

For entrants in FY 2016

Appended Form 1

Specifications for Major Program

Name of School (Program) [School of Pharmaceutical Sciences (Program of Medicinal Sciences)]

| | |
|---|----------------------------|
| Program name (Japanese) | |
| (English) | Medicinal Sciences Program |
| 1. Degree: Bachelor (medicinal sciences) | |
| <p>2. Outline</p> <p>Along with the introduction to the six-year Pharmacist Training Program and establishment of the Program in Pharmaceutical Sciences, this is a four-year program in the School of Pharmaceutical Sciences established for the purpose of drug discovery and development, pharmaceutical and medical supply development operations, medical supply information, and for training persons in charge of the environmental and health fields and researchers in pharmaceuticals at pharmaceutical companies. Based on a broad education not only within the field of pharmaceuticals but also in a range from organic chemistry to life science, this Program shall implement broad basic educational research into life science, and train researchers covering extensive life science and researchers and engineers involved in the development of new drugs. Through educational research in Pharmaceutical Sciences important as the basis for R&D into new drugs, this Program shall also implement research and develop researchers and professional engineers in charge of environmental problems and health. Although these human resources are not necessarily limited only to people from the field of pharmaceutical sciences, this Program offers a wide-ranging education from basics to clinical medicine based on not only knowledge acquired from basic education of life sciences, organic & inorganic chemistry, and analytical chemistry but also knowledge that can be acquired only from pharmaceutical fields such as pharmacology and pharmaceuticals, to foster human resources can play an active role in extensive fields naturally, with different skills from students who completed studies in other fields. In Japan, the field of pharmaceuticals has played a leading role in developing human resources involved in pharmaceutical R&D and production technologies, and we need to inherit the circumstances of having implemented four-year programs as an educational system for that purpose and the expertise of having fostered in those circumstances, and to further develop these inheritances in the future.</p> <p>In addition, based on the present situation where we are short of these human resources compared to other countries, the mission of the four-year medicinal sciences course is of great importance.</p> <p>While expecting students after graduation to become researchers or professional engineers with a global perspective in governmental agencies related to pharmaceuticals or in fields such as pharmaceuticals, food, chemical, and perfumery & cosmetics, this Program will foster human resources who can play a leading social role as front-line researchers after acquiring advanced knowledge and skills from their studies in graduate school.</p> <p>Although this Program is mainly implemented by members of the Pharmaceutical Sciences faculty, part of the Program, such as Pathology, shall be implemented by members of the School of Medicine and researchers of the Radiation Effects Research Foundation.</p> <p>In the first step after admission (Attached Sheet 2-2), students take liberal arts education subjects necessary for a special course education and develop broad knowledge necessary for their future character-building, such</p> | |

common subjects with the Program of Pharmaceutical Sciences as fundamental subjects, package subjects, information literacy basics and seminars, and foreign languages focusing on communication. Also, the first step is designed to allow students to participate in the “Early Joint Experience Practice.”

Furthermore, science classes for supplemental education that student did not chose for their individual scholastic ability tests are also prepared.

In the second step, set as the basis of education in pharmaceutical sciences, students will take basic specialized subjects in line with the common educational models and core curricula in pharmaceutical sciences in the Program in Pharmaceutical Sciences. At the same time, students will acquire the basics of experimenting by completing practices in all the fields of pharmaceutical sciences starting from basic chemical practice. In the third step, more specialized lectures are arranged and allocated as elective subjects so that students can acquire the knowledge required for pharmaceutical sciences to become their field of expertise in the future. In the fourth step, to take part in research in their desired field of expertise, students will select graduation research from Basic Research I, II, and III by being divided into groups to be assigned to each classroom. In the assignment of students to each classroom, individual student’s wishes will be respected. This graduation research is an introduction to conducting advanced research in a graduate school at a later date, in which the class content is taken into consideration so that students can acquire sufficient knowledge and skills. During the fourth step, applicants for the qualification for the national examination for pharmacists will be allowed to choose the related lectures.

3. Diploma policies (degree conferment policy & Program attainment goals)

In the Medicinal Sciences Program, graduation will be certified for students who have acquired the abilities listed below and who have acquired the predetermined number of credits.

- 1) Basic abilities in physics, chemistry, biology, mathematics, and ethics, which are required to study medicinal sciences (knowledge, skills, and attitude),
- 2) Basic knowledge of representative reactions, separation methods, and structure determination methods required to understand the basic reactivity of chemical substances including medical supplies and biological materials, and basic skills to conduct them,
- 3) Basic abilities related to the structure and functional adjustment of life forms required to understand the formation of life forms on the individual, organic, and cellular levels (knowledge, skills, and attitude),
- 4) Basic abilities related to the functions, mode of action, and the future effects of medicine in the body in the case of illness required to understand the medicinal action of medical supplies (knowledge, skills, and attitude),
- 5) Abilities related to basic and applied knowledge on drug therapy (knowledge, skills, and attitude),
- 6) Basic abilities related to the influence of medical supplies and chemical substances on people, and the relationships between the living environment & global ecosystem and human health (knowledge, skills, and attitude), and
- 7) The ability to continuously improve their capabilities to assess the organization and the results of experiments

health sports subjects, and fundamental subjects under the university-wide implementation system to enable students to acquire broad and diversified basic knowledge and basic learning skills,

- 2) Set subjects related to early experience, communication & humanism, the structure & nature of substances, natural medical resources, and the structure & functions of living bodies as basic specialized subjects to enable students to systematically acquire professional methodologies and knowledge,
- 3) Set subjects related to effects of medical supplies, internal kinetics of medical supplies, health & environment, adjustment of preparations & management of medical supplies, illness and disease states, operations of a pharmacist, pharmaceutical affairs-related laws and regulations, and experimental techniques as specialized subjects for students to choose from to foster the expertise required to achieve their career aims,
- 4) Set graduation research as a required subject and provide detailed individual guidance to enable students to integrate the knowledge and skills they have acquired, and to foster scientific thinking that will be linked to the solution of problems and creation of new values,
- 5) Establish a certain standard for assignment to a laboratory,
- 6) Provide the subjects required for a High School Teaching License for students who wish to obtain the license, and
- 7) For graduates of this Program to be qualified to take the national examination for pharmacists, they need to meet the following requirements: (1) To be enrolled in a Graduate School of Medicinal Sciences at this university for at least two years and complete the first semester of the doctor course, (2) To earn the additional credits necessary to graduate from the Program of Pharmaceutical Sciences (6-year course), and (3) To take pharmaceutical practical training during the period when they are not enrolled in this University's program or the graduate school (first semester of the doctor course) stated above.

5. Start of the Program / admission conditions

Start of this program is the first year (for choosing this Program).

6. Qualification(s)

- a) Qualifications for candidates for the National Examination for Pharmacist *¹

*¹ Graduates of the Program of Medicinal Sciences need to fulfill the following requirements to qualify for the national examination for pharmacist:

- (1) To be enrolled in the Graduate School of Medicinal Sciences at this university for at least 2 years, and complete the first semester of the doctor course,
 - (2) To earn additional credits necessary to graduate from the Program of Pharmaceutical Sciences (6-year course), and
 - (3) To take pharmaceutical practical training during the period when they are not enrolled in Hiroshima University's program or graduate school (first semester of the doctor course) stated above.
- b) Type-1 High School Teaching License (science)
 - c) Drug distributors, engineers responsible for medical equipment manufacturers and import & sales offices, technical managers of garbage disposal facilities, pollution control managers related to noise, dust, and vibration, engineers controlling environmental hygiene in buildings, and managers of water supply technologies

7. Class subjects and class content

See the Table of Registration Standards on Attached Sheet 1 for your class subjects. (Attach the Table of

(2) Program assessment

Criteria for program assessment

The educational and social effects of this program will be assessed. For the educational effect, the Program's effect on students' learning will be judged based on the evaluation of their academic achievements, evaluation of their attainment levels, and GPA. For the social effect, the social availability of this Program will be judged.

Implementing the assessment (relationship with class assessment will also count.)

Achievements in this Program will be assessed based on these criteria in the second semester of the fourth year. At the same time, a questionnaire on program assessment will be distributed each semester. Students' program assessments from the questionnaire will be added to the Program assessment conducted every year.

The educational effect shall be assessed in a comprehensive manner based on the evaluations of academic achievement and the achievement levels of students who have studied on this Program, and GPA.

A social assessment shall be conducted by checking the employment rates in companies (such as medical supply, chemical, food, and cosmetic companies) and government offices that are closely related to the content of the Program. At regular intervals, we ask students' main employers to assess the Program. We then ask graduates to assess themselves and the Program.

The idea and method of feedback for students

At regular intervals, the faculty council in charge distributes questionnaires to and holds interviews with students to inspect and assess the Program, and submits an improvement plan for the Program to the Educational Evaluation Committee and the resulting Improvement Report to the Bachelor Course Meeting. Based on students' assessment of classes and the Program assessment, class subjects in this Program are checked and assessed, and the results are used to improve the Program. These results are fed back to students through "Momiji." Comments from students in the questionnaire on class assessment will be fed back for every class through the Momiji questionnaire on class assessment.

* Please enter the list of faculty members in charge on Attached Sheet 5.

| Type | Subject type | Lesson Style | Required No. of credits | Class subjects, etc. | No. of credits | Type of course registration | Year in which the subject is taken | | | | | | | | | | |
|-------------------------------------|---|--------------|-------------------------|---|----------------|-----------------------------|------------------------------------|-------------------------------------|-----------|----------|-----------|------|-----------|------|----|---|--|
| | | | | | | | 1st grade | | 2nd grade | | 3rd grade | | 4th grade | | | | |
| | | | | | | | Spring | Fall | Spring | Fall | Spring | Fall | Spring | Fall | | | |
| Specialized Education Subjects | Specialized Subjects | Lecture | 26 | Biological Statistics | 2 | Elective/required | | | | | | | | | | | |
| | | | | Pharmacology III | 2 | | | | | | | 2 | | | | | |
| | | | | Clinical Pharmacy | 2 | | | | | | | | | 2 | | | |
| | | | | Clinical Medicine and Pharmacotherapy I | 2 | | | | | | | | | | 2 | | |
| | | | | Pharmacotherapy A | 2 | | | | | | | | | | 2 | | |
| | | | | AnOutline of Immunology | 2 | | | | | | | | | | 2 | | |
| | | | | Clinical Medicine and Pharmacotherapy II | 2 | | | | | | | | | | 2 | | |
| | | | | Pharmaceutical Affairs Related Laws | 2 | | | | | | | | | | 2 | | |
| | | | | Clinical Pharmacology A | 2 | | | | | | | | | | 2 | | |
| | | | | Pharmacotherapy B | 2 | | | | | | | | | | 2 | | |
| | | | | Drug Informatics | 2 | | | | | | | | | | 2 | | |
| | | | | Total(Elective/required) | | | | 50 | | | | | 18 | 14 | 12 | 6 | |
| | | | | Specialized Subjects | Practice | | 10 | Experiments in Analytical Chemistry | 1 | Required | | | | | | | |
| | Training of Physical Chemistry | 1 | | | | | | | | | | | | | | | |
| | Experiments in Organic Chemistry | 1 | | | | | | | | | | | | | | | |
| | Experiments of Cellular and Molecular Biology | 1 | | | | | | | | | | | | | | | |
| | Experiments of Biological Chemistry | 1 | | | | | | | | | | | | | | | |
| | Experiments of Pharmacognosy | 1 | | | | | | | | | | | | | | | |
| | Experiments of Microbial Chemistry | 1 | | | | | | | | | | | | | | | |
| | Pharmacology Practice | 1 | | | | | | | | | | | | | | | |
| | Practice of Pharmaceutics | 1 | | | | | | | | | | | | | | | |
| | Experiments of Public health Chemistry | 1 | | | | | | | | | | | | | | | |
| | Total(Practice) | | | | 10 | | | | 5 | 5 | | | | | | | |
| | Special Study for Graduation | | 6 | Special laboratory Works in Pharmaceutics | 2 | Required | | | | | | | | | | | |
| | | | | Special laboratory Works in Pharmaceutics | 2 | | | | | | | | | | | | |
| | | | | Special laboratory Works in Pharmaceutics | 2 | | | | | | | | | | | | |
| Total(Special Study for Graduation) | | | | 6 | | | | | | | 2 | 2 | 2 | | | | |
| Total(Specialized Subjects) | | | | 85 | | | | 5 | 25 | 17 | 30 | 8 | | | | | |
| | | | 87 | Total(Specialized Education Subjects) | 127 | | | | | | | | | | | | |

Note: You need at least 1 credit per subject in Elective/Required Subjects I, and at least 26 credits from 13 subjects in Elective/Required Subjects II.

Note: Subjects with a circle in the "Year in which the subject is taken" column are required subjects.

| Graduation requirement | Required No. of credits |
|--|-------------------------|
| Liberal Arts Education Subjects | 40 |
| Specialized Education Subjects | 87 |
| Basic Specialized Subjects | 42 |
| Free elective subjects | (2) |
| Required Subjects | 42 |
| Specialized Subjects | 45 |
| Free elective subjects Seminar | (2) |
| Required Subjects Seminar | 2 |
| Elective/required Seminar | 1 |
| Free elective subjects Lecture | (2) |
| Elective/required Lecture | 26 |
| Required Subjects Practice | 10 |
| Required Subjects Special Study for Graduation | 6 |
| Total | 127 |

Academic achievements of Medicinal Sciences Program
 Relationships between the evaluation items and evaluation criteria

| Academic achievements | | Evaluation criteria | | |
|-----------------------|--|--|--|---|
| Evaluation items | | Excellent | Very Good | Good |
| Age and Understanding | (1) The knowledge of chemical compounds including medicine. | 1. Being able to name representative components and correctly write down the structural formula. 2. Being able to select chemical reaction. 3. Being able to correctly announce results gained by clarifying used procedure or process. 4. Being able to enumerate additives used for medical drug production and to explain their roles and physicochemical character. 5. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 80%. | 1. Being able to name representative components and correctly write down the structural formula. 2. Being able to select appropriate chemical reaction. 3. Being able to announce results gained by clarifying used procedure or process. 4. Being able to explain the roles of additives used for medical drug production and their physicochemical character. 5. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 70%. | 1. Being able to name representative components and correctly write down the structural formula. 2. Being able to explain the outline the proposed chemical reaction. 3. Being able to present and announce outlines of used process and procedures. 4. Being able to explain the roles of additives used for medical drug production and their physicochemical character. 5. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 60%. |
| | (2) Knowledge of human and biological bodies. | 1. Being able to enumerate characteristics of representative enzyme and explain the characteristics of reaction comparing to general chemical reaction. 2. Being able to enumerate representative physiological active substances and explain their productive organs, physiological functions, mechanism of secretion adjustment and the related diseases. 3. Being able to briefly explain major human body's protective reaction mechanism in the level of tissue, cells and molecules . 4. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 80%. | 1. Being able to enumerate characteristics of representative enzyme and explain the characteristics of reaction comparing to general chemical reaction. 2. Being able to enumerate representative physiological active substances and explain their productive organs, physiological functions, mechanism of secretion adjustment and the related diseases. 3. Being able to briefly explain major human body's protective reaction mechanism in the level of tissue, cells and molecules . 4. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 70%. | 1. Being able to compare characteristics of representative enzyme reaction to general chemical reaction and explain them. 2. Being able to explain productive organs, physiological functions and mechanism of secretion adjustment of representative physiological active substances. 3. Being able to briefly explain major human biophylaxis reaction. 4. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 60%. |

| Academic achievements | Evaluation criteria | | |
|-----------------------|---------------------|-----------|------|
| Evaluation items | Excellent | Very Good | Good |

The knowledge relating to mutual reaction between chemical compounds including medicine and a human body

(3)

| Academic achievements | | Evaluation criteria | | |
|-----------------------|---|---|---|---|
| Evaluation items | | Excellent | Very Good | Good |
| Abilities and Skills | (2) Development of knowledge about human and biological bodies. (advance) | 1. Being able to construct activity measurement methods of representative enzyme. 2. Being able to construct measurements of activation and secretion of representative physiological active substances. 3. Being able to explain major human biophylaxis reaction relating with diseases. 4. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 80%. | 1. Being able to construct activity measurement methods of presented enzyme. 2. Being able to construct ways to measure activation and secretion of presented physiological active substances. 3. Being able to explain human biophylaxis reaction relating to diseases. 4. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 70%. | 1. Being able to outline activity measurement methods of presented enzyme. 2. Being able to outline ways to measure activation and secretion of presented physiological active substances. 3. Being able to outline human biophylaxis reaction relating to diseases. 4. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 60%. |
| | (3) Development of knowledge relating to mutual reaction between chemical compounds including medicine and a human body (application) | 1. Being able to investigate current situation of nutrition in Japan, explain the issues using used data and propose the solution. 2. Being able to investigate examples of drug interaction, explain the mechanism and propose the way of avoidance. 3. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 80%. | 1. Being able to investigate current situation of nutrition in Japan and explain the issues using used data. 2. Being able to investigate examples of drug interaction, consider the mechanism and propose the way of avoidance. 3. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 70%. | 1. Being able to investigate current situation of nutrition in Japan and enumerate the issues. 2. Being able to investigate examples of drug interaction, consider the mechanism and select the appropriate way of avoidance. 3. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 60%. |
| | (4) Being able to read English chemical papers and discuss them. (application) | 1. The learning attainment level is generally calculated combining grades, average scores of TOEIC tests and scores of graduation research based on designated formulae. The standard is more than 80%. | 1. The learning attainment level is generally calculated combining grades, average scores of TOEIC tests and scores of graduation research based on designated formulae. The standard is more than 70%. | 1. The learning attainment level is generally calculated combining grades, average scores of TOEIC tests and scores of graduation research based on designated formulae. The standard is more than 60%. |

| Academic achievements | Evaluation criteria | | |
|---|---|--|--|
| Evaluation items | Excellent | Very Good | Good |
| <p>To be able to basically treat major chemical agents, substances related to the living body, and microbes.</p> <p>(5)</p> | <p>1. Being able to construct pathways for synthesis of compounds including representative functional compounds and to synthesize them. 2. Being able to construct fixing tests, ways of separate refinement, ways of constructive decision and to identify them. 3. Being able to construct separate cultivation measures and authentic cultivation measures of representative micro-organism and to carry out them. 4. Being able to construct identification measures of representative bacteria and to identify them. 5. Being able to construct various kinds of experiments on biological related materials. 6. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 80%.</p> | <p>1. Being able to construct pathways for synthesis combining presented chemical reaction and synthesize them. 2. Being able to construct ways of qualitative tests, separation and refinement, and structural determination and identify them. 3. Being able to construct ways of separate cultivation and authentic cultivation and conduct them. 4. Being able to construct ways of identification of presented bacteria and conduct them. 5. Being able to conduct various kinds of experiments relating presented biologically relevant materials and conduct them. 4. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 70%.</p> | <p>1. Being able to synthesize using pathways for synthesis combining presented chemical reaction. 2. Being able to identify using ways of qualitative tests, separation and refinement, and structural determination. 3. Being able to construct ways of separate cultivation and authentic cultivation and conduct them. 4. Being able to construct ways of identification of presented bacteria and conduct them. 5. Being able to conduct various kinds of experiments relating presented biologically relevant materials and conduct them. 4. The learning attainment level is calculated as an average evaluation of grades based on designated formulae. The standard is more than 60%.</p> |
| <p>(6)</p> | | | |

| Academic achievements | | Evaluation criteria | | | |
|-------------------------|-----|--|--|--|---|
| Evaluation items | | Excellent | Very Good | Good | |
| Comprehensive Abilities | (1) | 1. The active attitude of dealing with issues on drug development and environmental hygiene. 2. The social responsibility as a specialist of drug development and environmental hygiene. 3. The comprehensive, scientific and calm attitude to solve problems. 4. The cooperative attitude in team research. 5. The ability to make communication and presentation. 6. The ability of assessment and analysis. 7. The active usage of information technology and the management ability. 8. The ethical consideration toward genetically modified foods and animal experiments | 1. Being able to investigate and estimate the research results on issues so far. 2. Being able to select must-be-solved issues for the attainment of goals. 3. Being able to find issues by themselves and make a experiment plan. 4. Being able to carry out the experiments along with the plan. 5. Being able to integrate the results, consider them and present them. 6. Being able to integrate the results in reports or theses. 7. Being able to propose the next research issues based on their own research results. 8.The learning attainment level is comprehensively calculated based on designated formulae combining average evaluation of grades and results of graduation research . The standard is more than 80%. | 1. Being able to investigate and estimate the research results on issues so far. 2. Being able to select must-be-solved issues for the attainment of goals. 3. Being able to make a experiment plan on proposed issues. 4. Being able to carry out the experiments along with the plan. 5. Being able to integrate the results, consider them and present them. 6. Being able to integrate the results in reports or theses. 7.The learning attainment level is comprehensively calculated based on designated formulae combining average evaluation of grades and results of graduation research . The standard is more than 70%. | 1. Being able to investigate and estimate the research results on issues so far. 2. Being able to select must-be-solved issues for the attainment of goals. 3. Being able to carry out research based on experiment plans of proposed issues. 4. Being able to integrate the results, consider them and present them. 5. Being able to integrate the results in theses. 6.The learning attainment level is comprehensively calculated based on designated formulae combining average evaluation of grades and results of graduation research . The standard is more than 60%. |
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Placement of Liberal Arts Education in the Major Program

Liberal arts education in this Program shall play a role in establishing the academic base to receive specialized education, and is placed as education for cultivating scientific thinking on the basis of respect for a voluntary and independent attitude, and of information gathering capabilities, analytical capabilities, and critical power. Furthermore, it is expected through the liberal arts education of this Program to develop a problem-solving ability, to cultivate a linguistic ability, and to strengthen interest in matters related to peace. Through these processes, students will foster an

| Subject | Specialized Education | | Type of | | Evaluation items | | | | | | | | | | | | | | | | | | | | | | | | Total weighted values of | | |
|---------|---|---|----------|---|-----------------------------|-----|-----|-----|-----|-----|-----|-----|----------------------|-----|-----|-----|-----|-----|-----|---|-----|----|-----|---|----|---|-----------|----|--------------------------|-------------------------|------|
| | | | | | Knowledge and Understanding | | | | | | | | Abilities and Skills | | | | | | | | | | | | | | Attitudes | | | Comprehensive Abilities | |
| | | | | | (1) | (2) | (3) | (4) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (1) | (1) | (8) | | | | | | | | | | | | | |
| | Special Laboratory Works in Pharmaceutical Sciences II | 2 | Required | 7 | 10 | 1 | | | 10 | 1 | | | 10 | 1 | | | 10 | 2 | | | | | 10 | 2 | | | 20 | 5 | 30 | 5 | 100 |
| | Special Laboratory Works in Pharmaceutical Sciences III | 2 | Required | 8 | 10 | 1 | | | 10 | 1 | | | 10 | 1 | | | 10 | 2 | | | | | 10 | 2 | | | 20 | 5 | 30 | 5 | 100 |
| | | | | | 870 | 17 | 915 | 23 | 715 | 17 | 380 | 5 | 420 | 12 | 255 | 12 | 245 | 16 | 240 | 7 | 590 | 19 | 180 | 8 | 80 | 2 | 325 | 21 | 685 | 28 | 5900 |



