Tokyo Metropolitan University Graduate School Education Curriculum Diploma Policy and Curriculum Organization and Implementation Policies

Program: Graduate School of Science — Chemistry

1. Diploma Policy (DP)

(1) Degrees to be conferred

[Master's Program]
Master's degree (Master of Science): Awarded upon successful completion

[Doctoral Program]
Doctorate (Doctor of Science): Awarded upon successful completion

(2) Certifications to be granted

i. Certifications to be granted upon completion of specified courses
Junior High School Advanced Teacher's License in Science, High School Advanced Teacher's License in Science

Students can apply for the above teacher’s license by satisfying the conditions that they have completed the master’s program and completed and earned credits for specified teacher training and subject courses (lectures, practice, and internship/external experience).

(3) Educational goals

Chemistry is the essential study of natural science that we explore to understand nature at the atomic and molecular levels and the properties and changes of matter. In recent years, chemistry has been significantly integrated with other fields of natural science, ranging from the development of materials such as electronic devices to space, life, and environmental issues. The Department of Chemistry aims to develop chemical researchers, engineers, and educators with extensive knowledge and understanding of chemistry, a high level of expertise, and the ability to make judgments in a broad and comprehensive manner beyond their specialties.

[Master's Program]
The master's program aims to develop a wide range of basic academic skills in chemistry and the ability to independently initiate research projects, organize the findings in papers, and present them at academic conferences, etc. Students will also develop the ability to perceive issues from a broad perspective and acquire the basic skills for research and providing guidance on technological and educational issues in their specialized fields. Through this program, students will acquire:

1. The basic knowledge necessary for conducting research in chemistry as well as logical thinking and practical research methods.
2. The ability to initiate research projects in each field of physics, solve problems, conduct research individually or under the graduate advisor's guidance, as well as the ability to write logically organized papers and present the research findings.
3. The ability to discuss with other researchers and present findings from a broad perspective.

[Doctoral Program]
The doctoral program aims to develop individuals who can independently identify and develop research projects from a broad perspective and organize the findings in papers at the international level. The program is also designed to develop individuals who can play active roles in international settings, presenting the research findings at international conferences and providing technical and educational

guidance from a broad perspective. The students will acquire:

1. The extensive knowledge, logical thinking, and practical research methods necessary to identify advanced and important research projects in chemistry.
2. The ability to initiate unique research projects in each field of chemistry, plan and conduct research, and develop the ability to deliver adequate research findings, write original papers, and publish them in international journals.
3. The ability to conduct research projects as an independent researcher, engage in international research discussions, widely present the findings and significance of the research, and associate the research projects with the society.

(4) Program features

The Department of Chemistry has three well-balanced research groups in different branches of chemistry: inorganic and analytical chemistry, organic and biological chemistry, and physical chemistry. Graduate students are assigned to one of the research groups and acquire the knowledge and skills necessary for advanced research in their respective fields under the guidance of professors, associate professors, and assistant professors in each group. Students will engage in their own research project, write about it in a dissertation, and present the research findings before the Review Committee and at academic conferences in Japan and abroad. In addition to the core courses in Chemistry, common courses established by the Chemistry and Physics departments are offered for students to acquire knowledge from a broader perspective.
Each graduate student majoring in Chemistry will have a secondary graduate advisor besides the primary advisor so that they can seek advice on research and school life in general.

(5) Specialized knowledge, R&D skills, and other skills

[Master's Program]
The master's program aims to develop a wide range of basic academic skills in chemistry and the ability to conduct unique research projects, organize the findings in papers, and present them at academic conferences, etc. Students will also develop the ability to perceive issues from a broad perspective and acquire basic skills for research and providing guidance on technological and educational issues in their specialized fields.

[Doctoral Program]
The doctoral program aims to develop individuals who can uniquely identify and develop research projects from a wide perspective, organize the findings in papers at the international level, and present them at international conferences. The program is also designed to develop leaders who can conduct research and provide technical and educational guidance on various topics in their specialized fields from a broad perspective based on their research experience while continuing to develop their skills.

(6) Completion requirements

Completion requirements of the master's and doctoral programs are prescribed in the Graduate School Rules of Tokyo Metropolitan University and the Department Rules of the Department of Chemistry.

[Master's Program]
In order to complete the master's program, students must complete the one-year enrollment period by attending regular classes, acquiring 30 or more credits of required courses in the master's program, submitting a thesis, and passing the final examination. If the graduate advisor considers it academically beneficial, up to 10 credits out of the 30 credits may be earned by taking non-major courses provided by the same graduate school or major courses provided by other graduate schools as prescribed by the Graduate School of Science. The standard enrollment period in the master's program is two years, and the enrollment period must not exceed four years.

The following courses are required for the master's degree.

- Advanced Research of Chemistry I, II
- Seminar on Advanced Chemistry I, II

Also, students are required to take two or more credits from each of the following groups, for a total of eight or more credits:

- Group 1: Advanced Theoretical Chemistry I, II
- Group 2: Advanced Theoretical Chemistry III, IV
- Group 3: Advanced Theoretical Chemistry V, VI, VII

The thesis evaluation process and criteria are as follows:
An applicant shall decide a thesis title with the prior approval of their graduate advisor and submit the completed thesis to them. The applicant shall submit a degree application with a document certifying that the thesis has been accepted by their graduate advisor. Acceptance/rejection of the degree application shall be decided by the Graduate Faculty Committee. If the application is accepted, the Graduate Faculty Committee shall establish a Review Committee consisting of three or more faculty members, including the chief examiner, with extra examiners from other graduate schools or universities/institutions if necessary. The Review Committee shall rigorously review the content of the submitted thesis. The applicant shall write and submit the master's thesis in Japanese or English. The applicant shall give a public presentation on the research findings in Japanese or English and answer questions. The Review Committee shall determine pass or fail on the thesis and presentation based on the criteria below and report the result to the Graduate Faculty Committee through the Department Meeting. The Graduate Faculty Committee shall make the final decision on whether to confer a degree.

(1) Were the research plan and methods appropriate?
(2) Did the applicant conduct research activities sufficiently during the period of the standard two-year program?
(3) Did the applicant perform an appropriate analysis of the research findings?
(4) Was the thesis written in logical and clear language?
(5) Were the presentation and response to questions in the Master's thesis presentation logical and clear?

[Doctoral Program]
In order to complete the doctoral program, students must complete the two-year enrollment period by attending regular classes, acquiring 20 or more credits in the required courses of the doctoral program, submitting a dissertation, and taking the final examination. The standard enrollment period in the doctoral program is three years, and the enrollment period must not exceed six years.

The following courses are required for the doctorate:

- Advanced Research of Chemistry III, IV
- Seminar on Advanced Chemistry III, IV

The dissertation evaluation process and criteria are as follows:
An applicant shall decide the dissertation title with the prior approval of the graduate advisor and submit an interim report to the Department before proceeding to write a dissertation. The completed dissertation shall be submitted to the graduate advisor. The applicant shall submit a degree application with a document certifying that the dissertation has been accepted by their graduate advisor. Acceptance/rejection of the degree application shall be decided by the Graduate Faculty Committee. If the degree application is approved, the Graduate Faculty Committee shall establish a Review Committee consisting of three or more faculty members, including the chief examiner, with extra examiners from other graduate schools or universities/institutions if necessary. The Review Committee shall rigorously review the content of the submitted dissertation. The applicant shall write and submit the dissertation in Japanese or English. The applicant shall give a public presentation on the research findings in Japanese or English and answer questions. The Review Committee shall determine pass or fail on the dissertation and presentation based on the criteria below and report the result to the Graduate Faculty Committee through the Department Meeting. The Graduate Faculty Committee shall make the final decision on whether to confer a degree.

(1) Did the applicant engage in a research project on an unsolved issue with scientific significance?
(2) Were the research plan and methods appropriate and sufficient?
(3) Did the applicant achieve significant results on the research project?
(4) Was the dissertation written in logical and clear language?

(5) Were the presentation and response to questions in the dissertation presentation logical and clear?
(6) Have the major research contents been published or will they be published in a peer-reviewed academic journal?
(7) Are appropriate ethical considerations given to planning and conducting research, presenting the research findings, and storing the data?

2. Curriculum Policy (CP): Policy on curriculum organization and implementation

(1) Basic policy on curriculum organization

The curriculum shall be appropriately organized to provide students with a high level of expert knowledge and competence in their field of study and to develop basic knowledge in related fields as follows.

[Master's Program]
The master's program helps students develop a wide range of basic academic skills in chemistry and the ability to perceive issues from a broad perspective, acquire the basic skills for research, and provide guidance on technological and educational issues in their specialized fields. In order to achieve this educational goal, the curriculum focuses on lectures, research, and seminars.

One of the requirements for program completion is that students must take several interdisciplinary courses in advanced chemistry outside their own field of specialization to acquire broad basic academic skills in chemistry. In addition, Physics and Chemistry departments co-establish interdisciplinary courses, which help the students acquire knowledge from a broader perspective and conduct practical research. Intensive courses taught by external experts are offered to allow students to acquire basic to advanced knowledge in a short period of time.

In the first year, students in each research group will participate in a seminar to study literature of a foreign language and conduct their own research projects on advanced subjects. The seminar requires students to read and summarize literature written in a foreign language, give a presentation, and answer questions to develop those skills. In addition, research courses help students acquire not only knowledge and technique but also global skills such as collecting and analyzing information and solving problems.

In the second year, students will work on writing their master's thesis based on the knowledge and experience they have acquired. At the end of the year, students will give a public presentation on research findings in the thesis presentation event.

[Doctoral Program]

The doctoral program aims to develop not only individuals who can uniquely identify and develop research projects from a wide perspective but leaders who can conduct research and provide technical and educational guidance on various topics in their specialized fields from a broad perspective based on their research experience while continuing to develop their skills. Students will pursue their own research to achieve this goal. In addition, the program aims to help students acquire the ability to conduct research activities as independent researchers and to engage in international discussions on research subjects. Students are expected to present their research findings at international conferences and publish them as original papers in international journals. Students must complete a doctoral dissertation by the end of their third year and give a public presentation in the dissertation presentation event (dissertation defense).

(2) Policy on teaching and learning methods in the curriculum

The courses shall be taught with various methods and forms, such as lectures, exercises, and practical training, in accordance with the objectives and learning goals of each course so that students can learn independently and actively and acquire the qualities and abilities appropriate to the objectives of human resources development and the degree awarding policy.

Research guidance shall be provided to improve students' research skills and methods under the research guidance plans defined separately.

(3) Policy on the assessment of learning outcomes

All courses shall be assessed according to the level of achievement of the course objectives, based on the assessment methods and criteria specified in the syllabus. Thesis/dissertations shall be assessed according to the following process and criteria.

[Master's Program]

○ Thesis evaluation process and criteria:

An applicant shall decide a thesis title with the prior approval of their graduate advisor and submit the completed thesis to them. The applicant shall submit a degree application with a document certifying that the thesis has been accepted by their thesis advisor. Acceptance/rejection of the degree application shall be decided by the Graduate Faculty Committee. If the application is accepted, the Graduate Faculty Committee shall establish a Review Committee consisting of three or more faculty members, including the chief examiner, with extra examiners from other graduate schools or universities/institutions if necessary. The Review Committee shall rigorously review the content of the submitted thesis. The applicant shall write and submit the master's thesis in Japanese or English. The applicant shall give a public presentation on the research findings in Japanese or English and answer questions. The Review Committee shall determine pass or fail on the thesis and presentation based on the criteria below and report the result to the Graduate Faculty Committee through the Department Meeting. The Graduate Faculty Committee shall make the final decision on whether to confer a degree.

(1) Were the research plan and methods appropriate?
(2) Did the applicant conduct research activities sufficiently during the period of the standard two-year program?
(3) Did the applicant perform an appropriate analysis of the research findings?
(4) Was the thesis written in logical and clear language?
(5) Were the presentation and response to questions in the Master's thesis presentation logical and clear?

[Doctoral Program]

○ Dissertation evaluation process and criteria:

An applicant shall decide the dissertation title with the prior approval of their graduate advisor and submit an interim report to the Department before proceeding to write a dissertation. The completed dissertation shall be submitted to the graduate advisor. The applicant shall submit a degree application with a document certifying that the dissertation has been accepted by their graduate advisor. Acceptance/rejection of the degree application shall be decided by the Graduate Faculty Committee. If the degree application is approved, the Graduate Faculty Committee shall establish a Review Committee consisting of three or more faculty members, including the chief examiner, with extra examiners from other graduate schools or universities/institutions if necessary. The Review Committee shall rigorously review the content of the submitted dissertation. The applicant shall write and submit the dissertation in Japanese or English. The applicant shall give a public presentation on the research findings in Japanese or English and answer questions. The Review Committee shall determine pass or fail on the dissertation and presentation based on the criteria below and report the result to the Graduate Faculty Committee through the Department Meeting. The Graduate Faculty Committee shall make the final decision on whether to confer a degree.

(1) Did the applicant engage in a research project on an unsolved issue with scientific significance?
(2) Were the research plan and methods appropriate and sufficient?
(3) Did the applicant achieve significant results on the research project?
(4) Was the dissertation written in logical and clear language?
(5) Were the presentation and response to questions in the dissertation presentation logical and clear?
(6) Have the major research contents been published or will they be published in a peer-reviewed academic journal?
(7) Are appropriate ethical considerations given to planning and conducting research, presenting the research findings, and storing the data?

Curriculum Structure of the Department of Chemistry