## 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: E	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" consist of "peace 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 choose subjects according to their interests. Through the "common subjects", students acquire skills of foreign 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 subjects", "specialized basic subjects", and "specialized subjects" that 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 "graduation research". The graduate school provides substantial curricula and a research environment for students 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 Division of Integrated Sciences for Life in the Graduate School of Integrated Sciences for Life in our university. The remaining students are employed as teachers, public servants, or company workers in the areas of chemistry, computing, and pharmaceuticals, or advance to the graduate school of another university.

We truly hope that students who are interested in searching for the truth, and are ambitious to try new things, will join us.

#### 3. Diploma policy (policy for awarding degrees and goal of the program)

This program aims to educate students to be scientists, with the background in chemistry and of international quality, who work in the cutting edge of areas related to chemistry, such as basic and applied researches, practical work in industry, and science education. In addition, the program aims to produce professionals who are capable of undertaking their work autonomously and with flexibility.

This program will award the degree of bachelor of science to students who, in addition to earning required credits defined for this educational course, have acquired capabilities and qualities described below:

- The qualities required for pioneering a new area of chemistry, based on profound knowledge of chemistry, expertise, thinking ability, judgment, and creative perspective;
- The abilities required for leading in modern society, based on an interest in an interdisciplinary field that has a relationship with more than one area, or a new area of chemistry that exceeds borders of previous frameworks;
- The ability to adapt oneself to a new situation and environment, based on constant, active, and voluntary academic interest in chemistry, and a comprehensive outlook; and
- The ability to constantly pursue one's endeavors, to logically exhibit and explain one's ideas in convincing manners, and to correct and improve one's understanding through discussion with others.
- 4. Curriculum policy (policy for organizing and implementing the curriculum)

This program provides high quality education courses that were established based on the tradition inherited from Hiroshima Bunrika University, in order to enable students to achieve the targets listed in the diploma policy. The organization with which these programs are implemented is formed to provide education flexibly while taking the level of achievement of the students into consideration. These programs are reviewed and evaluated every academic year after they have been implemented, to constantly improve the methodology of the education. In addition, these educational programs are designed to provide smooth continuity to the advanced education and research in the graduate school. The achievement in education is evaluated based on grade scores for the subjects and the level of achievement against the targets defined for this program. The following lists the educational policy and courses that are provided for students in each year:

• In the first year, students study subjects related to outlines of mathematics, physics, biology, and earth and planetary system science as specialized education subjects, which enable students to obtain basic knowledges in a wide range of areas of natural science. Students acquire qualities necessary for pioneering interdisciplinary fields beyond previous frameworks. Students also develop basic abilities needed for presenting their own ideas and logic in foreign languages through class subjects in foreign languages, principally English. The liberal arts subjects are provided to enable students to develop a wide-ranging intelligence, judgment, and deep humanity. In the specialized fundamental subjects of chemistry, students learn again basic knowledges of chemistry, physics,

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.
- In the third year, students are trained for chemical experiments throughout the academic year. In this process, students improve their skills in chemistry and foster their ability to constantly expend effort until they achieve their aim. They also study chemistry subjects related to advanced application, and state-of-the-art chemistry that is being developed on the front lines around the world. Through this study, students learn the roles that chemistry plays in solving various problems that human beings are facing, and develop basic creativity and practical abilities for leading activities in the local community and the international society.
- In the fourth year, students carry out their graduation research in a study group in the Department of Chemistry, and present their results. Through this process, they acquire the ability to autonomously advance their research while cooperating with faculty members and other students, objectively observing unfamiliar properties and phenomena, and logically explaining their cause and mechanism, logically presenting and explaining their obtained chemical findings in a convincing manner, and correcting and improving their understanding through discussion with others. Furthermore, they reinforce the basics required for working in cutting edge areas of chemistry in such fields as industry, education, academia, and graduate school.

#### 5. Start time and acceptance conditions

In School of Science, each department holds its entrance examinations. This program is organized primarily for students of the Department of Chemistry. Students are automatically registered in this program when they enter our university. Therefore, students will be educated according to this program from the start of the first year.

Students who enter the Department of Chemistry are expected to have mastered the subjects in high school listed below:

Subject name: Mathematics, Physics

This program also accepts all students at our university. When a student who does not belong to the Department of Chemistry chooses this program, requirements are stipulated separately, based on the provisions regarding transfer between schools / departments.

#### 6. Obtainable qualifications

- 1: Educational personnel certification
  - (1) Type 1 License for Junior High School Teacher (Science)
  - (2) Type 1 License for High School Teacher (Science)
- 2: Curator license
- 3 Certification of Poisonous and Deleterious Substances Business Operator
- 4 License for which eligibility for examination is awarded to a person with a bachelor's degree: Class A hazardous materials engineer

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

Evaluation
criteria
3.00 - 4.00
2.00 - 2.99
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 groups will be delivered to students before we conduct a survey of their allocation preferences. Students are also permitted to visit each research group at any time in order to learn about the situation in the group directly from the faculty members and students. Additionally, the lecture in "Advanced Chemistry" that is given in the third year helps students understand various aspects of 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 the "plan" and "do" processes.

For the process "check" process, the chair of Department of Chemistry consults with the committee responsible (the education affairs review committee in the Department of Chemistry) based on materials prepared by the faculty committee of the Chemistry Program. In the case of the "action" process, the required 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

- $\bigcirc$  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

#### $\bigcirc$ 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-oriented education", an external evaluation by ex-students and 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)

												r in wh e lower fig					
Type				Subject type	· ·	uired . of	Class subjects, etc.	No. of	Type of course	1st g	rade	2nd g		3rd g		4th g	rade
Type			r.	subject type		dits	Class subjects, etc.	credits	registration	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
									-	1	2	3	4	5	6	7	8
			Peace	e Science Courses	:	2	From "Peace Science Courses"	Each 2	Elective/required	0							
	sic es in rsity	Intro	oducti	ion to University Education		2	Introduction to University Education	2	Required	2							
	Ba: Cours Unive	Intro	ductor	y Seminar for First-Year Students	:	2	Introductory Seminar for First-Year Students	2	Required	2							
				Area Courses		8	From "Area Courses" (Note 2)	1  or  2	Elective/required	0	0	0	0				
				Basic English Usage		2	Basic English Usage I	1	Required	1							
			e 3)	Dasic English Usage		2	Basic English Usage II	1	Kequireu		1						
			English (Note	Communication I		2	Communication IA	1	Required	1							
		ges	glish	Communication 1		2	Communication IB	1	Required	1							
	cts	Foreign Languages	Eng	Communication II		2	Communication IIA	1	Required		1						
	Common Subjects	ı Laı		Communication	10	2	Communication IIB	1	Required		1						
	on S	reigı					Foreign Languages: Basic Studies I	1		0							
	mmo	Fo		-English Foreign Languages			Foreign Languages: Basic Studies II	1	Elective/required	0							
ects	ŭ		(	Select one language from German, French, Spanish,		4	Foreign Languages: Basic Studies III	1			0						
Subj			Ru	ssian, Chinese and Korean)			Foreign Languages: Basic Studies IV	1			0						
ion							${\rm I}$ , ${\rm I\hspace{-1.4mm}I}$ , ${\rm I\hspace{-1.4mm}I}$ and ${\rm I\hspace{-1.4mm}V}$ must be the same language										
ucat		Infor	matio	n and Data Science Courses		2	Exercise in Information Literacy	2	Required	2							
Arts Education Subjects			Heal	th and Sports Courses	:	2	From "Health and Sports Courses"	$1~{\rm or}~2$	Elective/required	0	0						
Art		Soc	ial C	poperation Courses(Note 4)	(	0)	From "Social Cooperation Courses"	$1 {\rm ~or~} 2$	Free elective	0	0						
Liberal							Calculus I	2		2							
Lib							Calculus II	2			2						
							Linear Algebra I	2		2							
						12	Linear Algebra II	2	Required		2						
						12	Experimental Methods and Laboratory Work in Physics I	1	Requireu		1						
							Experimental Methods and Laboratory Work in Physics ${\rm I\!I}$	1			1						
			Fou	ndation Courses	14		Experimental Methods and Laboratory Work in Chemistry I	1					(1)				
							Experimental Methods and Laboratory Work in Chemistry ${\rm I\!I}$	1					1				
							Experimental Methods and Laboratory Work in Biology I	1		0							
							Experimental Methods and Laboratory Work in Biology $ \mathrm{I\!I}$	1	Elective/required	0							
						2	Experimental Methods and Laboratory Work in Earth Sciences I	1	Liecuve/required			0					
							Experimental Methods and Laboratory Work in Earth Sciences ${\rm I\!I}$	1				0					
							I and II of the same subject (2 credits) from the 4	subject	s above								
	Tot	al(Li	beral	Arts Education Subjects)	4	2											

(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 rear, 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 commit determine a stratus for in the "Human & Social Science Subjects".
(Note 2) It is required to earn 4 credits in "Human & Social Science Subjects".
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".

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". (Note 3) 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.

"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 (Note 6) Chemistry Program

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

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 (Note 8) 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)

# (Specialized Education)

		P				m î					e subje			
Туре	Subject type	•	uired o. of	Class subjects, etc.	No. of	Type of course	1st e	(*Th		<sup>gure me</sup> grade	ans seme 3rd g			grade
rype	Subject type		dits	Class subjects, etc.	credits	registration	Spring	Fall	Spring				Spring	
			T			-	1	2	3	4	5	6	7	8
				Introduction to Mathematics	2		0	0						
				Introduction to Information Mathematics	2		0	0						
				Introduction to Physics A	2		0	0						
				Introduction to Physics B	2	Elective/required	0	0						
			4	Introduction to Biological Sciences A Introduction to Biological Sciences B	2		0	0						
				Introduction to Earth and Planetary Sciences A	2		0	0						
				Introduction to Earth and Planetary Sciences A Introduction to Earth and Planetary Sciences B	2		0	0						
						/////T			D″ (	- 1		11.4	1	
				2 subjects (4 credits) including "Introduction to F		A or introduc		Physic	SB ITO	om the	eignt s	ubjects	above	
				Basic Chemistry A	2		2							
				Basic Chemistry B	2		2							
				Basic Physical Chemistry A	2			2						
				Basic Physical Chemistry B	2			2						
	Basic Specialized Subjects	41		Fundamental Inorganic Chemistry	2			2						
	Dasic Specialized Subjects	41		Fundamental Organic Chemistry	2			2						
				Physical Chemistry IA	2				2					
				Physical Chemistry IB	2			-	2					
				Physical Chemistry IIA	2					2				
			37	Physical Chemistry IIB	2	Required				2				
				Inorganic Chemistry I	2				2					
				Inorganic Chemistry II	2				2	_				
				Inorganic Chemistry III	2				6	2				
				Organic Chemistry I	2				2					
				Organic Chemistry II	2				2	_				
				Organic Chemistry III	2					2				
				Exercises in Inorganic Chemistry	1					1	0			
				Exercises in Physical Chemistry	1						1			
				Exercises in Organic Chemistry	1						0	1		
ects				English Seminar on Chemistry (2 subjects of the same name)	Each 1						1	1		
idbjé				Advanced Mathematics	2					_	0			
on S				Advanced Physics	2					0		-		
cati				Advanced Chemistry	2	Elective/required						0		
Specialized Education Subjects			more	Advanced Biology	2						0	0		
red				Advanced Earth and Planetary Science	2							0		
ciali				At least 1 subject (2credits) from the five subject		1				_	1			
Spec				Biological and Structural Chemistry	2					0				
				Chemistry of Biological Compounds	2					0				
				Analytical Organic Chemistry	2					0				
				Organic Main Group Chemistry	2					0	0			
				Reaction Dynamics	2						0			
				Molecular Structural Chemistry	2			-			0			
				Quantum Chemistry	2						0			
				Inorganic Chemistry Solid State Chemistry	2						0			
				Instrumental Analytical Chemistry	2						0			
				Structural Organic Chemistry	2				L		0			
		43		Organic Reaction Chemistry	2	E1					0			
	Specialized Subjects	(note 5)			2	Elective/required					0			
		5)	more	Systembiology	2				L		0	(		-
				Biopolymer Chemistry	2				L			0		-
				Molecular Photochemistry	2							0		
				Organometallic Chemistry	2							0		
				Radiochemistry	2							0		
				Biological Chemistry	2							0		
				Bioinformatics	2							0		
				Practical Computational Chemistry	2				L			0		
				Exercises in Chemistry	1								0	
				Chemistry Internship	1		ļ		L		0	(		-
				"Special Lectures in Chemistry" (Note 6)	1						0	0	0	0
				At least 8 subjects (15 credits) from the twenty t		jects above								
				Chemical Experiments I	5	р			L		5	0		
			18	Chemical Experiments II	5	Required						5	_	-
				Special Study for Graduation	Each 4								4	4
			$0 \sim 8$	"Basic Specialized Subjects" and "Specialized Subjects" offered by other programs of School of		Free elective	0	0	0	0	0	0	0	
				Science (Note 7)								~		
	Total (Specialized Education Subjects)		34											1
			2	(Note 8)	1		0	0	0	0	0	0	0	0
	Any subject Total		28	(1000 0)			0		0	<u> </u>	0	0		

# Sheet 2

### Academic achievements of Chemistry Program Relationships between the evaluation items and evaluation criteria

		Academic achievements		Evaluation criteria	
		Evaluation items	Excellent	Very Good	Good
	(1)		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.
Iding	(2)	Understanding and learning advanced expertise in several	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.
d Understanding	(3)	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.
Knowledge and	(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.
Kno		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)	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.
	(1)	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.
and Skills	(2)	actitudes 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.
Abilities	(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.
ЧР	(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
s	(1)	Acquiring the ability of research planning.	Being able to completely understand the current research issues and consider the mays of solution and specific measures by themselves.	Being able to completely understand the current research issues and consider the mays of solution.	
Abilities	(2)	Acquiring the ability of research exercising•analyzing.	Being able to carry out research, treat appropriately the results and appropriately interpret and understand them.	Being able to carry out research, treat appropriately the results and understand them.	Being able to carry out research, treat appropriately the results.
nsive .	(3)	Acquiring communication ability	To be able to have discussions with researchers based in Japan about research contents. Also, to be able to improve research based on the discussions.	To be able to have discussions about research contents with researchers based in Japan	To be able to understand research conducted by researchers based in Japan
Compre	(4) (4)	Personal capability	Being able to tackle with research voluntarily, solve the issues by themselves with patient efforts and proceed it.	Being able to tackle with research voluntarily and proceed it.	To accomplish one's own research.
	(5)	Acquiring communication ability using foreign languages.	Being able to freely make communication in foreign languages with foreigners and make discussion on various issues.	Being able to make communication in foreign languages with foreigners.	Being able to collect foreign information using foreign languages.

### Placement of Liberal Arts Education in the Major Program

The liberal arts education in this program aims to build the foundation required for the specialized education. It develops abilities for data collection and analysis, thinking skills for considering problems in natural science while critically examining the opinions of others, and the ability to examine the essence and background of a phenomenon and identify and solve problems from a comprehensive perspective. In addition to this, students are educated to acquire autonomy and become people of talent, who have the language communication skills required of professionals who are able to work actively in a global setting and discuss issues related to peace.

### Sheet3

#### Relationships between the evaluation items and class subjects

																		E	valuatio	on ite	ms														Total
									nowled												and Sk									的な力					weighte d
Subject	Subject Name	Credits	Type of course	Grade	,	1)		2)		3)		4)	(	5)		6)	(	1)	(2	2)		3)		4)	,	1)		2)		3)		(4)	,	5)	values
Classification	Subject Name	Creats	registra tion	Grade	Weighted values of evaluatio n items in the subject	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the	Weighted values of evaluatio n items		Weighted values of evaluatio n items	Weighted values of evaluatio n items in the	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the outbingt	Weighted values of evaluatio n items	n items in	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the muchinet	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the outbingt	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the outpicet	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the outpliest	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the	Weighted values of evaluatio n items	Weighted values of evaluatio n items ir the whitest	Weighted values of evaluatio n items	Weighted values of evaluatio n items in the authinat	Weighted values of evaluatio n items	of evaluati on items in
Liberal Arts	Peace Science Courses	2	Elective/	1	subject		subject		subject		100	1	subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		100
Education Liberal Arts	Introduction to	2	Required	1																									100	1					100
Education Liberal Arts	University Education Introductory Seminar for	2	Required	1																									100	1					100
Education Liberal Arts	First-Year Students Area Courses	8	Elective/	1-4									100	1																-					100
Education Liberal Arts	Basic English Usage I	1	Required	1									100	-																			100	1	100
Education Liberal Arts	Basic English Usage II	1	Required	2																	-												100	1	100
Education Liberal Arts	Communication I	2	Required	1																													100	1	100
Education Liberal Arts	Communication II	2	Required	2																													100	1	100
Education Liberal Arts	Foreign Languages:	1	Elective/	1																													100	1	100
Education Liberal Arts	Basic Studies I Foreign Languages:	1	required Elective/	1					-												-												100		100
Education Liberal Arts	Basic Studies II Foreign Languages:		required Elective/	2					-												-													1	
Education Liberal Arts	Basic Studies III Foreign Languages:	1	required Elective/	2					-												-												100	1	100
Education Liberal Arts	Basic Studies IV Exercise in Information	1	required						-										100	1	-												100	1	100
Education Liberal Arts	Literacy	2	Required Elective/	1															100	1	100													├	100
Education Liberal Arts	Health and Sports Courses Social Cooperation	2	required	1-2					_												100	1												<u> </u>	100
Education Liberal Arts	Courses	0	elective	$1 \sim 2$							100	1																						<b> </b>	100
Education Liberal Arts	Calculus I	2	Required	1	50	1			50	1																								<b> </b>	100
Education Liberal Arts	Calculus II	2	Required	2	50	1			50	1																								<u> </u>	100
Education	Linear Algebra I	2	Required	1	50	1			50	1																								<u> </u>	100
Liberal Arts Education	Linear Algebra II	2	Required	2	50	1			50	1																								<u> </u>	100
Liberal Arts Education	Experimental Methods and Laboratory Work in Physics I	2	Required	2																			100	1										<b> </b>	100
Liberal Arts Education	Experimental Methods and Laboratory Work in Physics II	2	Required	2																			100	1											100
Liberal Arts Education	Experimental Methods and Laboratory Work in Chemistry I	2	Required	4																			100	1											100
Liberal Arts Education	Experimental Methods and Laboratory Work in Chemistry II	2	Required	4																			100	1											100
Liberal Arts Education	Experimental Methods and Laboratory Work in Biology I	2	Elective/ required	1																			100	1											100
Liberal Arts Education	Experimental Methods and Laboratory Work in Biology II	2	Elective/ required	1																			100	1											100
Liberal Arts Education	Experimental Methods and Laboratory Work in Earth Sciences I	2	Elective/ required	3																			100	1											100
Liberal Arts Education	Experimental Methods and Laboratory Work in Earth Sciences	2	Elective/ required	3																			100	1											100
Specialized Education	Introduction to Mathematics	2	Elective/ required	1	50	1			50	1																									100
Specialized Education	Introduction to Information Mathematics	2	Elective/ required	2	50	1			50	1																									100
Specialized Education	Introduction to Physics A	2	Elective/ required	1	50	1			50	1																									100
Specialized Education	Introduction to Physics B	2	Elective/ required	2	50	1			50	1																									100
Specialized Education	Introduction to Biological Sciences A	2	Elective/ required	1	50	1		1	50	1		1			1		1						1				1				1	1			100
Specialized Education	Introduction to Biological Sciences B	2	Elective/ required	2	50	1			50	1																									100
Specialized	Introduction to Earth and	2	Elective/	1	50	1			50	1					İ —																İ —				100
Education Specialized Education	Planetary Sciences A Introduction to Earth and Planetary Sciences B	2	Elective/	2	50	1			50	1					l					_											l				100
Education Specialized Education	Planetary Sciences B English Seminar on Chemistry	Each 1	Required	5-6	50	1			50	1	1																						<u> </u>		100

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Subject	Subject Name	Credits	Type of course	Grade	(·	1)	、 、	2)	(;	3)		4)	(	5)	,	6)	(	1)	(2)	(	(3)	,	4)		1)	,	2)	(	3)	,	4)	(;	5)	values
Classification	Subject Maine	Cieuits	registra tion	Graue	Weighted values of	Weighted	Weighted values of Weighted	Weighted values of	Weighted	Weighted values of	Weighted	Weighted values of	Weighted	Weighted values of	Weighted	Weighted values of	Weighted	Weighted values of	Weighted	Weighted values of	Weighted	of												
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Specialized Education	Basic Chemistry A	2	Required	1	50	1			50	1																								100
Specialized Education	Basic Chemistry B	2	Required	1	50	1			50	1																								100
Specialized	Basic Physical Chemistry	2	Required	2	50	1			50	1																								100
Education Specialized	Basic Physical Chemistry	2	Required	2	50	1			50	1																								100
Education Specialized	B Fundamental Inorganic	2	Dominad	2	50	1			50	1																								100
Education Specialized	Chemistry Fundamental Organic	2	rtequireu	2		1																						-						
Education	Chemistry		Required		50	-			50	1																		_						100
Éducation	Physical Chemistry IA	2	Required	3	50	1			50	1																		_						100
Specialized Education	Physical Chemistry IB	2	Required	3	50	1			50	1																								100
Specialized Education	Physical Chemistry IIA	2	Required	4	50	1			50	1																								100
Specialized Education	Physical Chemistry IIB	2	Required	4	50	1			50	1																								100
Specialized Education	Inorganic Chemistry I	2	Required	3	50	1			50	1																								100
Specialized	Inorganic Chemistry II	2	Required	3	50	1			50	1																								100
Education Specialized	Inorganic Chemistry III	2	Required	4	50	1			50	1												1												100
Education Specialized	Organic Chemistry I	2	Dominad	3	50	1			50	1										-														100
Education Specialized		-	Required																															
Education Specialized	Organic Chemistry II	2	Required	3	50	1			50	1																								100
Education	Organic Chemistry III	2	Required	4	50	1			50	1																								100
Specialized Education	Exercises in Inorganic Chemistry	1	Required	4													100	1																100
Specialized Education	Exercises in Physical Chemistry	1	Required	5													100	1																100
Specialized Education	Exercises in Organic Chemistry	1	Required	6													100	1																100
Specialized Education	Advanced Chemistry	2	Elective/ required	6			100	1																										100
Specialized Education	Biological and Structural Chemistry	2	Elective/	4			100	1																										100
Specialized Education	Chemistry of Biological	2	Elective/	4			100	1																										100
Specialized	Analytical Organic	2	Elective/	4			100	1																										100
Education Specialized	Chemistry Organic Main Group	2	required Elective/	4			100	1																										100
Education Specialized	Chemistry		required Elective/	5																														
Education Specialized	Reaction Dynamics Molecular Structural	2	required Elective/				100	1																										100
Education	Chemistry	2	required	5			100	1				-																						100
Specialized Education	Quantum Chemistry	2	Elective/ required	5			100	1																										100
Specialized Education	Inorganic Chemistry Solid State Chemistry	2	Elective/ required	5			100	1																										100
Specialized Education	Instrumental Analytical Chemistry	2	Elective/ required	5			100	1																										100
Specialized Education	Structural Organic Chemistry	2	Elective/ required	5			100	1																										100
Specialized	Organic Reaction	2	Elective/	5			100	1			İ		1		İ					1		1		İ										100
Education Specialized	Chemistry Photochemistry of	2	Elective/	5			100	1			1		1		1									1										100
Education Specialized	Condensed Matter Systembiology	2	required Elective/	5			100	1					†															<u> </u>						100
Education Specialized	Biopolymer Chemistry	2	required Elective/	5 6			100	1																				<u> </u>						100
Education Specialized	Biopolymer Chemistry Molecular		required Elective/									-	<u> </u>			-														$\vdash$				
Education Specialized	Photochemistry Organometallic	2	required	6			100	1	-																			<u> </u>						100
Education	Chemistry	2	Elective/ required	6			100	1					ļ															L						100
Specialized Education	Radiochemistry	2	Elective/ required	6			100	1																										100
Specialized Education	Biological Chemistry	2	Elective/ required	6			100	1																										100
Specialized Education	Bioinformatics	2	Elective/ required	6			100	1																										100

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Subject			Type of course		(	1)	(	(2)	(;	3)	(.	4)	(	5)	(	6)	(	1)	(	2)	(;	3)	(.	4)	(	1)	(	2)	(	3)	(	(4)	(.	5)	d values
Subject Classification	Subject Name	Credits	registra	Grade	Weighted		Weighted	Weighted	Weighted	Walahtad	Weighted	Walahtad	Weighted	Weighted	Weighted		Weighted		Weighted		Weighted		Weighted	Weinhted	Weighted	Weighted	Weighted	Wainktad	Weighted	Wainhtad	Weighted	Weighted	Weighted	Weighted	of
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					subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		subject		items in
Specialized Education	Practical Computational Chemistry	2	Elective/ required	6													100	1																	100
Specialized Education	Exercises in Chemistry	1	Elective/ required	7													100	1																	100
Specialized Education	Chemistry Internship	1	Elective/ required	5																			100	1											100
Education	Chemical Experiments I	5	Required	5																			100	1											100
Specialized Education	Chemical Experiments II	5	Required	6																			100	1											100
Specialized Education	Special Study for Graduation	Each 4	Required	7-8																					25	1	25	1	25	1	25	1			100

## Sheet4

### Curriculum Map of Chemistry

	Academic achievements	1st g	grade	2nd	grade	3rd	grade	4th g	grade
	Evaluation items	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester
		Calculus I(©)	Calculus II (©)	Physical Chemistry IA(©)	Physical Chemistry IIA(©)	English Seminar on Chemistry(©)	English Seminar on Chemistry(⊚)		
		Linear Algebra I(©)	Linear Algebra II(©)	Physical Chemistry IB(©)	Physical Chemistry IIB(©)				
	•(1)To thoroughly understand and learn	Introduction to Mathematics(O)	Introduction to Information Mathematics(O)	Inorganic Chemistry I(©)	Inorganic Chemistry III(©)				
	knowledge of physical chemistry, inorganic	Introduction to Physics A(O)	Introduction to Physics $B(O)$	Inorganic Chemistry II(©)	Organic Chemistry III(©)				
	chemistry and organic chemistry.	Introduction to Biological Sciences A(O)	Introduction to Biological Sciences B(Q)	Organic Chemistry I(©)					
	•(3)Understanding and acquiring logical frameworks and structure of basic studying	Introduction to Earth and Planetary Sciences A(O)	Introduction to Earth and Planetary Sciences B(O)	Organic Chemistry Ⅱ(◎)					
	and knowledge and skills necessary for	Basic Chemistry A(©)	Basic Physical Chemistry A(©)						
	learning construction.	Basic Chemistry B(⊚)	Basic Physical Chemistry B(©)						
ling			Fundamental Inorganic Chemistry(©)						
stanc			Fundamental Organic Chemistry(©)						
nders					Biological and Structural Chemistry(O)	Reaction Dynamics(O)	Advanced Chemistry(O)		
and Understanding					Chemistry of Biological Compounds(O)	Molecular Structural Chemistry(O)	Biopolymer Chemistry(O)		
ge ar					Analytical Organic Chemistry(O)	Quantum Chemistry(O)	Molecular Photochemistry(O)		
wled	(2)Understanding and learning advanced expertise in several chemical and				Organic Main Group Chemistry(O)	Inorganic Chemistry Solid State Chemistry(O)	Organometallic Chemistry(O)		
Kno	expertise in several chemical and					Instrumental Analytical Chemistry(O)	Radiochemistry(O)		
	interdisciplinary areas.					Structural Organic Chemistry(O)	Biological Chemistry(O)		
						Organic Reaction Chemistry(O)	Bioinformatics(O)		
						Photochemistry of Condensed Matter(O)			
						Systembiology(O)			
	(4)To learn abilities to express oneself by	Peace Science Courses(O)	Social Cooperation Courses( $\Delta$ )						
	considering problems that human and society are facing from multiple perspectives.	Social Cooperation Courses( $\Delta$ )							
	(5)Getting ability to explain the process of	Area Courses(O)	Area Courses(O)	Area Courses(O)	Area Courses(O)				
	construction and development in each academic discipline.								
	(1)To acquire ability to apply chemical				Exercises in Inorganic Chemistry(©)	Exercises in Physical Chemistry(©)	Exercises in Organic Chemistry(©)	Exercises in Chemistry(O)	
	knowledge, witch is already acquired, into chemical issues.						Practical Computational Chemistry(O)		
Skills	(2)To learn basic knowledge, skills, and attitudes related to information, also to acquire skills to	Exercise in Information Literacy(©)							
and S	musers and and inside information								
	(3)To acquire the ability to explain the	Health and Sports Courses(O)	Health and Sports Courses(O)						
Abilities	importance of fitness and health promotion from scientific perspectives.								
	(4)To obtain skills to conduct experiments	Experimental Methods and Laboratory Work in Biology I (O)	Experimental Methods and Laboratory Work in Physics I (@)	Experimental Methods and Laboratory Work in Earth Sciences I (Q)	Experimental Methods and Laboratory Work in Chemistry I (©)	Chemical Experiments I (©)	Chemical Experiments II (©)		
	based on basic knowledge, which is learned.	In Biology I (O) Experimental Methods and Laboratory Work in Biology II (O)	in Physics I (@) Experimental Methods and Laboratory Work in Physics II (©)	In Earth Sciences I (O) Experimental Methods and Laboratory Work in Earth Sciences II (O)	In Chemistry I ((0)) Experimental Methods and Laboratory Work in Chemistry II ((0))	Chemistry Internship(O)			
			arrayoos 11 (@/		an onemistry II (@/			Special Study for Graduation (@)	Special Study for Graduation(©)
	(1)Acquiring the ability of research planning.								
	(2)Acquiring the ability of research							Special Study for Graduation (@)	Special Study for Graduation(©)
	exercising analyzing.								
s N				1	I	I	1	1	

	Academic achievements	1st i	grade	2nd	grade	3rd	grade	4th g	grade
	Evaluation items	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester	Spring semester	Fall semester
Abilitie	(3)Acquiring communication ability	Introductory Seminar for First- Year Students(©)						Special Study for Graduation ( $\bigcirc$ )	Special Study for Graduation ( $\bigcirc$ )
e Ab		Introduction to University Education (©)							
nsiv		Communication IA(©)	Communication IIA(©)						
rehe		Communication IB(©)	Communication IIB(©)						
Comp	(5)Acquiring communication ability using foreign languages.	Basic English Usage I(⊚)	Basic English Usage Ⅱ (⊚)						
		Foreign Languages: Basic Studies I (O)	Foreign Languages: Basic Studies Ⅲ(O)						
		Foreign Languages: Basic Studies II (O)	Foreign Languages: Basic Studies Ⅳ(O)						
	(4)Personal capability							Special Study for Graduation(©)	Special Study for Graduation(©)
	(4)Fersonal capability								
	-	(例)	Liberal Arts Education Subjects	Basic Specialized Subjects	Specialized Education Subjects	Graduation Thesis	(©)Required	(O)Elective/required	$(\Delta)$ Free elective