

## Master's Program in Chemistry

Name of the degree to be conferred	Master of Science
Educational purpose	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.
Vision of human resources development	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.
Competencies specified in diploma policy	Evaluation perspectives
1. Knowledge application competence: Ability to contribute to society with advanced knowledge	① Can you apply knowledge gained through research and other activities in society? ② Can 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	① Can you take on major tasks with systematic planning? ② Can you understand and solve problems from multiple perspectives?
3. Communication competence: Ability to accurately and clearly communicate expert knowledge	① Are you capable of efficient communication for research purposes? ② Can 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	① Do you have experience cooperatively and actively working on challenges as part of a team? ② Have you helped promote projects and activities other than your own research?
5. Internationality competence: Willingness to contribute to international society	① Are you aware of making contributions to international society and getting involved in international activities? ② Have 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 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 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
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

## Dissertation evaluation criteria

### 【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's 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 organization policy

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.

### Learning methods · Processes

- 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.

Evaluation of learning outcomes	<ul style="list-style-type: none"> <li>· Foundation Subjects for Major: If the fundamental abilities appropriate to a master's degree in science were gained for the research area</li> <li>· Foundations in associated areas: If the fundamental abilities appropriate to a master's degree in science were gained for the areas associated with the research</li> <li>· Knowledge about problems in reality: If insight appropriate to a master's degree in science was gained as to problems in reality</li> <li>· Wide perspective: If a wide perspective appropriate to a master's degree in science was gained</li> <li>· Problem identification to solution: If the ability to identify problems in an area of specialty and lead them to concrete solutions was gained</li> <li>· Presentation and communication abilities: If the logical presentation and communication abilities appropriate to a master's degree in science were gained</li> <li>· Academic outcomes: If research outcomes appropriate to a master's degree in science were accomplished</li> </ul> <p>The achievements in these items are evaluated with written exams, report submission, oral exams and the confirmation of credits earned, and are verified and confirmed carefully at the time of thesis review and final exam. To grant a degree, these examinations need to be passed.</p>
---------------------------------	---

### Admission Policy

Desired students	<p>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.</p>
Selection policy	<ul style="list-style-type: none"> <li>· In light of Desired Students, diverse candidates who possess the qualities and abilities appropriate as potential researchers or highly specialized professionals are selected.</li> <li>· Candidates are evaluated from multifunctional and comprehensive points of view with consideration for fairness and diversity.</li> </ul>