis review board opens and arranges the oral presentation and oral exam of the master's degree candidate to evaluate the comprehension of research content and the achievement of the research. After the board finishes evaluation, the thesis reviewers have an evaluation meeting and decides on the final acceptance. 【Review items】 1. The submitted master's thesis must have a high level of completeness including the description, logical development and graphics. 2. The master's thesis content must have a sufficient high level as research in the areas of chemistry. 3. The master's thesis must have references cited appropriately. 4. The master's thesis must show the sufficient contribution of the master's degree applicant. 5. Preceding researches must be deeply understood and the disciplinary position of the research theme must be clear. 6. The master's thesis content must be deeply understood and the question-and-answer session in the presentation must be carried out appropriately. 【Level standards required for the degree thesis】 The thesis passes if approved to be on a master's thesis level in all criteria 1 to 5 and if approved to have an appropriate level of master's degree diploma with criterion 6 met in the presentation and oral exam in the master' thesis review board.

Curriculum Policy

The curriculum places four large frameworks which include the boundary areas with life sciences and engineering, etc. in addition to inorganic/analytical chemistry, physical chemistry and organic chemistry, which form the foundation of chemistry.
This system allows a research theme to involve a wide range of chemical areas. The Program is designed to provide students with education and research supervision to develop a breadth of basic skills in pure and applied sciences and to have the big picture in mind in natural science extending to science and technology and to engineering as well as the generic knowledge and ability that support students to be active in diverse social scenes, along with the research ability, specialized knowledge and ethical view in each area.
Through this specialized research, students conduct leading-edge research to experimentally and theoretically seek to elucidate the structures and properties of various chemical substances as well as chemical reaction mechanisms, etc. at the electron and molecular level. With this, students can learn the chemical concepts covering from the foundation to application of chemical substances and also the techniques of experiment and research highly versatile in the areas in chemistry.

Curriculum Design Framework	In order to cultivate the basic skills and wide perspectives as well as generic knowledge and ability in associated areas with the student's major at the core, Colloquium on Pure and Applied Sciences (1 credit) must be taken as a required subject from Degree Programs' Common Courses, and students are encouraged to take other Degree Programs' Common Courses, Inter-disciplinary Foundation Courses and Graduate General Education Courses. The research supervision takes a multiple-instruction scheme to develop a research ability that exerts multifaceted perspectives. – The curriculum has a lineup of finely organized courses. Foundation Subjects for Major and Major Subjects help students widely learn the basic and specialized contents of chemistry to cultivate the ability to seek to solve problems. Students also take Graduate General Education Courses and Degree Programs' Common Courses to acquire communication ability and linguistic skill. – As for the research area of each student, students learn advanced contents under the personal attention of supervisory faculty members in charge.
Teaching and Learning Methods	– The curriculum places four large frameworks which include the combined areas with life sciences and engineering, etc. in addition to physical chemistry, inorganic/analytical chemistry and organic chemistry, which form the foundation of chemistry. – Through the specialized research in each area, students can learn the chemical concepts covering from the foundation to application of chemical substances and also the techniques of experiment and research highly versatile in the areas in chemistry. – Students widely learn the basic and specialized contents of chemistry to develop problem-solving ability and also gain communication ability and linguistic skill.

Admission Policy

Desired Student Profile	The Program seeks those who possess the scientific skills, logical and rational thinking abilities and linguistic skill cultivated in a bachelor's program and can challenge problems persistently toward solutions. The Program, which seeks to cultivate highly specialized professionals possessing the practical ability to contribute to the society in actual research scenes on the cutting edge, welcomes those who can be actively committed to academic disciplines and research with a strong desire to learn to attain what the Program seeks.
Student Selection Process	– In light of Desired Students, diverse candidates who possess the qualities and abilities appropriate as potential researchers or highly specialized professionals are selected. – Candidates are evaluated from multifunctional and comprehensive points of view with consideration for fairness and diversity.

Learning Support Framework

Academic Support	Through a support system consisting of co-supervisor and specialised fields (inorganic/analytical chemistry, physical chemistry, and organic chemistry), objectivity in research guidance and responsiveness to a variety of consultations are ensured. By providing opportunities to participate in lectures and seminars outside of the student's own specialised research field, as well as research presentation meetings and study groups, support is given for deepening research, along with guidance in presentation skills and writing support.
Opportunities for Peer Interaction	By providing opportunities to participate in events such as research presentation meetings and career path lectures, where students from different academic years gather, a system is established to promote interaction among students across years and groups through QandA sessions and open discussions. Through the *Semikai* (a degree-program-wide seminar), opportunities are provided for interaction among students across research fields and academic years.
Opportunities for Student–Faculty Interaction	Through the *Semikai* (a degree-program-wide seminar), opportunities are provided for interaction with faculty members other than the supervisor and co-supervisors. Meetings between graduate students and the faculty council are held to provide opportunities for interaction with faculty members other than the supervisor and co-supervisors.

Approaches to Assuring and Enhancing Educational Quality

Through ongoing reviews and improvements of overall educational activities—conducted in settings such as meetings between graduate students and faculty—we will ensure the quality of education and strengthen the framework for achieving the goals of the degree program