

For entrants in AY 2020

Appended Form 1

Specifications for Major Program

Name of School (Program) [School of Science (Department of Chemistry)]

Program name (Japanese)	化学プログラム
(English)	Chemistry

1. Degree to be obtained: Bachelor of Science

2. Overview

Chemistry is a study of natural phenomena from the perspective of substances, in order to develop new methods for understanding natural phenomena and create materials with new and useful functions that will contribute to the progress of human beings. It is important for students to understand deeply a wide range of areas, from the basics of chemistry, i.e., physical chemistry, inorganic chemistry, and organic chemistry, to interdisciplinary fields.

This program is constituted of "liberal arts subjects" and "specialized education subjects." The "liberal arts subjects", "basic courses in university education common subjects", and "fundamental subjects". "Specialized education subjects" consist of "specialized fundamental subjects" and "specialized subjects." The "liberal arts subjects" are provided for students to develop general intelligence and their personality. Students can

languages, which are fundamental means of conveying advanced knowledges internationally, computers, and presentations. Practice based on knowledge is important in chemistry, the subject in which students in this program will major, and students acquire knowledges and abilities for practice in a bottom-up manner. Therefore, students obtain the fundamental knowledge in the "basic su

is organized systematically, mainly based on physical chemistry, inorganic chemistry, and organic chemistry. In addition, the program allows students to take subjects provided by other departments of the School of Science, taking into consideration the importance of interdisciplinary fields. Based on the knowledge they have obtained in the above subjects, students learn basic skills for practice in the subjects "Chemical Experiments I" and "Chemical Experiments II", and in the "specialized subjects". Students also develop abilities required for scientists in society in their

who have graduated from the School of Science. The graduate school is an ideal place where students can enhance their abilities as scientists and exercise these abilities through their research. The Chemistry Program is designed to have continuity with the education in the graduate school.

This program also provides sufficient education to meet requirements of students who wish to obtain the certification for science teachers of junior and senior high schools.

In this program, approximately three quarters of students, who graduate from the Department of Chemistry in the School of Science, go on to the Basic Chemistry Program in the Division of Advanced Science and Engineering in the Graduate School of Advanced Science and Engineering or to the Program of Mathematical and Life Sciences in the

biology, and mathematics that they have studied in high school, in order to prepare for advanced chemistry. In addition, they study fundamentals of quantum chemistry that are required for understanding all other areas of chemistry.

- In the second year, specialized education aimed at full-fledged study in chemistry is provided, in order for students to acquire advanced knowledges of chemistry. This enables students to improve basic abilities required for pioneering new areas of chemistry. Because faculty members consistently use the same textbook for physical chemistry, inorganic and analytical chemistry, and organic chemistry, students can systematically study each area.

7. Class subjects and their contents

- * For the class subjects, refer to the subject table in Attachment 1.
- * For the details of the class subjects, refer to the syllabus that is published for each academic year.

8. Academic achievement

The evaluation criteria are specified for each evaluation item of academic achievement, and the achievement level against the criteria is given at the end of the semester.

The evaluation score for each evaluation item is converted to a numerical value (S = 4, A = 3, B = 2, and C = 1) and the evaluation standard for academic achievement, from when the student entered the university to the end of the last semester, is determined by using these values and applying weightings. The evaluation standards consist of three levels, i.e., Excellent, Very Good, and Good.

Evaluation of academic achievement	Converted value
S (90 or more points)	4
A (80 – 89 points)	3
B (70 – 79 points)	2
C (60 – 69 points)	1

Academic achievement	Evaluation criteria
Excellent	3.00 – 4.00
Very Good	2.00 – 2.99
Good	1.00 – 1.99

- * Refer to the relationship between evaluation items and evaluation criteria described in Attachment 2.
- * Refer to the relationship between evaluation items and class subjects described in Attachment 3.
- * Refer to the curriculum map in Attachment 4.

9. Graduation thesis (graduation research) (meaning, student allocation, timing, etc.)

1. Purpose

Students join state-of-the-art research that is being performed in the research group to which they are allocated, based on the fundamental knowledge and skills in basic practices in chemistry that they have acquired in their studies up to and including the third year. They acquire the latest knowledge of the research area and connected areas, as well as advanced practical skills. In addition to this, they study how to advance their research and refine their personal qualities as cooperative, unique, ambitious, patient, and flexible scientists. Furthermore, they acquire skills that can be used for further study in the graduate school, research activities in a company, and educational and/or social activities in other fields.

2. Overview of Research

An overview of research is given on the website of each research group. Materials introducing the research

3. Student allocation timing and method

Students are allocated to their research group at the beginning of the fourth academic year. To be allocated to a laboratory, students must satisfy the conditions for starting graduation research. For details of this, refer to the "Criteria for Attending Specialized Education Subjects in Chemistry Program 2" found in the "Student Handbook" (received when the student enters the university).

Students are allocated to a research group based on their individual wishes, within the capacity constraints of each group that are defined by the faculty committee of the Department of Chemistry.

10. Responsibility

(1) Responsibility for PDCA (plan, do, check, and act) cycle

The faculty committee of the Chemistry Program (head: chair of the Department of Chemistry) is engaged in

responsible (the education affairs review committee in the Department of Chemistry) based on materials

actions are carried out by the faculty committee of the Chemistry Program, taking the result of the consultation into consideration.

The faculty members who constitute the faculty committee for each major program are listed in Attachment 5.

(2) Evaluation of the program

○ Perspectives for the evaluation of program

- 1: Objective level of achievement of the students
- 2: Level of satisfaction of the students
- 3: Level of satisfaction of the faculty members
- 4: Results of graduation research

○ Evaluation method

- 1: An external evaluation is conducted by ex-students.
- 2: A questionnaire for evaluation of the whole program is distributed to students and ex-students of the program.
- 3: A questionnaire for evaluation of the whole program is distributed to members of faculty.
- 4: A questionnaire for the results of the graduation research is distributed to ex-students.

○ Policy and method for feedback to students

Based on the basic philosophy of "student-
questionnaires for students and ex-students are conducted each academic year, and the results are comprehensively reviewed to identify any problems in the program. Then, the faculty committee of the Chemistry Program revises the composition of the program and the contents of subjects as required.

Table of Registration Standards for Chemistry Program

Refer to Study Guidance for the Chemistry Program for requirements for attending the course.

Students are allowed to take class subjects provided in other programs and schools, and in other universities, in addition to the class subjects listed in this table, and the credit for those subjects that the faculty committee of the Chemistry Program certifies is accepted as the required credit for graduation.

* Students who have earned required credits (refer to the Student Handbook for the details) can acquire the type 1 license for junior high school teachers (science), the type 1 license for senior high school teachers (science), the poisonous and deleterious substances business operator license, and the curator license.
In addition to this, students who graduate from this program acquire eligibility for the examination for Class A hazardous materials engineer.

(Liberal Arts Education)

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Liberal Arts Education Subjects	Peace Science Courses		2	From "Peace Science Courses"		Each 2	Elective/required	○						
	Basic Courses in University	Introduction to University Education	2	Introduction to University Education		2	Required	②						
		Introductory Seminar for First-Year Students	2	Introductory Seminar for First-Year Students		2	Required	②						
	Common Subjects	Area Courses		8	From "Area Courses" (Note 2)		1 or 2	Elective/required	○	○	○	○		
		Foreign Languages	English (Note 3)	Basic English Usage	2	Basic English Usage I	1	Required	①					
						Basic English Usage II	1			①				
				Communication I	2	Communication IA	1	Required	①					
						Communication IB	1		①					
			Communication II	2	Communication IIA	1	Required		①					
					Communication IIB	1			①					
			Non-English Foreign Languages (Select one language from German, French, Spanish, Russian, Chinese and Korean)	10	4	Foreign Languages: Basic Studies I	1	Elective/required	○					
						Foreign Languages: Basic Studies II	1		○					
						Foreign Languages: Basic Studies III	1			○				
						Foreign Languages: Basic Studies IV	1			○				
		I, II, III and IV must be the same language												
	Information and Data Science Courses		2	Exercise in Information Literacy		2	Required	②						
	Health and Sports Courses		2	From "Health and Sports Courses"		1 or 2	Elective/required	○	○					
	Social Cooperation Courses (Note 4)		(0)	From "Social Cooperation Courses"		1 or 2	Free elective	○	○					
	Foundation Courses		14	12	Calculus I	2	Required	②						
					Calculus II	2			②					
Linear Algebra I					2			②						
Linear Algebra II					2			②						
Experimental Methods and Laboratory Work in Physics I					1			①						
Experimental Methods and Laboratory Work in Physics II					1			①						
Experimental Methods and Laboratory Work in Chemistry I					1					①				
Experimental Methods and Laboratory Work in Chemistry II					1					①				
2				Experimental Methods and Laboratory Work in Biology I	1	Elective/required	○							
				Experimental Methods and Laboratory Work in Biology II	1		○							
	Experimental Methods and Laboratory Work in Earth Sciences I	1			○									
	Experimental Methods and Laboratory Work in Earth Sciences II	1			○									
I and II of the same subject (2 credits) from the 4 subjects above														
Total(Liberal Arts Education Subjects)		42												

(Note 1) The indicated semester represents that in which students typically take the subject. It is permitted to take the subject in the same (first or second) semester in the following year, however, it is required to confirm the details in syllabus for that academic year, because the subject might be provided in a different semester or term.

(Note 2) It is required to earn 4 credits in "Human & Social Science Subjects" and 4 credits in "Natural Science Subjects". Students who want to acquire an educational personnel certification must take the subject "Japanese Constitution" in the "Human & Social Science Subjects".
Credits earned through the subject "Advanced English for Communication", "Foreign Languages: Intensive Studies" and "Overseas Language Seminar (German, French, Spanish, Russian, Chinese, and Korean)" in "Foreign Languages" are accepted as the credits required for "Human & Social Science Subjects".

(Note 3) The credit for "Field Research in the English-speaking World" that is earned through such activities as a short-term study abroad, and that for "Online English Seminar A" and "Online English Seminar B", that is earned through self-study, are accepted as the credit for the subject "Communication I and II".
Achievement in a foreign language skill test might also be accepted as credit. For the details, refer to the description of English subjects in Liberal Arts Education and the item "Credit based on Achievement in Foreign Language Skill Tests" in the Student Handbook.

(Note 4) The credit of the subject "Social Cooperation Courses" is accepted as credit for the category of "Any subject".

* Note for the "Specialized Education Subjects" listed in the next page and after

(Note 5) To achieve the 43 credits required for the "Specialized Subjects", it is required to earn 8 or more credits for elective required subjects and free elective subjects, as well as 18 credits for required subjects and 17 credits for elective required subjects.

(Note 6) "Special Lectures in Chemistry" shall be offered intensively in a certain period (in or after the fifth semester). For taking the subject, refer to the Study Guidance for the Chemistry Program.

(Note 7) This includes the subjects that the faculty committee of Chemistry Program accept. Consult with the tutor for the details.

(Note 8) Because 128 credits are required for graduation, it is required to earn 2 or more credits, regardless of the categorization of Liberal Arts Education Subjects and Specialized Education Subjects, in addition to the required credits for each subject category (126 credits in total that consist of 42 credits for Liberal Arts Education Subjects and 84 credits for Specialized Education Subjects).

However, the credit for the subjects described below is not accepted as the required credit for graduation: For the details of subjects related to educational personnel certification, refer to the list of required credits in "Acquisition of Educational Personnel Certification" in the Student Handbook.

• Any credit for subjects only related to educational personnel certification

• Credits for "Experiments in General Physics A", "Experiments in Chemistry A", "Laboratory Work in Biology A" and "Experiments in General Geology A"

• "Basic Specialized Subjects" and "Specialized Subjects" provided in the other programs in the other schools (except those that are admitted by the faculty committee of the Chemistry Program)

Introduction to Mathematics	2	○		
Introduction to Information Mathematics	2		○	
Introduction to Physics A	2	○		
Introduction to Physics B	2		○	
Introduction to Biological Sciences A	2	○		
Introduction to Biological Sciences B	2		○	
Introduction to Earth and Planetary Sciences A	2	○		
Introduction to Earth and Planetary Sciences B	2		○	
Basic Chemistry A	2	②		
Basic Chemistry B	2	②		
Basic Physical Chemistry A	2		②	
Basic Physical Chemistry B	2		②	
Fundamental Inorganic Chemistry	2		②	
Fundamental Organic Chemistry	2		②	
Physical Chemistry IA	2			②
Physical Chemistry IB	2			②
Physical Chemistry IIA	2			②
Physical Chemistry IIB	2			②
Inorganic Chemistry I	2		②	
Inorganic Chemistry II	2		②	
Inorganic Chemistry III	2			②
Organic Chemistry I	2		②	
Organic Chemistry II	2		②	
Organic Chemistry III	2			②
Exercises in Inorganic Chemistry	1			①

Academic achievements of Chemistry Program

Relationships between the evaluation items and evaluation criteria

Academic achievements			Evaluation criteria		
Evaluation items			Excellent	Very Good	Good
Knowledge and Understanding	(1)	To thoroughly understand and learn knowledge of physical chemistry, inorganic chemistry and organic chemistry.	Being able to fully understand basic information on chemistry and make it bases to understand advanced contents.	Being able to fully understand basic information on chemistry.	Being able to understand basic information on chemistry.
	(2)	Understanding and learning advanced expertise in several chemical and interdisciplinary areas.	Being able to fully understand chemical expertise and make it bases to conduct the latest research.	Being able to fully understand chemical expertise.	Being able to understand chemical expertise.
	(3)	Understanding and acquiring logical frameworks and structure of basic studying and knowledge and skills necessary for learning construction.	To understand the basics of physical science perfectly; also, to make the knowledge a foundation for learning cutting-edge information.	To be able to understand the basics of physical science perfectly.	To be able to understand the basics of physical science.
	(4)	To learn abilities to express oneself by considering problems that human and society are facing from multiple perspectives.	By understanding problems that human and society are facing from multiple viewpoints, to consider specific solutions and express one's idea	To be able to understand problems that human and society are facing from multiple perspectives.	To be able to understand problems that human and society are facing from multiple perspectives.
	(5)	Getting ability to explain the process of construction and development in each academic discipline.	Being able to fully understand the construction and development process of each studying and explain the relationship between the necessity and modern learning.	Being able to fully understand the construction and development process of each studying.	Being able to understand the construction and development process of each studying.
	(6)	To learn skills to explain certain academic and comprehensive topics from various perspectives.	Being able to fully understand interdisciplinary and general topics on chemistry and other areas and explain them.	Being able to fully understand interdisciplinary and general topics on chemistry and other areas.	Being able to understand interdisciplinary and general topics on chemistry and other areas.
Abilities and Skills	(1)	To acquire ability to apply chemical knowledge, witch is already acquired, into chemical issues.	To be able to apply chemical knowledge, which is already acquired, into chemical problems, and solve them.	To be able to apply learned chemical basic knowledge into chemical problems.	To be able to understand relations between basic chemical knowledge, which is already acquired, and chemical issues.
	(2)	To learn basic knowledge, skills, and attitudes related to information, also to acquire skills to process, output and input information appropriately.	Being able to fully understand information on closely related to chemistry and appropriately deal, send and receive them.	Being able to understand information on closely related to chemistry and deal, send and receive them.	Being able to use chemistry related information.
	(3)	To acquire the ability to explain the importance of fitness and health promotion from scientific perspectives.	To appropriately understand explain relations among human body, health and science.	To appropriately understand relations among human body, health and science.	To understand explain relations among human body, health and science.
	(4)	To obtain skills to conduct experiments based on basic knowledge, which is learned.	Based on basic knowledge of natural science, to be able to handle experiments in accordance with appropriate steps, also to understand the results deeply.	Based on basic knowledge about natural science, to be able to conduce research and understand research results.	Based on acquired basic knowledge about natural science, to be able to conduct research.

Academic achievements	Evaluation criteria		
Evaluation items	Excellent	Very Good	Good

(1) Acquiring the ability of research planning.

[illegible]

[illegible]

Curriculum Map of Chemistry

