MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**

APPROVED
Head teacher
Yu.S. Khotimchenko
"_____" _____ 2021

# COLLECTION OF PRACTICE PROGRAMS

**Undergraduate program**
**19.03.01 Biotechnology**

**Academic Baccalaureate Program**
**Molecular Biotechnology**

Graduate Qualification - Academic Bachelor

Full-time form of education
The standard term for the development of the program
(full-time education) 4 years

Vladivostok
2021

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

## SCHOOL OF BIOMEDICINE

AGREED
Head of EP

V.V. Kumeiko

February 19, 2021

APPROVED
Director of the Department of Medical Biology and Biotechnology

V.V. Kumeiko

February 19, 2021

# WORKING PROGRAM OF TRAINING PRACTICE

## Educational and introductory practice

**Undergraduate program**
**19.03.01 Biotechnology**
**Molecular Biotechnology program**

Vladivostok
2021

## 1. Normative documentation governing the process of organizing and passing practice

The internship program is developed in accordance with the requirements of:

– Educational standard in the direction of training 03/19/01 Biotechnology (bachelor's level), independently established by FEFU, approved by the order of the rector of 03/22/2017 No. 12-13-485;

– Main professional educational program of bachelor's degree "Molecular Biotechnology" 03/19/01 Biotechnology;

– Regulations on the procedure for the practice of students studying at the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" under higher education programs (for bachelor's, specialist's, master's programs), approved by order of 23.10.2015 No. 12-13-2030;

– Regulations on the funds of evaluation means of educational programs of higher education - bachelor's, specialist's, master's programs at FEFU, approved by order of the rector of 12.05.2015 No. 12-13-850.

## 2. OBJECTIVES OF LEARNING PRACTICE

The objectives of the educational (educational) practice is to consolidate the theoretical knowledge obtained in the study of basic and professional disciplines; acquisition of initial professional skills for future professional activity; the formation of competencies that meet the requirements of the main professionaleducational program of the bachelor's degree "Molecular Biotechnology" 03/19/01 Biotechnology.

## 3. OBJECTIVES OF EDUCATIONAL PRACTICE

The objectives of the educational (educational) practice are:

– preparation of objects and development of research methods;

– obtaining biological material for laboratory research;

– participation in laboratory and biological research according to a given method;

– selection of technical means and methods of work, work on experimental installations, preparation of equipment;

– analysis of the obtained laboratory biological information using modern computer technology.

## 4. GENERAL INFORMATION ON PRACTICE

General information about the practice is presented in table 1.

Table 1

| | |
|---|---|
| Practice type | *Training* |
| Practice type | *Educational and introductory on obtaining initial skills and abilities* |
| Method of carrying out | *Stationary and mobile* |
| Form (forms) of conducting | *Concentrated* |
| The amount of practice in credit units; duration of practice; course, semester | *1 course, 2 semester: 3 dollars, 2 weeks, 108 academic. hour.* |
| Practice bases | *1) Center for Genomic and Regenerative Medicine, BMS FEFU, laboratory of biomedical cell technologies;*<br>*2) Federal Scientific Center for Biodiversity of Terrestrial Biota of East Asia FEB RAS (FSC Biodiversity FEB RAS), laboratory of biotechnology; bioengineering laboratory;*<br>*3) FSBI Science "National Research Center for Marine Biology named after A.V. Zhirmunsky "FEB RAS, laboratory of cell technologies* |

## 5. PLANNED PRACTICE OUTCOMES

Table 2 presents the planned results of the practice.

table 2

| View professional activities | Planned results of practice (code, wording competencies or competency elements) |
|---|---|
| Research activities | OK-5 demonstrates the ability to use modern methods and technologies (including information technologies) in professional activities;<br>OK-9 readiness to use the basic methods of protecting production personnel and the population from the possible consequences of accidents, catastrophes, natural disasters;<br>OK-10 demonstrates the ability to analyze the main stages and patterns of the historical development of society for the formation of a civic position;<br>OK-12 demonstrates the ability to use the foundations |

| | |
|---|---|
| | of legal knowledge in various fields of activity;<br>OK-13 demonstrates the ability to work in a team, tolerantly perceiving social and cultural differences;<br>OK-14 demonstrates the ability for self-organization and self-education;<br>OPK-6 possesses the main methods of protecting production personnel and the population from the possible consequences of accidents, catastrophes, natural disasters;<br>PC-7 demonstrates ability systematize and generalize information on the use of enterprise resources;<br>PC-12demonstrates willingness to use modern information technologies in their professional field, including databases and application packages |

## 6. LOCATIONEDUCATIONAL PRACTICES IN THE STRUCTURE OF OP

Block B2.U "Educational practice"educational standard towards 19.03.01 Biotechnology, independently installed FEFU, approved by the order of the rector from 22.03.2017 No. 12-13-485, is mandatory, and is a type of training sessions directly focused on the professional and practical training of students.

Educational practice is the first stage of practical training at the level of higher education– bachelor degree – and is aimed at providing students with initial skills in research activities.

Educational and familiarization practice in research activities is carried out only in a base, stationary organization, a structural unit that has the necessary personnel, scientific, technical and material potential (stationary).

Educational and familiarization practice is based on the theoretical development of such disciplines as: "Introduction to biotechnology and professional activity", "General biology", "General and inorganic chemistry", etc.

The passage of educational and familiarization practice by students is an integral part of the educational process and is necessary for the subsequent study of the module of professional cycles "Scientific design and methodology of scientific research", "Biomedical cell technologies", as well as during other types of practice (practice to obtain professional skills and experience of professional activities (research, production and technology, organizational and management, design) and pre-diploma practice).

## 7. STRUCTURE AND CONTENT OF TRAINING PRACTICE

Practice content is determined by its type and type.

The total labor intensity of the industrial practice is 2 weeks / 3 credits, 108 hours.

| Practice phase | Types of work in practice, including the student's independent work | Labor intensity (in hours) | Monitoring forms |
|---|---|---|---|
| Preparatory (organizational) stage:<br>– obtaining documents for practice (direction, diary, individual assignment);<br>– arrival at the practice site and undergoing induction, primary and on-the-job training;<br>– organization of the workplace and getting to know the team. | – introductory lecture;<br>– safety briefing. | 2 h<br>2 h | diary entry; answers on questions |
| The main stage:<br>– familiarization with the basic methods of work in biochemical and cultural laboratories, as well as safety precautions when working in the laboratory;<br>– selection of technical means and methods of work, work on experimental installations, preparation of equipment;<br>– preparation of objects and development of research methods;<br>– the acquisition of practical skills in the preparation of solutions for biochemical methods and the method of cell culture;<br>– acquisition of skills in working with laboratory animals and biomaterial isolation;<br>– mastering the method of isolation and fractionation of high molecular weight protein compounds;<br>– acquisition of skills in working with cell culture in a laminar flow hood: defrosting, transplanting, changing the medium and freezing. | – laboratory safety briefing;<br>– performing practice assignments in accordance with the program and individual assignment;<br>– study of materials and documents at the place of internship;<br>– processing and analysis of the received practice materials. | 16 h<br>18 h<br>16 h<br>16 h | diary entry; answers on questions |
| Final stage:<br>– processing and systematization of the received material; | – systematization of the material; | 10 h | |

| | | | |
|---|---|---|---|
| – preparation of a report on the passage of industrial practice;<br>– protection of the report on industrial practice. | – registration of an individual assignment;<br>– writing a report;<br>– preparation of presentation;<br>– protection of the report. | 10 h<br><br><br>10 h<br>6 h<br>2 h | <br><br><br><br><br>graded credit |

## 8. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF THE INDEPENDENT WORK OF THE STUDENT ONEDUCATIONAL PRACTICE

Educational and familiarization practice is aimed at familiarizing students with the material and technical support of the laboratory of cell technologies, software and modern methods of laboratory research and testing.

During educational practice, regardless of the place of its passage, students should pay special attention to issues related to life safety and Undergraduate program . To do this, it is necessary to consider the principles of state and public control of compliance with labor legislation, the organization of the life safety service and its tasks.

Educational and familiarization practice begins with drawing up a general description of the laboratory, its functions, describing the structure of the laboratory, the program of research activities, studying the directions of development.

**The acquisition of primary skills and abilities, the consolidation of theoretical knowledge for research activities under the program "Molecular Biotechnology" should be carried out through the following types of work**:

1) selection of technical means and methods of work, work on experimental installations, preparation of equipment;

2) mastering the method of isolation and fractionation of high molecular weight protein compounds.

3) preparation of objects and development of research methods;

4) obtaining biological material for laboratory research;

5) acquisition of skills in working with cell culture in a laminar flow hood: defrosting, transplanting, changing the medium and freezing.

6) acquisition of skills in working with laboratory animals and biomaterial isolation.

7) the acquisition of practical skills in the preparation of solutions for biochemical methods and the method of cell culture.

**Individual assignment**(Appendix 1) the student is issued at the university by the head of the practice before the start of the practice. It should be aimed at collecting and analyzing scientific and technical information related to the methods of molecular and cell biology, molecular biotechnology.

## 9. FORMS OF CERTIFICATION (ON THE RESULTS OF PRACTICE)

Before passing the educational and familiarization practice, the student receives an individual task from the head of the practice from the university, the content and scope of which is negotiated with the head of the practice.

Based on the results of the internship, the student draws up a report on the passage of the internship, participates in the final conference with the presentation of the results of the internship, and then receives a test with an assessment.

**The practice report should contain the following elements**:

− title page (Appendix 3);

− assignment and schedule of practice (Appendix 1);

− a document confirming the fact of passing the practice;

− a description drawn up by the head of the practice from an organization or structural unit in case the practice is conducted on the basis of FEFU;

− content;

− introduction (modern problems and methods of molecular biotechnology, the place of cell biology and its methodological approaches in the system of biological sciences);

− the main part about the activities in the process of passing the internship;

− completed individual task;

− conclusion;

− information sources;

The report is drawn up in accordance with the "Requirements for the design of written work performed by students and students of FEFU."

**Approximate structure of the main body of the report**:

1. General information about the laboratory and its brief description (history, a list of structural units with an indication of their purpose; description of the laboratory's functions, programs of research activities, description of development directions).

2. Description technical means and methods of work, work on experimental installations, preparation of equipment and objects of research.

3. Description of methods for isolation and fractionation of high-molecular-weight protein compounds.

4. Description of biological material for laboratory research.

5. Description obtaining biological material.

6. Description of the technology of the process of working with cell culture in a laminar box: defrosting, transplanting, changing the medium and freezing.

By agreement with the head of the practice from the university and depending on the place of this type of practice, the structure of the report or its individual parts may change.

After completing the internship and drawing up a report in accordance with the requirements, the student submits his report to the protection of the head from the university. Based on the results of the defense, a test is given with an assessment (excellent, good, satisfactory, unsatisfactory):

“Excellent” - the necessary practical work skills and professional competencies provided by the program of educational practice are fully formed, the tasks are completed, the quality of their implementation is assessed by the number of points close to the maximum.

"Good" - the necessary practical work skills and professional competencies provided by the program of educational practice are fully formed, the tasks are completed, the quality of the performance of none of them is not assessed by the minimum number of points, some types of tasks were performed with errors or insufficiently thoroughly.

“Satisfactory” - the necessary practical work skills and professional competencies are basically formed, the gaps are not significant, some of the completed tasks contain errors.

"Unsatisfactory" - the necessary practical skills and professional competencies provided for by the program of educational practice are not formed, all completed study tasks contain gross errors, additional independent work on the report materials will not lead to any significant improvement in the quality of assignments.

## 10. EDUCATIONAL, METHODOLOGICAL AND INFORMATION SUPPORTEDUCATIONAL PRACTICES

1. Biotechnology: a textbook for universities in 8 kn. book 3. Cell engineering / R.G. Butenko, M.V. Gusev, A.F. Kirkin [et al.]; ed. N.S. Egorova, V.D. Samuilov. - Moscow: Higher school, 1987 .-- 127 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:245775&theme=FEFU

2. Genetic foundations of plant breeding. Volume 3. Biotechnology in plant breeding. Cellular engineering [Electronic resource] / V.S. Anokhin [and others]. - Electron. text data. - Minsk: Belarusian Science, 2012 .-- 490 p. - Access mode:http://www.iprbookshop.ru/29441.html... - EBS "IPRbooks"

3. Genetic foundations of plant breeding. Volume 4. Biotechnology in plant

breeding. Genomics and genetic engineering [Electronic resource] / O.Yu. Urbanovich [and others]. - Electron. text data. - Minsk: Belarusian Science, 2014 .-- 654 p. - Access mode:http://www.iprbookshop.ru/29578.html... - EBS "IPRbooks"

4. Dolgikh, S.G. Textbook on genetic engineering in plant biotechnology [Electronic resource]: study guide / S.G. Dolgikh - Electron. text data. - Almaty: Nur-Print, 2014 .-- 141 p. - Access mode:http://www.iprbookshop.ru/67169.html... - EBS "IPRbooks".

5. Ermishin, A.P. Genetically modified organisms and biosafety [Electronic resource] / Ermishin A.P. - Electron. text data. - Minsk: Belarusian Science, 2013. - 172 p. - Access mode:http://www.iprbookshop.ru/29440.html... - EBS "IPRbooks".

6. Zengbusch, P. Molecular and cellular biology: in 3 volumes. Vol. 2 / P. Zengbush; per. with him. G.I. Loydina. - Moscow: Mir, 1982. - 438 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:3337&theme=FEFU

7. Zengbush, P. Molecular and Cellular Biology: in 3 volumes. Vol. 3 / P. Zengbush; per. with him. L.V. Alekseeva. - Moscow: Mir, 1982 .-- 344 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:46167&theme=FEFU

8. Sengbusch, Peter. Molecular and Cellular Biology: in 3 volumes. Vol. 1 / P. Zengbush; per. with him. L.V. Alekseeva, L.S. Shlyakhtenko. - Moscow: Mir, 1982 .-- 367 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:3337&theme=FEFU

9. Lutova, L.A. Biotechnology of higher plants: tutorial / L.A. Lutova - SPb .: SPbSU, 2003 .-- 227 p. http://lib.dvfu.ru:8080/lib/item?id=chamo:3337&theme=FEFU

10. Tuzova, R.V. Molecular genetic mechanisms of the organic world evolution. Genetic and cellular engineering [Electronic resource]: monograph / Tuzova R.V., Kovalev N.A. - Electron. text data. - Minsk: Belarusian Science, 2010 .-- 395 p. - Access mode:http://www.iprbookshop.ru/10115.html... - EBS "IPRbooks"

11. Freshny, R. Ya. Animal cell culture: a practical guide / R.Ya. Freshny; per. from English Yu.N. Khomyakova, T.I. Khomyakova. - Moscow: BINOM. Knowledge Laboratory, 2010 - 691 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:299244&theme=FEFU

12. Shchelkunov, S.N. Genetic engineering: a textbook for universities / S.N.Schelkunov. - Novosibirsk: Siberian University Publishing House, 2004. - 496 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:6586&theme=FEFU

13. Shchelkunov, S.N. Genetic engineering [Electronic resource]: study guide / S.N. Shchelkunov. - Electron. text data.- Novosibirsk: Siberian University Publishing House, 2017. - 514 s.

http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-65273&theme=FEFU

## 11. MATERIAL AND TECHNICAL SUPPORT PRODUCTION PRACTICES

Educational and scientificlaboratories of biotechnology and biomedical cell technologiesequipped with the following equipment:

1) Centrifuge 5804 R, Eppendorf; Microscope IX-73, Olympus ,. CO2 incubator Galaxy 48R, Eppendorf 14. System for continuous monitoring of living cells in real time Cell-IQ. Amplifier Applied Biosystems; Amplifier biorad, Spectrophotometer, Thermostat GNOM, Thermostat Thermit, Chambers for electrophoresis of proteins and nucleic acids Biorad 2 pcs., Power supplies for the phoresis chamber 2 pcs. Biorad, Zeiss inverted microscope 2 pcs.

2) Deep optical imaging system for biomaterials FluoView FV1200MPE, Freezing microtome CM 1950, Leica, Microtome RM2265, Leica, Robotic system for automated cell cultivation CompacT SelecT, Laboratory cryo-storage 24K, Taylor Wharton, Cell sorter high-speed MoFlo CO2 Astrios Coulter 130 , Eppendorf, Ion Chef ™ Instrument Sample Preparation System for Whole Genome Sequencing, Thermo Fisher Scientific, Ion S5 ™ XL System, Thermo Fisher Scientific, Applied Biosystems 3500 Genetic Analyzer, Thermo Fisher Scientific, Automated Biacore X100 System for Analysis intermolecular interactions, System for analysis of rheological properties of biomaterials HAAKE MARS III, Thermo Fisher Scientific, Atomic force microscope (probe) BioScope Resolve, Bruker

For persons with disabilities and disabled people, the choice of places for training is consistent with the requirement of their accessibility for these students and the practice is carried out taking into account the peculiarities of their psychophysical development, individual capabilities and state of health.

**Составители:**

ст. преподаватель _____ И.А. Супрунова

ассистент _____ М.К. Корнейко

**The program of the practice was discussed at the meeting of the Department of Medical Biology and Biotechnology, Protocol No. 6 dated February 19, 2021.**

ATTACHMENT 1

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

**I APPROVE:**
Head of OP
_____
_____FULL NAME.
"____" _____20__

# INDIVIDUAL MISSION

by _____
(type of practice)

student _____ group _____
(FULL NAME learner)

Educational program _____

Base (place, organization) of practice _____
_____

Dates of practice from _____20___ to _____ 20___

| | |
|---|---|
| Generalized formulation of the task | |

Schedule for the task

| The name of the tasks (activities) that make up the task | Date of completion of the task (event) |
|---|---|
| one. | |
| 2. | |
| 3. | |
| | |

Practice leader _____ _____
*signature, full name, position*

APPENDIX 2

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

# DIARY

according to _____

practice

student _____ group _____

program_____

Place of practice _____

Practice period _____ weeks _____

Practice head from FEFU

_____

Practice manager from a specialized organization

_____

1. Student work schedule

| No. p \ p | Name of works | Calendar dates | | Surname of the head of practice |
|---|---|---|---|---|
| | | Start | ending | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

2. Student work diary

| date | A summary of the trainee's work | Signature the head |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

3. Results of report protection

The report is protected by "____" _____ 20___

Rated _____

Head of EP _____ AND ABOUT. Surname

APPENDIX 3

**Practice Report Cover Page Form**

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

The report is protected with a rating of
_____
"_____" _____ 20__

Leader
educational program
_____ AND ABOUT.
Surname

**REPORT**
**on the passage of the educational (educational) practice in research activities**

_____
(full name of the profile organization)

Student of the group _____ _____ (_____)
*Signature name*
Practice leader
from the profile organization _____ (_____)
*Signature name*

Practice leader
from FEFU _____ (_____)

*Signature name*

APPENDIX 4

## Internship referral form

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**

**DEPARTMENT** _____

# DIRECTION

**for an educational (educational and introductory) practice in research activities**

**1st year undergraduate student**
**Last name First name Patronymic of the group _____**
(Full Name)

sent to _____
name of the parent organization

address _____

Order on the direction of training practice from No.
for _____ practice
in the field of training _____
for a period of
***from*** **_____** ***20*** **___.**until _____ 20___ (continuous / discrete)

Leader
educational practice
in research activities

M.P. _____ _____ _____
(position, academic title) (signature) (I.O.F)

**Notes on the implementation and terms of practice**

| Company name | Arrival and departure mark | Signature, decryption of signature, seal |
|---|---|---|
| *Name of the enterprise, organization in accordance with the contract* | Arrived on __.__. 20__ | |
| | Retired on __.__. 20__ | |

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
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(FEFU)

**SCHOOL OF BIOMEDICINE**

AGREED
Head of EP

V.V. Kumeiko

February 19, 2021

APPROVED
Director of the Department of Medical Biology and Biotechnology

V.V. Kumeiko

February 19, 2021

# WORKING PROGRAM OF TRAINING PRACTICE

## Practice for obtaining primary professional skills and abilities, including primary skills and research skills

**Undergraduate program**
**19.03.01 Biotechnology**
**Molecular Biotechnology program**

Vladivostok
2021

## 1. Normative documentation governing the process of organizing and passing practice

The internship program is developed in accordance with the requirements of:

– Educational standard in the direction of training 03/19/01 Biotechnology (bachelor's level), independently established by FEFU, approved by the order of the rector of 03/22/2017 No. 12-13-485;

– Main professional educational program of bachelor's degree "Molecular Biotechnology" 03/19/01 Biotechnology;

– Regulations on the procedure for the practice of students studying at the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" under higher education programs (for bachelor's, specialist's, master's programs), approved by order of 23.10.2015 No. 12-13-2030;

– Regulations on the funds of evaluation means of educational programs of higher education - bachelor's, specialist's, master's programs at FEFU, approved by order of the rector of 12.05.2015 No. 12-13-850.

## 2. OBJECTIVES OF LEARNING PRACTICE

The objectives of educational practice to acquire primary professional skills and abilities, including primary skills in research activities, is to consolidate the theoretical knowledge obtained in the study of basic and professional disciplines; acquisition of initial professional skills for future professional activity; the formation of competencies that meet the requirements of the main professionaleducational program of the bachelor's degree "Molecular Biotechnology" 03/19/01 Biotechnology.

## 3. OBJECTIVES OF EDUCATIONAL PRACTICE

The objectives of educational practice to acquire primary professional skills, including primary skills in research activities are:

– preparation of objects and development of research methods, analysis and processing of experimental data obtained in the course of research;

– mastering modern information technologies and software products used for scientific research in the field of biotechnology;

– obtaining biological material for laboratory research;

– participation in laboratory and biomedical research according to a given method;

– analysis, systematization and generalization of scientific and technical information on the topic of research;

– selection of technical means and methods of work, work on experimental installations, preparation of equipment;

– analysis of the obtained laboratory biological information using modern computer technology;

– assessment of the scientific and practical significance of the research and the reliability of the research results obtained;

– the formation of skills in the design of the results of scientific research (report preparation, writing scientific articles, abstracts).

## 4. GENERAL INFORMATION ON PRACTICE

General information about the practice is presented in table 1.

Table 1

| | |
|---|---|
| Practice type | *Training* |
| Practice type | *Practice for obtaining primary professional skills and abilities, including primary skills and research skills* |
| Method of carrying out | *Stationary and mobile* |
| Form (forms) of conducting | *Concentrated* |
| The amount of practice in credit units; duration of practice; course, semester | *2nd year, 4th semester: 3 dollars, 2 weeks, 108 academic. hour.* |
| Practice bases | *1) Center for Genomic and Regenerative Medicine, BMS FEFU, laboratory of biomedical cell technologies;*<br>*2) Federal Scientific Center for Biodiversity of Terrestrial Biota of East Asia FEB RAS (FSC Biodiversity FEB RAS), laboratory of biotechnology; bioengineering laboratory;*<br>*3) FSBI Science "National Research Center for Marine Biology named after A.V. Zhirmunsky "FEB RAS, laboratory of cell technologies* |

## 5. PLANNED PRACTICE OUTCOMES

Table 2 presents the planned results of the practice.

table 2

| View professional activities | Planned results of practice (code, wording competencies or competency elements) |
|---|---|
| Primary professional skills and abilities | OK-1 demonstrates the ability for self-improvement and self-development in the professional sphere, for raising the general cultural level;<br>OK-9 demonstrates readiness to use the main methods of protecting production personnel and the population from the possible consequences of accidents, catastrophes, natural disasters;<br>OK-13 has the ability to work in a team, tolerantly perceiving social and cultural differences;<br>OK-14 possesses the ability to self-organization and self-education;<br>PC-4 owns the ability to ensure compliance with safety regulations, industrial sanitation, fire safety and Undergraduate program ;<br>PC-5 owns the ability to organize the work of performers, find and make managerial decisions in the field of organization and work rate setting;<br>PC-6 owns readiness to implement a quality management system for biotechnological products in accordance with the requirements of Russian and international quality standards;<br>PC-7 has the ability to systematize and summarize information on the use of enterprise resources |
| Primary skills in research activities | OK-4 demonstrates the ability to creatively perceive and use the achievements of science and technology in the professional sphere in accordance with the needs of the regional and world labor market;<br>OPK-5 possesses the basic methods, methods and means of obtaining, storing, processing information, skills of working with a computer as a means of information management;<br>PC-8demonstrates ability work with scientific and technical information, use Russian and international experience in professional activities;<br>PK-9 possesses the basic methods and techniques of |

| | |
|---|---|
| | experimental research in its professional field;<br>PC-10demonstrates ability conduct standard and certification tests of raw materials, finished products and technological processes;<br>PK-11 possesses methods of experiment planning, processing and presentation of the obtained results;<br>PC-12demonstrates willingness to use modern information technologies in their professional field, including databases and software packages;<br>UK-3 demonstrates the ability to apply basic ideas about the basic laws and modern achievements of genetics and selection, about genomics, proteomics;<br>UK-6 demonstrates the ability to apply knowledge about the basics of biotechnological and biomedical industries, microbiological synthesis, biocatalysis, genetic engineering, nanobiotechnology, molecular modeling |

## 6. LOCATIONEDUCATIONAL PRACTICES IN THE STRUCTURE OF OP

Block B2.U "Educational practice"educational standard towards 19.03.01 Biotechnology, independently installed FEFU, approved by the order of the rector from 22.03.2017 No. 12-13-485, is mandatory, and is a type of training sessions directly focused on the professional and practical training of students.

Educational practice is the first stage of practical training at the level of higher education– bachelor degree – and is aimed at providing students with initial skills in research activities.

Practice for obtaining primary professional skills and abilities, including primary skills and research skills, is carried out only in a basic, stationary organization, a structural unit that has the necessary human, scientific, technical and material potential (stationary).

The practice of obtaining primary professional skills and abilities, including primary skills and research skills, is based on the theoretical development of such disciplines as: "Introduction to biotechnology and professional activity", "General biology", "General and inorganic chemistry" and dr.

Passage by students practice for obtaining primary professional skills, including primary skills and research skills, is an integral part of the educational process and is necessary for the subsequent study of the module of professional

cycles "Scientific design and research methodology", "Biomedical cell technologies", as well as while undergoing other types of practice (practice for obtaining professional skills and experience of professional activity (research, production and technological, organizational and managerial, project) and pre-diploma practice).

## 7. STRUCTURE AND CONTENT OF TRAINING PRACTICE

Practice content is determined by its type and type.

The total labor intensity of the industrial practice is 2 weeks / 3 credits, 108 hours.

| Practice phase | Types of work in practice, including the student's independent work | Labor intensity (in hours) | Monitoring forms |
|---|---|---|---|
| Preparatory (organizational) stage:<br>– obtaining documents for practice (direction, diary, individual assignment);<br>– arrival at the practice site and undergoing induction, primary and on-the-job training;<br>– organization of the workplace and getting to know the team. | – introductory lecture;<br>– safety briefing. | 2 h<br>2 h | diary entry; answers on questions |
| The main stage:<br>– familiarization with the basic methods of work in biochemical and cultural laboratories, as well as safety precautions when working in the laboratory;<br>– selection of technical means and methods of work, work on experimental installations, preparation of equipment;<br>– preparation of objects and development of research methods;<br>– the acquisition of practical skills in the preparation of solutions for biochemical methods and the method of cell culture;<br>– acquisition of skills in working with laboratory animals and biomaterial isolation;<br>– mastering the method of isolation and fractionation of high molecular weight protein compounds; | – laboratory safety briefing;<br>– performing practice assignments in accordance with the program and individual assignment;<br>– study of materials and documents at the place of internship;<br>– processing and analysis of the received practice materials. | 16 h<br>18 h<br>16 h<br>16 h | diary entry; answers on questions |

| | | | |
|---|---|---|---|
| – acquisition of skills in working with cell culture in a laminar flow hood: defrosting, transplanting, changing the medium and freezing. | | | |
| Final stage:<br>– processing and systematization of the received material;<br>– preparation of a report on the passage of industrial practice;<br>– protection of the report on industrial practice. | – systematization of the material;<br>– registration of an individual assignment;<br>– writing a report;<br>– preparation of presentation;<br>– protection of the report. | 10 h<br>10 h<br><br>10 h<br>6 h<br>2 h | <br><br><br><br><br>graded credit |

## 8. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF THE INDEPENDENT WORK OF THE STUDENT ONEDUCATIONAL PRACTICE

The practice of obtaining primary professional skills and abilities, including primary skills and research skills, is aimed at acquainting students with the material and technical support of the laboratory of cell technologies, software and modern methods of laboratory research and testing.

During practices for obtaining primary professional skills, including primary skills and research skillsregardless of the place of its passage, students should pay special attention to issues related to life safety and Undergraduate program . To do this, it is necessary to consider the principles of state and public control of compliance with labor legislation, the organization of the life safety service and its tasks.

The practice of obtaining primary professional skills and abilities, including primary skills and abilities of research activities, begins with drawing up a general description of the laboratory, its functions, describing the structure of the laboratory, the program of research activities, and studying the directions of development.

**The acquisition of primary skills and abilities, the consolidation of theoretical knowledge for research activities under the program "Molecular Biotechnology" should be carried out through the following types of work**:

1) selection of technical means and methods of work, work on experimental installations, preparation of equipment;

2) mastering the method of isolation and fractionation of high molecular weight protein compounds.

3) preparation of objects and development of research methods;

4) obtaining biological material for laboratory research;

5) acquisition of skills in working with cell culture in a laminar flow hood: defrosting, transplanting, changing the medium and freezing.

6) acquisition of skills in working with laboratory animals and biomaterial isolation.

7) the acquisition of practical skills in the preparation of solutions for biochemical methods and the method of cell culture.

**Individual assignment**(Appendix 1) the student is issued at the University by the head of the practice before the start of the practice. It should be aimed at collecting and analyzing scientific and technical information related to the methods of molecular and cell biology, molecular biotechnology.

## 9. FORMS OF CERTIFICATION (ON THE RESULTS OF PRACTICE)

Before passing Practices for obtaining primary professional skills, including primary skills and research skills, the student receives from the head of the practice from the University an individual task, the content and scope of which is negotiated with the head of the practice.

Based on the results of the internship, the student draws up a report on the passage of the internship, participates in the final conference with the presentation of the results of the internship, and then receives a test with an assessment.

**The practice report should contain the following elements**:

− title page (Appendix 3);

− assignment and schedule of practice (Appendix 1);

− a document confirming the fact of passing the practice;

− a description drawn up by the head of the practice from an organization or structural unit, if the practice is conducted on the basis of FEFU;

− content;

− introduction (modern problems and methods of molecular biotechnology, the place of cell biology and its methodological approaches in the system of biological sciences);

− the main part about the activities in the process of passing the internship;

− completed individual task;

− conclusion;

− information sources;

The report is drawn up in accordance with the "Requirements for the design of written work performed by students and students of FEFU."

**Approximate structure of the main body of the report**:

1. General information about the laboratory and its brief description (history, a list of structural units with an indication of their purpose; description of the laboratory's functions, research programs, description of development directions).
2. Description technical means and methods of work, work on experimental installations, preparation of equipment and objects of research.
3. Planning an experiment and building a model using the example of growing microorganisms.
4. Description of methods and techniques of genetic engineering.
5. Description of methods for carrying out the transformation of a biological object.
6. Technique for registration of transformation, detection of inserted genes and their expression.

By agreement with the head of the practice from the University and depending on the place of this type of practice, the structure of the report or its individual parts may change.

After completing the internship and drawing up a report in accordance with the requirements, the student submits his report to the protection of the head from the university. Based on the results of the defense, a test is given with an assessment (excellent, good, satisfactory, unsatisfactory):

“Excellent” - the necessary practical work skills and professional competencies provided by the program of educational practice are fully formed, the tasks are completed, the quality of their implementation is assessed by the number of points close to the maximum.

"Good" - the necessary practical work skills and professional competencies provided by the program of educational practice are fully formed, the tasks are completed, the quality of the performance of none of them is not assessed by the minimum number of points, some types of tasks were performed with errors or insufficiently thoroughly.

“Satisfactory” - the necessary practical work skills and professional competencies are basically formed, the gaps are not significant, some of the completed tasks contain errors.

"Unsatisfactory" - the necessary practical skills and professional competencies provided for by the program of educational practice are not formed, all completed study tasks contain gross errors, additional independent work on the report materials will not lead to any significant improvement in the quality of assignments.

## 10. EDUCATIONAL, METHODOLOGICAL AND INFORMATION SUPPORTEDUCATIONAL PRACTICES

1. Godbey, WT An introduction to biotechnology: The science, technology and medical applications / WT Godbey. - Amsterdam Boston Heidelberg: Elsevier, [2014]. - XIX, 414 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:823819&theme=FEFU

2. Aleshina, E.S. Cultivation of microorganisms as the basis of the biotechnological process [Electronic resource]: textbook / E.S. Aleshina, E.A. Drozdova, N.A. Romanenko - Electron. text data. - Orenburg: Orenburg State University, EBS ASV, 2017 .-- 192 p. - Access mode:http://www.iprbookshop.ru/71282.html... - EBS "IPRbooks"

3. Biotechnology: a textbook for universities in 8 kn. book 3. Cell engineering / R.G. Butenko, M.V. Gusev, A.F. Kirkin [et al.]; ed. N.S. Egorova, V.D. Samuilov. - Moscow: Higher school, 1987 .-- 127 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:245775&theme=FEFU

4. Genetic foundations of plant breeding. Volume 3. Biotechnology in plant breeding. Cellular engineering [Electronic resource] / V.S. Anokhin [and others]. - Electron. text data.— Minsk: Belarusian Science, 2012. - 490 p. - Access mode:http://www.iprbookshop.ru/29441.html... - EBS "IPRbooks"

5. Genetic foundations of plant breeding. Volume 4. Biotechnology in plant breeding. Genomics and genetic engineering [Electronic resource] / O.Yu. Urbanovich [and others]. - Electron. text data. - Minsk: Belarusian Science, 2014 .-- 654 p. - Access mode:http://www.iprbookshop.ru/29578.html... - EBS "IPRbooks"

6. Gorlenko, V.A. Scientific foundations of biotechnology. Part 1. Nanotechnology in biology [Electronic resource]: textbook / V.A. Gorlenko, N.M. Kutuzov, S.K. Pyatunin. - Electron. text data. - M .: Prometheus, 2013 .-- 262 p. - Access mode:http://www.iprbookshop.ru/24003.html... - EBS "IPRbooks"

7. Dolgikh, S.G. Textbook on genetic engineering in plant biotechnology [Electronic resource]: study guide / Dolgikh S.G. - Electron. text data. - Almaty: Nur-Print, 2014. - 141 p. - Access mode:http://www.iprbookshop.ru/67169.html... - EBS "IPRbooks".

8. Dyshlyuk, L.S. Introduction to direction. Biotechnology [Electronic resource]: textbook / L.S. Dyshlyuk [and others]. - Electron. Dan. - Kemerovo: KemSU, 2014 .-- 157 p.https://e.lanbook.com/book/60191

9. Ermishin, A.P. Genetically modified organisms and biosafety [Electronic resource] / Ermishin A.P. - Electron. text data. - Minsk: Belarusian Science, 2013. - 172 p. - Access mode:http://www.iprbookshop.ru/29440.html... - EBS "IPRbooks".

10. Zengbusch, P. Molecular and cellular biology: in 3 volumes. Vol. 2 / P. Zengbush; per. with him. G. I. Loydina. - Moscow: Mir, 1982. - 438 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:3337&theme=FEFU

11. Zengbush, P. Molecular and Cellular Biology: in 3 volumes. Vol. 3 / P. Zengbush; per. with him. L. V. Alekseeva. - Moscow: Mir, 1982 .-- 344 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:46167&theme=FEFU

12. Sengbusch, Peter. Molecular and Cellular Biology: in 3 volumes. Vol. 1 / P. Zengbush; per. with him. L.V. Alekseeva, L.S. Shlyakhtenko. - Moscow: Mir, 1982 .-- 367 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:3337&theme=FEFU

13. Lutova, L.A. Biotechnology of higher plants: tutorial / L.A. Lutova - SPb .: SPbSU, 2003 .-- 227 p. http://lib.dvfu.ru:8080/lib/item?id=chamo:3337&theme=FEFU

14. Sirotkin, A.S. Theoretical foundations of biotechnology [Electronic resource]: teaching aid / A.S. Sirotkin, V.B. Zhukov. - Electron. text data. - Kazan: Kazan National Research Technological University, 2010. - 87 p. - Access mode:http://www.iprbookshop.ru/63475.html... - EBS "IPRbooks"

15. Tuzova, R.V. Molecular genetic mechanisms of the organic world evolution. Genetic and cellular engineering [Electronic resource]: monograph / Tuzova R.V., Kovalev N.A. - Electron. text data. - Minsk: Belarusian Science, 2010 .-- 395 p. - Access mode:http://www.iprbookshop.ru/10115.html... - EBS "IPRbooks"

16. Freshny, R. Ya. Animal cell culture: a practical guide / R.Ya. Freshny; per. from English Yu. N. Khomyakova, T. I. Khomyakova. - Moscow: BINOM. Knowledge Laboratory, 2010 - 691 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:299244&theme=FEFU

17. Shleikin, A.G. Introduction to biotechnology [Electronic resource]: textbook / A.G. Shleikin, N.T. Zhilinskaya. - Electron. Dan. - St. Petersburg: NRU ITMO, 2013 .-- 95 p.https://e.lanbook.com/book/70820

18. Schmid, R. Visual biotechnology and genetic engineering / R. Schmid; per. with him. A.A. Vinogradova, A.A. Sinyushin. - Moscow: BINOM. Knowledge Laboratory, 2014 .-- 324 p. http://lib.dvfu.ru:8080/lib/item?id=chamo:797469&theme=FEFU

19. Shchelkunov, S.N. Genetic engineering: textbook for universities / S. N. Shchelkunov. - Novosibirsk: Siberian University Publishing House, 2004 .-- 496 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:6586&theme=FEFU

20. Shchelkunov, S.N. Genetic engineering [Electronic resource]: study guide / S.N. Shchelkunov. - Electron. text data.- Novosibirsk: Siberian University Publishing House, 2017. - 514 s. http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-65273&theme=FEFU

## 11. MATERIAL AND TECHNICAL SUPPORT PRODUCTION PRACTICES

Educational and scientificlaboratories of biotechnology and biomedical cell technologiesequipped with the following equipment:

1) Centrifuge 5804 R, Eppendorf; Microscope IX-73, Olympus ,. CO2 incubator Galaxy 48R, Eppendorf 14. System for continuous monitoring of living cells in real time Cell-IQ. Amplifier Applied Biosystems; Amplifier biorad, Spectrophotometer, Thermostat GNOM, Thermostat Thermit, Chambers for electrophoresis of proteins and nucleic acids Biorad 2 pcs., Power supplies for the phoresis chamber 2 pcs. Biorad, Zeiss inverted microscope 2pcs.

2) Deep optical imaging system for biomaterials FluoView FV1200MPE, Freezing microtome CM 1950, Leica, Microtome RM2265, Leica, Robotic system for automated cell cultivation CompacT SelecT, Laboratory cryo-storage 24K, Taylor Wharton, Cell sorter high-speed MoFlo CO2 Astrios Coulter 130 , Eppendorf, Ion Chef ™ Instrument Sample Preparation System for Whole Genome Sequencing, Thermo Fisher Scientific, Ion S5 ™ XL System, Thermo Fisher Scientific, Applied Biosystems 3500 Genetic Analyzer, Thermo Fisher Scientific, Automated Biacore X100 System for Analysis intermolecular interactions, System for analysis of rheological properties of biomaterials HAAKE MARS III, Thermo Fisher Scientific, Atomic force microscope (probe) BioScope Resolve, Bruker

For persons with disabilities and disabled people, the choice of places for training is consistent with the requirement of their accessibility for these students and the practice is carried out taking into account the peculiarities of their psychophysical development, individual capabilities and state of health.

**Составители:**

ст. преподаватель _____ И.А. Супрунова

ассистент _____ М.К. Корнейко

**The program of the practice was discussed at the meeting of the Department of Medical Biology and Biotechnology, Protocol No. 6 dated February 19, 2021.**

ATTACHMENT 1

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

**I APPROVE:**
Head of OP
_____
_____FULL NAME.
"____" _____20__

# INDIVIDUAL MISSION

by _____
(type of practice)

student _____ group _____
(FULL NAME learner)

Educational program _____

Base (place, organization) of practice _____
_____

Dates of practice from _____20___ to _____ 20___

| | |
|---|---|
| Generalized formulation of the task | |

Schedule for the task

| The name of the tasks (activities) that make up the task | Date of completion of the task (event) |
|---|---|
| one. | |
| 2. | |
| 3. | |
| | |

Practice leader _____ _____
*signature, full name, position*

APPENDIX 2

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

# DIARY

according to _____

practice

student _____ group _____

program_____

Place of practice _____

Practice period _____ weeks _____

Practice head from FEFU

_____

Practice manager from a specialized organization

_____

1. Student work schedule

| No. p \ p | Name of works | Calendar dates | | Surname of the head of practice |
|---|---|---|---|---|
| | | Start | ending | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

2. Student work diary

| date | A summary of the trainee's work | Signature the head |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

3. Results of report protection

The report is protected by "____" _____ 20___

Rated _____

Head of EP _____ AND ABOUT. Surname

APPENDIX 3

## Practice Report Cover Page Form

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

The report is protected with a rating of
_____
"_____" _____ 20__

Leader
educational program
_____ AND ABOUT.
Surname

## REPORT

**about passing practice on obtaining primary professional skills and abilities, including primary skills and research skills**

_____
(full name of the profile organization)

Group student _____ _____ (_____)
*Signature name*
Practice leader
from the profile organization _____ (_____)
*Signature name*
Practice leader
from FEFU _____ (_____)
*Signature name*

APPENDIX 4

## Internship referral form

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**

**DEPARTMENT** _____

# DIRECTION

**for practice in obtaining primary professional skills, including primary skills and abilities of research activities**

**2-year undergraduate student**
**Last name First name Patronymic of the group _____**
**(Full Name)**

sent to _____
name of the parent organization

address _____

Order on the direction of training practice from No. 1
for _____ practice
in the field of training _____
for a period of
***from*** **_____ *20* ___.**until _____ 20___ (continuous / discrete)

Practice leader
by obtaining primary
professional skills
including primary skills and abilities
research activities

M.P. _____ _____ _____
(position, academic title) (signature) (I.O.F)

**Notes on the implementation and terms of practice**

| Company name | Arrival and departure mark | Signature, decryption of signature, seal |
|---|---|---|
| *Name of the enterprise, organization in accordance with the contract* | Arrived on __.__. 20__ | |
| | Retired on __.__. 20__ | |

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**

AGREED
Head of EP

V.V. Kumeiko

February 19, 2021

APPROVED
Director of the Department of Medical Biology and Biotechnology

V.V. Kumeiko

February 19, 2021

# WORKING PROGRAM OF PRODUCTION PRACTICE

## Practice for obtaining professional skills and experience in production and technology, organizational and management, project activities (including technological practice)

**Undergraduate program**
**19.03.01 Biotechnology**
**profile "Molecular Biotechnology"**

Vladivostok
2021

## 1. Normative documentation governing the process of organizing and passing practice

The internship program is developed in accordance with the requirements of:

– Educational standard independently established by FEFU, approved by the order of the rector dated March 22, 2017 No. 12-13-485;

– Main professional educational program of bachelor's degree "Molecular Biotechnology" 03/19/01 Biotechnology;

– Regulations on the procedure for the practice of students studying at the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" under higher education programs (for bachelor's, specialist's, master's programs), approved by order No. 12-13-2030 of 23.10.2015;

– with the Regulations on the Funds for Assessment Means of Educational Programs of Higher Education - Bachelor's, Specialist's, Master's programs at FEFU, approved by order of the rector of 12.05.2015 No. 12-13-850.

## 2. OBJECTIVES OF PRODUCTION PRACTICE DEVELOPMENT

The objectives of the practice to obtain professional skills and experience in professional (production and technological, organizational and managerial, design)activities are the consolidation of theoretical knowledge obtained in the study of basic and professional disciplines; acquisition of professional skills in future professional activities; the formation of competencies that meet the requirements of the main professionaleducational program of the bachelor's degree "Molecular Biotechnology" 03/19/01 Biotechnology.

## 3. OBJECTIVES OF PRODUCTION PRACTICE

The tasks of industrial practice to obtain professional skills and experience inprofessional (production and technological, organizational and managerial, design) activities are:

**3.1 tasks of industrial practice to obtain professional skills and experience inproduction and technological activities:**

– participation in the management of individual stages of existing biotechnological industries;

– familiarization with the organization of workplaces, their technical equipment, the placement of technological equipment;

– participation in the control over the observance of technological discipline;

– participation in the organization and conduct of incoming control of raw materials and materials;

– use of standard methods of quality control of manufactured products;

– identification of the causes of defects in production and the development of measures for its prevention and elimination;

– participation in works on fine-tuning and mastering of technological processes in the course of preparation for production of new products;

– participation in commissioning, tuning and experimental testing of equipment and software;

– participation in checking the technical condition and residual life of equipment, in organizing preventive examinations and maintenance, in drawing up applications for equipment and spare parts, in preparing technical documentation for repair work;

**3.2 tasks of industrial practice to obtain professional skills and experience inorganizational and managerial activities:**

– participation in the development of operational plans for the work of primary production units;

– participation in organizing the work of teams of performers;

– participation in the preparation of technical documentation (work schedules, technological instructions, safety instructions, applications for materials and equipment, business correspondence documents);

– participation in the collection and preparation of initial data for the selection and justification of scientific, technical and organizational decisions based on economic analysis;

– participation in the implementation of the enterprise quality management system;

– participation in the implementation of works on preparation for certification of technical means, systems, processes, equipment and materials;

– participation in the organization and implementation of measures to prevent industrial injuries, occupational diseases and environmental violations;

**3.3 tasks of industrial practice to obtain professional skills and experience in project activities:**

– participation in the collection of initial data for the design of technological processes and installations;

– participation in the design of individual stages of the technological process using standard design automation tools;

– participation in the development of the main stages of the technological scheme, research of the technological process at pilot and pilot industrial installations;

– participation in the development of design and working technical documentation;

– the acquisition of skills in assessing the results of the design of biotechnological enterprises at the project stage.

## 4. GENERAL INFORMATION ON PRACTICE

General information about the practice is presented in table 1.

Table 1

| | |
|---|---|
| Practice type | *Production* |
| Practice type | *On obtaining professional skills and experience* |
| Method of carrying out | *Outgoing* |
| Form (forms) of conducting | *Concentrated* |
| The amount of practice in credit units; duration of practice; course, semester | *3 course, 6 semester: 6 c.u., 2 weeks, 216 academic. hour.* |
| Practice bases | *1) Federal Scientific Center for Biodiversity of Terrestrial Biota of East Asia FEB RAS (FSC Biodiversity FEB RAS), laboratory of biotechnology; bioengineering laboratory;*<br>*2) FSBI Science "National Research Center for Marine Biology named after A.V. Zhirmunsky "FEB RAS, laboratory of cell technologies* |

## 5. PLANNED PRACTICE OUTCOMES

Table 2 presents the planned results of the practice.

table 2

| View professional activities | Planned results of practice (code, wording competencies or competency elements) |
|---|---|

| | |
|---|---|
| Production and technological activities | OK-3 demonstrates the ability to show initiative and make responsible decisions, realizing responsibility for the results of their professional activities;<br>OK-4 demonstrates the ability to creatively perceive and use the achievements of science and technology in the professional sphere in accordance with the needs of the regional and world labor market; |
| | OK-5 demonstrates the ability to use modern methods and technologies (including information technologies) in professional activities;<br>PC-1 demonstrates the ability to carry out the technological process in accordance with the regulations and use technical means to measure the main parameters of biotechnological processes, properties of raw materials and products;<br>PC-2 demonstrates the ability to implement and manage biotechnological processes;<br>PC-3 possesses methods for assessing technical means and technology, taking into account the environmental consequences of their use;<br>PC-4 demonstrates the ability to ensure compliance with safety regulations, industrial sanitation, fire safety and Undergraduate program ; |
| Organizational and managerial activity | OK-1 demonstrates the ability for self-improvement and self-development in the professional sphere, for raising the general cultural level;<br>OK-14 demonstrates the ability to self-organize and self-education;<br>OK-9 demonstrates readiness to use the main methods of protecting production personnel and the population from the possible consequences of accidents, catastrophes, natural disasters;<br>OK-11 has the ability to use the basics of economic knowledge in various fields of activity;<br>OK-12 has the ability to use the foundations of legal knowledge in various fields of activity; |

| | |
|---|---|
| | OK-13 demonstrates the ability to work in a team, tolerantly perceiving social and cultural differences;<br>OPK-6 demonstrates the main methods of protecting production personnel and the population from the possible consequences of accidents, catastrophes, natural disasters;<br>PC-5 demonstrates the ability to organize the work of performers, find and make managerial decisions in the field of organizing and rationing work;<br>PC-6 demonstrates readiness to implement a quality management system for biotechnological products in accordance with the requirements of Russian and international quality standards;<br>PC-7 demonstrates the ability to systematize and generalize information on the formation and use of enterprise resources; |
| Project activities | PK-13 demonstrates the ability to participate in the development of technological projects as part of the team of authors;<br>PK-14 demonstrates readiness to use modern computer-aided design systems;<br>PK-15 possesses methods of designing technological processes using automated systems for technological preparation of production as part of a team of authors;<br>PK-16 owns methods for assessing the results of the design of biotechnological enterprises at the project stage;<br>PC-17 demonstrates the ability to develop the main stages of the biotechnological process;<br>PK-18 demonstrates its readiness to participate in research of the biotechnological process at pilot and pilot industrial installations;<br>PK-19 demonstrates readiness to participate in the development of design and working technical documentation. |

## 6. LOCATIONPRODUCTION PRACTICES IN THE STRUCTURE OF OP

Block B2.P "Industrial practice"educational standard in the direction 19.03.01 Biotechnologyindependently installed by FEFU, independently installed FEFU, approved by the order of the rector dated March 22, 2017 No. 12-13-485, is mandatory, and is a type of training sessions directly focused on the professional and practical training of students.

Industrial practice is the second stage of practical training at the level of higher education– bachelor degree – and is aimed at obtaining professional skills and experience in professional activities by students.

Industrial practice is carried out both in third-party organizations that have the necessary human and scientific and technical potential (offsite), and on the basis of the Far Eastern Federal University (stationary).

Industrial practice is based on the theoretical development of such disciplines as: "Economics", "Jurisprudence", "Engineering and Computer Graphics", "Life Safety", "Design Basics", "Biophysics", "Electrical Engineering and Electronics" and etc.

Passage by students of industrial practice is an integral part of the educational process and is necessary for the subsequent study of disciplines of the professional cycle ("Management and economics in biotechnology", "Industrial biotechnology", "Pharmaceutical biotechnology", etc.), as well as during the passage of research and pre-diploma practice ...

## 7. STRUCTURE AND CONTENT OF PRODUCTION PRACTICES

Practice content is determined by its type and type.

The total labor intensity of the industrial practice is 4 weeks / 6 credits, 216 hours.

| Practice phase | Types of work in practice, including independent work of students | Labor intensity (in hours) | Monitoring forms |
|---|---|---|---|
| Preparatory (organizational) stage:<br>– obtaining documents for practice (direction, diary, individual assignment);<br>– arrival at the practice site and undergoing induction, primary and on-the-job training;<br>– organization of the workplace and getting to know the team. | – introductory lecture;<br>– safety briefing. | 2 h<br>2 h | diary entry; answers on questions |
| The main stage:<br>– study of the organizational structure and processes of the economy of an enterprise (organization, institution); | – safety briefing at the enterprise;<br>– performing practice assignments in accordance | 10 h | diary entry; answers |

| | | | |
|---|---|---|---|
| – study of regulatory and technical documentation;<br>– study of the algorithm for introducing the results of developments into production biotechnological products;<br>– fulfillment of specific production tasks in the management of individual stages of existing biotechnological industries;<br>– fulfillment of specific production tasks to monitor compliance with technological discipline<br>– study of the organization of metrological support of production;<br>– participation in the collection of initial data for the design of technological processes and installations;<br>– participation in the implementation of the enterprise quality management system;<br>– participation in monitoring compliance environmental safety. | with the program and individual assignment;<br>– study of materials and documents at the place of internship;<br>– processing and analysis of the received practice materials. | 60 h<br>60 h<br>60 h | on questions |
| Final stage:<br>– processing and systematization of the received material;<br>– preparation of a report on the passage of industrial practice;<br>– protection of the report on industrial practice. | – systematization of the material;<br>– registration of an individual assignment;<br>– writing a report;<br>– preparation of presentation;<br>– protection of the report. | 8 h<br>6 h<br>6 h<br>2 h | graded credit |

## 8. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF INDEPENDENT WORK OF STUDENTS ONPRODUCTION PRACTICE

The industrial practice is aimed at acquainting students with the material and technical support of the enterprise / workshop / laboratory, software and modern research methods.

During industrial practice, regardless of the place of its passage, students should pay special attention to issues related to life safety, Undergraduate program and industrial sanitation. To do this, it is necessary to consider the principles of state and public control of compliance with labor legislation, the organization of the life safety service and its tasks.

Industrial practice begins with the compilation of a general description of the enterprise (organization, institution), which includes the history of its development, structure, program of production activities, analysis of the management scheme, study of promising directions of development.

**Acquisition of skills and experience professional skills and experience in professional (production and technological, organizational and managerial, design) activities by program "Molecular Biotechnology "must be carried out through the following types of work:**

1) fulfillment of specific production tasks in the management of individual stages of existing biotechnological industries;

2) study of the organizational structure and processes of the economy of an enterprise (organization, institution);

3) characteristics of the organizational structure and processes of the economy of the enterprise, (organization, institution);

4) study of regulatory and technical documentation;

5) study of the algorithm for introducing the results of developments into the production of biotechnological products;

6) characteristics of the implementation of biotechnological developments in the production of biotechnological products;

7) descriptions of the technological process and its technological functions with examples;

8) characteristics of management of individual stages of existing biotechnological processes;

9) descriptions of the level of technological preparation of production and technical support with devices, devices, apparatus for biotechnological purposes with examples;

10) study of the organization of metrological support of production;

11) participation in the implementation of the enterprise quality management system;

12) participation in the implementation and description of the function of monitoring compliance with environmental safety;

13) participation in the collection of initial data for the design of technological processes and installations.

Individualthe task (Appendix 1) is given to the student at the university by the head of the practice before the start of the practice. It should be aimed atcollection and analysis of biomedical and scientific and technical information, as well as generalization of domestic and foreign experience in the field of biotechnical systems and technologies, analysis of patent literature,preparedkuoriginalwowmaterialbutfor future coursework works and projects, as well as graduationOhqualificationOhworkss.

## 9. FORMS OF CERTIFICATION (ON THE RESULTS OF PRACTICE)

Before passing the industrial (technological) internship, the student receives an individual task from the head of the internship from the university, the content and scope of which is negotiated with the head of the internship.

Based on the results of practice, the student draws up a report on the passage of the practice, participates in the final conference with the presentation of the results of the practice, and then receives a credit with an assessment.

**The practice report should contain the following elements:**

− title page (Appendix 3);

− assignment and schedule of practice (Appendix 1);

− a document confirming the fact of passing the practice;

− a description drawn up by the head of the practice from an organization or structural unit in case the practice is conducted on the basis of FEFU;

− content;

− introduction;

− the main part about the activities in the process of passing the internship;

− completed individual task;

− conclusion;

− information sources;

The report is drawn up in accordance with the "Requirements for the design of written work performed by students and students of FEFU".

**The approximate structure of the main part of the report:**

1. Organizational and management structure:

1.1 general information about the enterprise and its brief description (history, geographical location, a list of the main workshops, buildings and structures with an indication of their purpose);

1.2 management structure and staffing;

1.3 structure of the enterprise and its individual divisions, production structure, information about the main services of the enterprise;

1.4 programs and mechanisms for production modernization, enterprise restructuring and optimization of production and economic activities;

1.5 long-term plan for the development of the enterprise;

2. Production design solutions:

2.1 construction, drawing and description of the selected instrumental and technological scheme for the production of biotechnological products;

2.2 construction, drawing and description of the plan of the production workshop (before reconstruction and after reconstruction during the reconstruction of the line, workshop), in which the selected technological line is located.

2.3 analysis of available technological solutions with advanced technologies based on CAD.

3. Technological part:

3.1 organization of supplies to the enterprise of raw materials, materials, containers;

3.2 characteristics of raw materials;

3.3 production capacity, assortment and types of products;

3.4 applied production technologies;

3.5 description of technological lines in accordance with the types of manufactured biotechnological products (see classification according to GOST R 57079-2016 Biotechnology. Classification of biotechnological products) based on technological block diagrams;

3.6 requirements for the quality of finished products;

3.7 organization of sales of finished products;

3.8 technological equipment;

3.9 production automation;

4. Technical and economic characteristics of the enterprise.

5. Production control of production.

6. Production standardization and quality control of biotechnological products.

7. Occupational Safety and Health.

8. Environmental Safety.

9. Conclusions.

10. Conclusion.

By agreement with the head of the practice from the university and depending on the place of this type of practice, the structure of the report or its individual parts may change.

After completing the internship and completing the report in accordance with the requirements, the student submits his report for the protection of the head from the university. Based on the results of the defense, a test is given with an assessment (excellent, good, satisfactory, unsatisfactory):

“Excellent” - the necessary practical work skills and professional competencies provided by the program of educational practice are fully formed, the tasks are completed, the quality of their implementation is assessed by the number of points close to the maximum.

"Good" - the necessary practical work skills and professional competencies provided by the program of educational practice are fully formed, the tasks are completed, the quality of the performance of none of them is not assessed by the minimum number of points, some types of tasks were performed with errors or insufficiently thoroughly.

“Satisfactory” - the necessary practical work skills and professional competencies are basically formed, the gaps are not significant, some of the completed tasks contain errors.

"Unsatisfactory" - the necessary practical skills and professional competencies provided for by the program of educational practice are not formed, all completed study tasks contain gross errors, additional independent work on the report materials will not lead to any significant improvement in the quality of assignments.

## 10. EDUCATIONAL, METHODOLOGICAL AND INFORMATION SUPPORT PRODUCTION PRACTICES

1. Aleshina, E.S. Cultivation of microorganisms as the basis of the biotechnological process [Electronic resource]: textbook / E.S. Aleshina, E.A. Drozdova, N.A. Romanenko - Electron. text data. - Orenburg: Orenburg State University, EBS ASV, 2017 .-- 192 p. - Access mode:http://www.iprbookshop.ru/71282.html... - EBS "IPRbooks"

2. Stem cell biology and cell technologies: for medical universities in 2 volumes: vol. 1 / M. A. Paltsev, R. S. Akchurin, M. A. Aleksandrova [and etc.]; ed. M. A. Paltseva. - Moscow: Medicine, Shiko, 2009 .-- 272 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:779352&theme=FEFU

3. Stem cell biology and cell technologies: for medical universities in 2 volumes: vol. 2 / M. A. Paltsev, R. S. Akchurin, M. A. Aleksandrova [and etc.]; ed. M. A. Paltseva. - Moscow: Medicine, Shiko, 2009 .-- 455 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:779355&theme=FEFU

4. Biryukov, V.V. Fundamentals of industrial biotechnology / V.V. Biryukov. - M .: KolosS, 2004 .-- 296 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:231970&theme=FEFU

5. Biyashev, K.B. Fundamentals of industrial biotechnology [Electronic resource]: textbook / K.B. Biyashev [and others]. - Electron. text data. - Almaty:

Nur-Print, 2015 .-- 164 p. - Access mode:http://www.iprbookshop.ru/67117.html... - EBS "IPRbooks".

6. Bratus, A.S. Dynamical systems and models of biology / A.S. Bratus, A.S. Novozhilov, A.P. Platonov. - Moscow: FIZMATLIT, 2009 .-- 400 p.https://e.lanbook.com/book/2119

7. Genetic foundations of plant breeding. Volume 3. Biotechnology in plant breeding. Cellular engineering [Electronic resource] / V.S. Anokhin [and others]. - Electron. text data.http://www.iprbookshop.ru/29441.html... - Minsk: Belarusian Science, 2012 .-- 490 p. - Access mode: - http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-29441&theme=FEFU

8. Genetic foundations of plant breeding. Volume 4. Biotechnology in plant breeding. Genomics and genetic engineering [Electronic resource] / O.Yu. Urbanovich [and others]. - Electron. text data.http://www.iprbookshop.ru/29578.html- Minsk: Belarusian Science, 2014 .-- 654 p. - Access mode:http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-29578&theme=FEFU

9. Glick, B. Molecular Biotechnology. Principles and application / B. Glick, J. Pasternak, trans. from English - M .: Mir, 2002 .-- 589 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:4799&theme=FEFU

10. Gorlenko V.A. Scientific foundations of biotechnology. Part 1. Nanotechnology in biology [Electronic resource]: tutorial / VA Gorlenko, NM Kutuzova, SK Pyatunina. - Electron. text data.http://www.iprbookshop.ru/24003.html- M .: Prometheus, 2013 .-- 262 p. - Access mode:http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-24003&theme=FEFU

11. Egorova, T.A. Fundamentals of biotechnology: textbook for universities / T.A. Egorova, S.M. Klunova, E.A. Zhivukhina. - M: Academy, 2006 .-- 208 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:255141&theme=FEFU

12. Elinov, N.P. Fundamentals of biotechnology: textbook / N.P. Elinov. - SPb .: "Science", 1995. - 600 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:128910&theme=FEFU

13. Krieger, O.V. Organization of biotechnological production [Electronic resource]: textbook / O.V. Krieger, S.A. Ivanova. - Electron. Dan. - Kemerovo: KemSU, 2018 .-- 99 p. - Access mode:https://e.lanbook.com/book/107701...

14. Lukanin, A.V. Engineering biotechnology: the basics of microbiological production technology: Textbook / A.V. Lukanin - M .: NITs INFRA-M, 2016 .-- 304 p .:http://lib.dvfu.ru:8080/lib/item?id=Znanium:Znanium-527386&theme=FEFU

15. Lukanin, A.V. Engineering biotechnology: processes and devices of

microbiological production: textbook / A.V. Lukanin. - M .: NITs INFRA-M, 2016 .-- 451 p .:http://lib.dvfu.ru:8080/lib/item?id=Znanium:Znanium-527535&theme=FEFU

16. Molecular biology of the cell [in 3 volumes]: vol. 3 / Bruce Alberts, Alexander Johnson, Julian Lewis [and others]; with problems of J. Wilson, T. Hunt; per. from English A.N. Dyakonova, A.V. Duba, A. Svetlova. - Moscow, Izhevsk: Institute of Computer Research, Regular and Chaotic Dynamics, 2013. - p. 1737-2764.http://lib.dvfu.ru:8080/lib/item?id=chamo:772786&theme=FEFU

17. Molecular biology of the cell [in 3 volumes]: vol. 3 / Bruce Alberts, Alexander Johnson, Julian Lewis [and others]; with problems of J. Wilson, T. Hunt; per. from English A.N. Dyakonova, A.V. Duba, A. Svetlova. - Moscow, Izhevsk: Institute of Computer Research, Regular and Chaotic Dynamics, 2013. - p. 1737-2764.http://lib.dvfu.ru:8080/lib/item?id=chamo:772786&theme=FEFU

18. Nanostructures in biomedicine / ed. K. Gonsalves[and etc.]; per. from English - Moscow: Binom. Knowledge Laboratory, 2013 .-- 519 p.https://e.lanbook.com/book/8685

19. New biomedical technologies using dietary supplements. Issue 2 / Far Eastern Scientific Center of Respiratory Physiology and Pathology of the Siberian Branch of the Russian Academy of Medical Sciences, Scientific Research Institute of Medical Climatology and Rehabilitation Treatment; [ed. EAT. Ivanov]. - Vladivostok 1999 .-- 127 p. http://lib.dvfu.ru:8080/lib/item?id=chamo:710781&theme=FEFU

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21. Regenerative potential of mesenchymal stem cells / B.V. Popov. - St. Petersburg: Medical book "ELBI", 2015. - 287 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:803153&theme=FEFU

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23. A.S. Sirotkin Theoretical foundations of biotechnology [Electronic resource]: teaching aid / Sirotkin AS, Zhukova VB. - Electron. text data.http://www.iprbookshop.ru/63475.html- Kazan: Kazan National Research Technological University, 2010. - 87 p. - Access mode:http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-

63475&theme=FEFU

24. Stepanov V.M. Molecular biology, structure and function of proteins / ed. A.S. Spirina. - M .: Lomonosov Moscow State University (Lomonosov Moscow State University), 2005 .-- 336 p.http://lib.dvfu.ru:8080/lib/item?id=IPRbooks:IPRbooks-63475&theme=FEFU

25. Chentsov, Yu.S. Introduction to cell biology: a textbook for universities in biological specialties / Yu.S. Chentsov. - ed. 4th, rev. and additional, erased, reprinted. with ed. 2005. - Moscow: Alliance, 2015 .-- 494 p.http://lib.dvfu.ru:8080/lib/item?id=chamo:776847&theme=FEFU

26. Dvoretsky, S.I. Fundamentals of designing chemical production: textbook / S.I. Butler, D.S. Butler, G.S. Kormiltsin, A.A. Pakhomov. - Moscow: Publishing House "Spectrum", 2014. - 356 p.

27. Kantere, V.M. Fundamentals of design of enterprises of the microbiological industry / V.M. Kantere, M.S. Mosichev, M.I. Doroshenko and others - M .: Agropromizdat, 1990 .-- 304 p.

28. Sartakova, O. Yu. Industrial microbiology / O.Yu. Sartakov. - Barnaul: AltSTU Publishing House, 2009 .-- 173 p.

29. Fundamentals of industrial microbiology: for bachelors and masters of the areas of training "Microbiology" and "Biotechnology", as well as graduate students of the direction of training "Biological Sciences" / Comp .: O.I. Guliy, O.S. Larionova, E.G. Potemkina, E.A. Faust. - FGBOU VPO "Saratov GAU". - Saratov, IC "Science", 2015. - 119 p.

30. Manakov, M.N. Theoretical foundations of microbiological production technology / M.N. Manakov, D.G. Pobedimsky. - M .: Agropromizdat, 1990 .-- 272 p.

31. Fundamentals of industry technologies and organization of production: Textbook / Yu.M. Anosov, L.L. Bekrenev, V.D. Durnev, G.N. Zaitsev, V.A. Saltykov, V.K. Fedyukin. ed. VC. Fedyukin. - SPb .: Polytechnic, 2002 .-- 312 p.

## List of resources of the information and telecommunications network "Internet"

1. Ministry of Health of the Russian Federation - official website: https://www.rosminzdrav.ru/

2. Central Research Institute of Health Organization and Informatization - official website: http://mednet.ru/

3. Research Institute of Biomedical Chemistry. V.N. Orekhovich - official site:http://www.ibmc.msk.ru/

4. Federal State Institution "Federal Research Center" Fundamental Foundations of Biotechnology "of the Russian Academy of Sciences" - official site: https://www.fbras.ru/

5. Federal Budgetary Institution of Science "State Scientific Center for Applied Microbiology and Biotechnology" - official website:http://www.obolensk.org/

6. Federal State Budgetary Institution of Science Institute of Gene Biology of the Russian Academy of Sciences (IBG RAS) - official site: http://www.genebiology.ru/

7. Federal State Budgetary Institution of Science Institute of Molecular Genetics of the Russian Academy of Sciences (IMG RAS) - official site: https://img.ras.ru/ru

8. **Federal State Budgetary Scientific Institution "Medical Genetic Research Center"** (FGBNU MGNTs) of the Ministry of Science and Higher Education of the Russian Federation and the Russian Academy of Sciences (RAS) - official website: http://med-gen.ru/

9. **International educational and scientific biotechnological center**Moscow State University named after M.V. Lomonosov - official site:http://biocentr.msu.ru/

10. Scientific Research and Design Institute of Biotechnological Industry LLC Research and Development Institute BIOTIN - official website: http://www.biotin-kirov.ru/

11. Federal State Budgetary Institution "State Research Institute of Genetics and Selection of Industrial Microorganisms of the National Research Center" Kurchatov Institute "(GosNIIgenetics) - official site:http://www.genetika.ru/

12. Federal State Budgetary Scientific Institution "**Research Institute of Vaccines and Serums named after I.I. Mechnikov "** (FGBNU NIIVS named after I.I.Mechnikov) of the Russian Academy of Sciences - official site: http://www.instmech.ru/news

13. Federal budgetary institution of science **FSBI "National Medical Research Center of Oncology**them. N.N. Blokhin "of the Ministry of Health of Russia - official site: https://www.ronc.ru/

14. Federal State Budgetary Institution of Science "Institute of Bioorganic Chemistry" named after M.M. Shemyakin and Yu.A. Ovchinnikova (IBH) - official site:http://www.ibch.ru/

15. Federal State Budgetary Institution "Scientific Center for Expertise of Medicinal Products" of the Ministry of Health of Russia (FSBI "NCESMP" of the Ministry of Health of Russia) - official site: https://www.regmed.ru/Default.aspx

16. All-Russian Research Institute of Physiology, Biochemistry and Animal Nutrition - a branch of the Federal State Budgetary Scientific Institution “Federal Research Center for Animal Husbandry - VIZh named after Academician L.K. Ernst " - official site: http://bifip.ru/

**17.** Federal State Budgetary Scientific Institution "All-Russian Research Institute of Agricultural Biotechnology" (FGBNU VNIISB) - official website:http://www.vniisb.ru/ru/

18. **Institute of Biochemistry and Physiologists of Plants and Microorganisms** Russian Academy of Sciences (IBPRM RAS) - official site: http://ibppm.ru/

19. **Institute of Biochemistry and Physiology of Microorganisms named after G.K. Scriabin** Russian Academy of Sciences (IBFM RAS) - a separate subdivision of the Federal State Budgetary Institution of Science "Federal Research Center" Pushchino Scientific Center for Biological Research of the Russian Academy of Sciences " - official site: http://www.ibpm.ru/

20. Federal Scientific Center "All-Russian Research and Technological Institute of Poultry" of the Russian Academy of Sciences (FSC "VNITIP" RAS - official site: http://www.vnitip.ru/

21. Federal State Autonomous Educational Institution of Higher Education "Kazan (Volga Region) Federal University", Institute of Fundamental Medicine and Biology, Department of Biochemistry, Biotechnology and Pharmacology - official site: https://kpfu.ru/biology-medicine/struktura-instituta/kafedry/kafedra-biohimii/uchebnyj-process

22. **JSC "Pharmstandard",** pharmaceutical company - official site: https://pharmstd.ru/

23. Federal State Unitary Enterprise "Moscow Endocrine Plant", **FSUE "Moscow Endocrine Plant"** - official site: http://endopharm.ru/

24. CJSC Bioamid - official site: http://www.bioamid.com/

25. ECOPROM JSC - official site: http://www.ecoprom.ru/firm/index.php

26. PJSC "Biosintez", a group of companies San Pharma drug manufacturer - official site: http://biosintez.com/

27. Republican Unitary Pharmaceutical Enterprise of Belarus "Belmedpreparaty" - official site: https://www.belmedpreparaty.com/

28. "Ashland" chemical and biotechnology company - official site: https://www.ashland.com/

29. LLC "Saratov chemical plant of acrylic polymers" ACRIPOL " - official site: https://www.acrypol.ru/company/

30. LLC "International Biotechnological Center" Generium " - official site: http://www.generium.ru/

31. Federal State Budgetary Institution of Science Institute of Cytology of the Russian Academy of Sciences, St. Petersburg - official website: https://www.incras.ru/

32. **Institute of Plant Physiology. K.A. Timiryazeva** RAS - official site: https://ippras.ru/

33. **Institute of General Genetics. N.I. Vavilova** RAS - official site: http://vigg.ru/

## 11. MATERIAL AND TECHNICAL SUPPORT PRODUCTION PRACTICES

Educational and scientificlaboratories of biotechnology and biomedical cell technologiesequipped with the following equipment:

1) Centrifuge 5804 R, Eppendorf; Microscope IX-73, Olympus ,. CO2 incubator Galaxy 48R, Eppendorf 14. System for continuous monitoring of living cells in real time Cell-IQ. Amplifier Applied Biosystems; Amplifier biorad, Spectrophotometer, Thermostat GNOM, Thermostat Thermit, Chambers for electrophoresis of proteins and nucleic acids Biorad 2 pcs., Power supplies for the phoresis chamber 2 pcs. Biorad, Zeiss inverted microscope 2 pcs.

2) Deep optical imaging system for biomaterials FluoView FV1200MPE, Freezing microtome CM 1950, Leica, Microtome RM2265, Leica, Robotic system for automated cell cultivation CompacT SelecT, Laboratory cryo-storage 24K, Taylor Wharton, Cell sorter high-speed MoFlo CO2 Astrios Coulter 130 , Eppendorf, Ion Chef ™ Instrument Sample Preparation System for Whole Genome Sequencing, Thermo Fisher Scientific, Ion S5 ™ XL System, Thermo Fisher Scientific, Applied Biosystems 3500 Genetic Analyzer, Thermo Fisher Scientific, Automated Biacore X100 System for Analysis intermolecular interactions, System for analysis of rheological properties of biomaterials HAAKE MARS III, Thermo Fisher Scientific, Atomic force microscope (probe) BioScope Resolve, Bruker

For persons with disabilities and disabled people, the choice of places for training is consistent with the requirement of their accessibility for these students and the practice is carried out taking into account the peculiarities of their psychophysical development, individual capabilities and state of health.

**Compiled by:**

Associate Professor, Cand. biol. sciences,
Head of EP Molecular Biotechnology V.V. Kumeiko

**The internship program was discussed at a meeting of the Department of Medical Biology and Biotechnology,**

**minutes of February 19, 2021**

ATTACHMENT 1

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

**I APPROVE:**
Head of OP
_____
_____FULL NAME.
"____" _____20__

# INDIVIDUAL MISSION

by _____
(type of practice)

student _____ group _____
(Name of student)

Educational program _____

Base (place, organization) of practice _____
_____

Dates of practice from _____20___ to _____ 20___

| | |
|---|---|
| Generalized formulation of the task | |

Schedule for the task

| The name of the tasks (activities) that make up the task | Date of completion of the task (event) |
|---|---|
| one. | |
| 2. | |
| 3. | |
| | |

Practice leader _____ _____
*signature, full name, position*

APPENDIX 2

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

# DIARY

according to _____

practice

student _____ group _____

program_____

Place of practice _____

Practice period _____ weeks _____

Practice head from FEFU

_____

Practice manager from a specialized organization

_____

1. Student work schedule

| No. p \ p | Name of works | Calendar dates | | Surname of the head of practice |
|---|---|---|---|---|
| | | Start | ending | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

2. Student work diary

| date | A summary of the trainee's work | Signature the head |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

3. Results of report protection

The report is protected by "____" _____ 20___

Rated _____

Head of EP _____ AND ABOUT. Surname

APPENDIX 3

**Practice Report Cover Page Form**

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

The report is protected with a rating of
_____
"_____" _____ 20__

Leader
educational program
_____ AND ABOUT.
Surname

# REPORT

**on production practice**
**(on the passage of internship to obtain professional skills and experience in professional (production and technological, organizational and managerial, project) activities)**

_____
(full name of the profile organization)

Group student _____ _____ (_____)
*Signature name*
Practice leader
from the profile organization _____ (_____)
*Signature name*
Practice leader
from FEFU _____ (_____)

*Signature name*

APPENDIX 4

## Internship referral form

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**

**DEPARTMENT** _____

# DIRECTION

**for practice to receive professional skills and experience in professional activities**

**3rd year undergraduate student (s)**
**_ Last name First name Patronymic of the group _____**
**(Full Name)**

sent to _____
name of the parent organization

address _____

Order on the direction to industrial practice from No.
for _____ practice
in the field of training _____
for a period of
***from*** **_____** ***20*** **___.**until _____ 20___ (continuous / discrete)

Practice leader
by receiving
professional skills and experience
in professional activities

M.P. _____ _____ _____
(position, academic title) (signature) (I.O.F)

**Notes on the implementation and terms of practice**

| Company name | Arrival and departure mark | Signature, decryption of signature, seal |
|---|---|---|
| *Name of the enterprise, organization in accordance with the contract* | Arrived on __.__. 20__ | |
| | Retired on __.__. 20__ | |

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**

AGREED
Head of EP

V.V. Kumeiko

February 19, 2021

APPROVED
Director of the Department of Medical Biology and Biotechnology

V.V. Kumeiko

February 19, 2021

# RESEARCH PROGRAM

**main professional educational program**
**higher education**
**Undergraduate program** 19.03.01 Biotechnology
**on the profile "Molecular Biotechnology"**

Vladivostok
2021

## 1. GENERAL PROVISIONS OF THE PROGRAM

1.1. This Program is developed in accordance with the current legislation in the field of science and innovation.

Research work is a mandatory section of the main professional educational program for training bachelors in the profile of "Molecular Biotechnology" and is aimed at developing competencies in accordance with the requirements of the educational standard independently established by the federal state autonomous educational institution of higher education "Far Eastern Federal University" for the basic professional educational programs in the field of training 03/19/01 Biotechnology, the level of higher education is bachelor's degree, approved by order of the rector of 03/22/2017 No. 12- 13-485.

1.2. The volume (total number) of hours allocated for research work is determined by the OS of the FEFU in accordance withthe direction of training 19.03.01 Biotechnology, and is 3 c.u. (108 hours)

1.3. The content of the research work of students is determined in accordance with the profile of the training program, the topic of scientific research of the department. Specific types, forms of research work and the timing of their implementation are indicated in the individual plan of the student's research work.

1.4. An individual plan is developed by the student together with the scientific supervisor for semesters and approved by the head of the educationalprograms (Appendix 1).

1.5. The general management of the research work on the program is carried out by the head of the educational program. Scientific supervisors appointed in accordance with the order of the Director of the School of Biomedicine directly supervise the research work of students.

## 2. GOALS AND OBJECTIVES

## RESEARCH WORK

2.1.The purpose of research work is to form students' skills and develop competencies in research activities that allow them to solve the following professional tasks:

– studying scientific and technical information, performing literary and patent searches on the research topic;

– mathematical modeling of processes and objects based on standard computer-aided design packages;

– experimental research and testing according to a given method, mathematical processing of experimental data;

– participation in the implementation of research and development results;

– preparation of data for the preparation of reports, reviews, scientific publications;

– participation in activities for the protection of intellectual property.

2.2.Research work is carried out by the student under the guidance of a scientific advisor. The direction of the student's research work is determined in accordance with the profile of the training program "Molecular Biotechnology" and the topic of the final qualifying work.

2.3. Research work should ensure the formation of the following professional competencies in students:

– the ability to work with scientific and technical information, use Russian and international experience in professional activities (PC-8);

– possession of the basic methods and techniques of experimental research in their professional field (PC-9);

– ability to conduct standard and certification tests of raw materials, finished products and technological processes (PC-10);

– possession of methods for planning an experiment, processing and presenting the results obtained (PC-11);

– willingness to use modern information technologies in their professional field, including databases and software packages (PC-12);

– the ability to apply knowledge of the principles of the cellular organization of biological objects, biophysical and biochemical bases, membrane processes and molecular mechanisms of life (UK-1);

– the ability and willingness to understand and analyze biochemical, physicochemical, molecular biological mechanisms of the development of pathological processes in the cells and tissues of the human body (UK-2);

– the ability to apply basic ideas about the basic laws and modern achievements of genetics and breeding, about genomics, proteomics (UK-3);

– the ability to assess morphofunctional, physiological conditions and pathological processes in the human body for solving professional problems (UK-4);

– ability and readiness to implement applied and practical projects for the study of biochemical, biophysical and physiological processes and phenomena occurring at the cellular, organ and systemic levels in the human body (UK-5);

– the ability to apply knowledge about the basics of biotechnological and biomedical industries, microbiological synthesis, biocatalysis, genetic engineering, nanobiotechnology, molecular modeling (UK-6);

– the ability and readiness to apply new research methods in research activities in the field of biotechnology, taking into account the rules of observance of copyright (UK-7);

– knowledge of the principles of production, research and use of enzymes, viruses, microorganisms, cell cultures of animals and plants, products of their biosynthesis and biotransformation (UK-8);

– possession of modern approaches to the design of medicines and diagnostic products (UK-9).

2.4. The following types and stages of the implementation and control of the student's research work are envisaged:

– planning of research work, including familiarization with the topics of research work in this area and the choice of a research topic;

– research work;

– adjusting the research plan;

– drawing up a report on research work;

– public defense of the work performed.

The main form of planning and adjusting the individual plans of the research work of students is the substantiation of the topic, discussion of the plan and intermediate results of the research within the framework of the research seminar.

2.5. Based on the results of the research work, the student must:

Know:

– the history of the development of a specific scientific problem, its role and place in the studied scientific direction;

– the degree of scientific elaboration of the problem under study;

– the specifics of the technical presentation of scientific material;

Own:

– modern problems of this branch of knowledge;

– the main methods of the research being conducted;

– scientific discussion skills;

Be able to:

– apply certain methods in scientific research;

– practically carry out scientific research, experimental work in a particular scientific field related to the performance of qualifying work / master's thesis;

– search for bibliographic sources;

– work with information software products and Internet resources, etc.

## 3. ORGANIZATION RESEARCH WORK

**3.1 Research work should be carried out in the following forms**:

– fulfillment of the tasks of the scientific supervisor in accordance with the approved individual plan of research work;

– participation in scientific events of the FEFU and the department;

– preparation of reports and speeches at scientific conferences, seminars, symposia and other scientific events at the regional, national and international levels;

– preparation and publication of theses of reports, scientific articles;

– preparation and defense of term paper in the direction of ongoing research;

– participation in research projects carried out at the university in the framework of research programs;

– preparation and defense of the final qualifying work.

**3.2 The content of the research work.**

3.2.1 Planning research work. Selection and approval of the research topic, substantiation of its relevance and theoretical significance, study of the degree of scientific elaboration of the problematic, writing an essay or article on the selected topic. Drawing up a work schedule for the final qualifying work. Analysis of the main results and provisions obtained by leading experts in the field of the research being carried out, an assessment of their applicability within the framework of the chosen topic, as well as the author's alleged personal contribution to the development of the topic (novelty of the research and the formulation of specific author's proposals). Participation in the scientific and methodological seminar.

3.2.2 Setting goals and objectives of scientific research; definition of the object and subject of research; determination of the methodological apparatus that is supposed to be used, selection and study of the main bibliographic sources that will be used as a theoretical basis for the study; study of special literature and other scientific and technical information, achievements of domestic and foreign science and technology in the relevant field of molecular biotechnology.

3.2.3 Collection, processing, analysis and systematization of scientific and technical information on the topic of work, compilation of a literature review, systematization of factual material for research. Participation in experiments, development of measurement techniques (if any) and scientific research on the topic of work.

In order to identify the novelty, technical level, competitiveness and efficiency of the topic being developed, a patent search is carried out. Sources of information about inventions are: the abstract publication "Inventions of the World", the official bulletins of the Russian Agency for Patents and Trademarks "Inventions", "Inventions. Utility Models ", descriptions of the invention, abstract journals of VINITI, materials of the Federal Institute of Patent Property.

Patent research makes it possible to analyze the latest achievements of domestic and foreign science and technology in this area, to identify the main technical directions in solving the problem, create preconditions for improving the research methodology, clarifying the experimental setup scheme, and contribute to obtaining results at the level of the invention.

Patent research is carried out by the developer under the guidance and with the participation of the scientific advisor and employee of the patent department.

Patent research includes the following types of work:

– development of search rules;

– search and review of patent and other scientific and technical documentation;

– systematization and analysis of the selected documentation;

– summarizing the results, choosing analogs, compiling a certificate of patent research and introducing materials into the literature review.

– The search procedure is carried out in the following sequence:

– definition of the subject of the search (the object as a whole, its constituent parts);

– determination of countries (firms) for information retrieval;

– determination of types of information sources;

– classification of search items according to the international classification of inventions (ICI), universal decimal classification (UDC), according to the national classification of inventions (NCI);

– determination of the required depth of search;

– locating sources of information;

– definition of types and methods of search.

As a rule, patent research is carried out sequentially at the stages:

– planning and forecasting research work;

– in the course of research work;

– in the process of completing research and the use of its results.

Patent search is carried out on the collections of patent documents of the Russian Federation and countries that are leading in this field, and other scientific and technical literature with a retrospective of at least 10 years (usually 15 - 20 years). In the course of the search, the current level of development is determined, the development of this area is predicted based on the analysis of the level of industrially developed technology and equipment.

The level of industrially developed technology and equipment is determined on the basis of information obtained from the retrospective patent fund, data from scientific and technical literature, standards, specifications, advertising and catalog

magazines, technical journals, etc., by comparing domestic and foreign solutions, their technical economic indicators.

The level of technical developments is determined by comparing the results of domestic and foreign research and development and design developments protected by copyright certificates and patents over the past 10-15 years and set forth in research reports for the last 2-3 years. Particular attention is paid to the description of copyright certificates and patents in recent years. This type of analysis allows you to select technical solutions - analogues with the highest technical and economic indicators.

The level of technical solutions in the future is determined by the study of the latest inventions and patents, which makes it possible to predict the level of development of technology for 10-15 years ahead and determine the most progressive directions.

As a result of patent research, one or several ways of solving the problem are fixed, the expediency and the degree of use of known technical solutions are determined, the probability of ensuring the technical solution of patent purity is estimated.

Based on the results of patent research, a search certificate is drawn up, for example:

Information about patent research on the topic …….

| Countries searched | Patent Classification Indices | Search depth (period) | No. of patents | Identified analogues |
|---|---|---|---|---|
| Russia | | | | |
| USA | | | | |
| Germany | | | | |
| Japan | | | | |
| France | | | | |
| England | | | | |

Search made _____

3.2.4 Participation in the scientific and methodological seminar. Preparation of a report for the student scientific conference of the university. Speech at conferences of young scientists and students, as well as participation in other interuniversity and regional scientific conferences. Publication of a scientific article.

Writing a review of scientific literature of the final qualifying work and its public discussion within the framework of a scientific and methodological seminar.

Preparation of the final text of the final qualifying work, its technical design.

According to the results of the implementation of the individual plan of

research work, the scientific supervisor sets the final grade.

**3.3 Topics of individual assignments for research work.** An individual task for research work (R&D) is issued by the head of the research work.

An individual assignment must correspond to the field of study for the main professional educational program of the bachelor's degree 19.03.01 "Molecular Biotechnology".

Approximate research topics:

1. Systems for the production of recombinant proteins in E. coli.
2. Hormonal regulation of gene expression at the transcriptional level.
3. Influence of changing cultivation conditions on different genotypes of the species Syringa vulgaris.
4. The use of molecular mechanisms of intracellular regulation in biotechnological production.
5. Application of methods of molecular genetics and microbiology in ecology and biotechnology of cyanobacteria.
6. Molecular design of polymeric materials for biotechnology and medicine.
7. Molecular biological approaches to the selection of bacterial cultures in the creation of starter cultures for biotechnology.
8. Objects of molecular biotechnology.
9. Molecular biotechnology of prokaryotes.
10. Molecular biotechnology of eukaryotes.
11. Point mutagenesis and genetic engineering of proteins.
12. Molecular biotechnology in pharmacy.
13. Molecular biotechnology of vaccines.
14. Molecular biotechnology of microbiological systems.
15. Current state and problems of amino acid production.
16. The current state and problems of the production of biologically active substances.
17. Current state and problems of antibiotic production.
18. Current state and problems of insulin production.
19. Current state and problems of obtaining pectins.
20. Current state and problems of obtaining carotenoids.
21. Problems of the production of biologically active molecules.
22. The use of genetic engineering to obtain practically useful strains of microorganisms.
23. Optimization of biotechnological processes using software products.
24. Oversynthesis of metabolic products using genetic methods.
25. The influence of cultivation conditions on the stability of plasmids and the biosynthetic activity of recombinant bacterial strains.

**3.4 Designing an experiment...** Based on the analysis of literature data, the main, known technical and technological directions and solutions to the problem posed in the work are identified, its relevance is assessed, and the goal is specified. In the first approximation, the ways of its possible solution are outlined, i.e. a working hypothesis is formulated, specific research objectives are determined.

In the course of planning an experiment, a course of work is developed - a step by step (descriptive or graphical) structural diagram of the organization of the study, containing its main stages, objects and research methods, etc.

When starting to prepare a scheme for setting up an experiment, one should understand the purpose and objectives of the study, present the essence of the selected approaches, the specifics of the objects and methods used. The methodology of the work should be discussed with the supervisor. The scheme for setting up an experiment should be specific, informative, reflect the essence of the work, its main stages and their focus.

The correctness of the choice of research objects largely determines the degree of reliability of the experimental data. The object must be stable in composition and properties; the rules of sampling and sampling should be strictly observed during operation.

The selected methods and means of measurement must ensure the accuracy and objectivity of the results of the experiment.

It should be borne in mind that research is divided into direct and indirect, objective (individual, biological, biochemical, etc.) and subjective (organoleptic indicators). When planning an experiment, you should choose methods that have the smallest error and correlate with each other.

Preparatory work related to the allocation of a workplace, selection of equipment, materials and reagents, working documentation,
the installation of equipment ensuring the specified measurement accuracy should be planned in advance.

When conducting research work, the student must conduct a series of preliminary experiments on mastering the selected research methods, clarifying their duration and identifying arising interferences that affect the accuracy of the results.

Taking into account the specific nature of the research work performed on the instructions of the supervisor in order to study the mathematical model of the process under study and use it to determine the optimal conditions, it is recommended to carry out mathematical planning of the experiment.

**3.5 Conducting experimental research.**The main goal of the experiment is to test the correctness of the formulation of a working hypothesis and to optimize the research results. The experimental part of the thesis research work after passing the

safety briefing is performed by students independently with consultations and control certifications of the head, provided for by the schedule and schedule.

Experiment protocols are kept in a workbook with numbered pages. The manager periodically checks the journal and adds his comments and recommendations to it. Each experiment must be described in detail and recorded.

In the general part of the experiment protocol, the name of the experiment and its number, the date of the experiment, the characteristics of the research object, possible variants of the research method, the specific plan of the experiment, the purpose of its setting, and the parameters to be determined are recorded.

The data and observations obtained during the experiment are recorded in previously prepared tables. If necessary, the student writes down special remarks that arose during the experiment.

Scientific documentation is attached to the protocol: diagrams, graphs, diagrams, photographs, photocopies of documents (for example, acts of tastings), chromatograms, aminograms, densitograms, etc.

Protocols and annexes to them are the only objective scientific documentation for writing a thesis.

As a rule, experimental research is carried out in two stages: at the first stage, primary data are obtained on model systems (which allows a refinement or adjustment of the work program), at the second stage, the main results are obtained at basic objects.

Experimental data should be carried out in absolute or relative values, indicators of the same type should have the same degree of rounding. Quantities that have a physical meaning must have dimensions and designations in accordance with the international system of units (SI).

When performing experimental studies, it is necessary to pay attention to obtaining reliable results, which is achieved by carrying out the analysis by several parallel experiments (3-4), processing the results by statistical methods.

By systematizing and processing the data obtained in this way, the likelihood of erroneous conclusions and conclusions is excluded.

## 4. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT OF SCIENTIFIC RESEARCH WORK

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## 11. MATERIAL AND TECHNICAL SUPPORT OF SCIENTIFIC RESEARCH WORK

**11.1 Research laboratories for biomedical cell technologies, equipped with the following equipment:**

– Robotic system for automated cultivation of cells CompacT SelecT SC - ARM, with a module for preparing a plate for analysis, THE AUTOMATION PARTNERSHIP;

– System for continuous monitoring of living cells in culture, formation and analysis of images Cell-IQ MLF, Chip Technologies, Czech Republic;

– FluoView FV1200MPE deep optical imaging system for biomaterials (FV12M-5XX-ZXX);

– Personal CO2 incubator - with a system for monitoring and increasing the vitality of Galaxy cells (CO48R-230-1200);

– Spectrophotometer with accessories for sample processing BioSpectrometer-kinetic;

– CFX96 Touch Real Time System device for polymerase chain reaction with detection of amplification products in "real time" mode;

– System for volumetric fixation and preparation of deposited biosamples included in the Volume Fixation System;

– Multimodular station for rotary sedimentation processing of samples Sediment Modules;

– Automated system Biacore X100 System for the analysis of intermolecular interactions with a set of additional parts and software;

– Ion S5 ™ XL System for DNA Sequence Analysis + Starter kit for testing and commissioning the system;

– Genetic analyzer Applied Biosystems 3500 + Starter kit consumables for testing and commissioning the system;

– High-speed cell sorter MoFlo Astrios EQ + A set of consumables starter kit for testing the performance and commissioning of the system;

– System for preparation of samples for whole genome sequencing Ion Chef ™ Instrument + A set of consumables starter kit for validation and commissioning of the system.

**11.2 Reading rooms of the FEFU Scientific Library with open access to the collection (building A - level 10):**

HP ProOpe 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD +/- RW, GigEth, Wi-Fi, BT, usb kbd / mse, Win7Pro (64-bit) + Win8.1Pro (64-bit), 1-1-1 Wty Internet access speed 500 Mbps. Workplaces for people with disabilities are equipped with displays and Braille printers; equipped with: portable devices for reading flat-printed texts, scanning and reading machines, video enlarger with the ability to regulate color spectra; magnifying electronic loupes and ultrasonic markers.

For persons with disabilities and disabled people, the choice of places for training is consistent with the requirement of their accessibility for these students and the practice is carried out taking into account the peculiarities of their psychophysical development, individual capabilities and state of health.

## 12. LIST OF INFORMATION TECHNOLOGIES AND SOFTWARE

**12.1 Programs:**

– Microsoft Office Professional Plus 2010 - an office suite that includes software for working with various types of documents (texts, spreadsheets, databases, etc.);

– 7Zip 9.20 - free file archiver with high data compression ratio;

– ABBYY FineReader 11 - a program for optical character recognition;

– Adobe Acrobat XI Pro - a software package for creating and viewing electronic publications in PDF format;

– ESET Endpoint Security - comprehensive protection for Windows-based workstations. Virtualization support + new technologies;

– WinDjView 2.0.2 - a program for recognizing and viewing files with the same name format DJV and DjVu;

**12.2 Local network resources:**

– Legal reference system Garant operating system - Microsoft Windows Linux (with WINE @ Etersoft ) iOS Android, etc .;

– Computer legal reference system ConsultantPlus - operating system Microsoft Windows, Linux (with WINE), Apple iOS Android, Windows Phone;

– Professional help system Techexpert - operating systemsMicrosoft Windows, Linux, FreeBSD.

**12.3 Educational software packages:**

– 1C Enterprise 8.2, (educational version), version 8.2.13.205, training complex of programs;

– Windows Seven Enterprice,version SP3x64, operating system

– Eset NOD32 Antivirus, version 4.2.76.1,malware detection tool;

– Microsoft Office 2010 Professional Plus, version 14.0.6029.1000,office suite;

– Microsoft Office Professional Plus 2013, version 15.0.4420.1017,office suite;

– Microsoft Visual Studio 2012 Professional, version 11.0.50727.26, training complex of programs;

– Microsoft Visual Studio 2013 Community, version 12.0.31101, training complex of programs;

– 7-Zip, version 9.20.00.0, training complex of programs;

– Abbyy FineReader 11, version 11.0.460, educational complex of programs;

– Adobe Acrobat XI Pro, version 11.0.00, training complex of programs;

– Adobe Photoshop CS6, version 13.0, Educational software package;

– Autodesk 3DS Max Design 2013, version 15.0.0.347, training complex of programs;

– Autodesk 3DS Max Design 2015, version 17.1.149.0, training complex of programs;

– Autodesk Autocad 2012, version 18.2.51.0, educational complex of programs;

– Autodesk Autocad 2013, version 19.0.55.0, educational complex of programs;

– Autodesk Autocad 2013, version 19.0.59.0, educational complex of programs;

– Autodesk Autocad 2015 version 20.0.51.0, educational suite of programs;

– Autodesk Autocad Architecture 2013, version 7.0.50.0, educational suite of

programs;

– Autodesk Autocad Electrical 2016, version 20.0.46.0, educational suite of programs;

– Autodesk Autocad Revit 2013, version 12.02.21203, training complex of programs;

– Autodesk DWG TrueView 2013, version 19.0.55.0, training set of programs;

– Autodesk Invertor 2015, version 19.0.15900.0000, training complex of programs;

– Autodesk Revit 2015, version 15.0.207.0, training complex of programs;

– Coogle Chrome version 42.0.2311.90,web browser;

– CoreDraw Graphics Suite X3. version 13.0.0.739, a training complex of programs;

– CoreDraw Graphics Suite X6, version 16.1.0.843, training complex of programs;

– Free Pascal, version 2.6.4, educational complex of programs;

– Gimp 2.8.10, Gimp version 2.8.14,graphic package for teaching students;

– GNU Octave, version 3.8.2, educational software package;

– MySQL Community, version 5.6, a database training complex;

– MySQL Database, version 5.5.23, a training complex on databases.

## 13. PROVISION OF ELECTRONIC LIBRARY SYSTEM AND ELECTRONIC INFORMATION AND EDUCATIONAL ENVIRONMENT WITH RESOURCES

| Name of the document, indicating the details | Document validity period |
|---|---|
| Sublicense agreement Springer / 34 of 12/25/17<br>Ministry of Education | 25.12.19-31.12.20 |
| Competition of the Ministry of Education and Science. Clarivate Analytics (Scientific) LLC Web of Science database dated 04/01/17 | 01.04.19-31.03.20 |
| Contract No. P-1370-16 dated January 09, 2017 EBS "Lan" "Engineering and technical sciences. Mathematics. Computer science. Physics. Theoretical mechanics. Chemistry" | 01.02.2019-31.01.2020 |
| Agreement No. P-61-17 dated 25.01.2017. EBS "Doe" "Psychology. Pedagogy "," Physical Culture and Sports ") | 01.03.2019-28.02.2020 |
| Contract No. R-62-17 dated 25.01.2017. EBS "Student Consultant" "Medicine. Healthcare "," Architecture and Construction "," Mechanical Engineering " | Until 03/30/2020 |
| Contract No. 12 / IA / 17 dated 09.03.2017 EB of the Grebennikov | 01.05.2019-30.06.2020 |

| | |
|---|---|
| Publishing House | |
| Contract No. SIO-262/17 dated 16.03.2017 SCIENCE INDEX (NEB) | 12.04.2019-02.05 2020 |
| Contract No. R-234-17 dated 03.24.2017 Ross Intellect Service LLC. Access to the electronic journal of the publishing house "Aktion MCFER" "Glavbukh" | 01.05.2019-30.04.2020 |
| Contract No. P-230-17 dated 04/03/2017. Scientific journals on the ELIBRARY platform (RUNEB) | 04/03/19-02.04.20 |
| Contract No. R-288-17 dated 06.04.2017. EBS_YURIGHT | 05/02/19-01.05.20 |
| Agreement No. P-155-17 dated 02.05.2017 EBSCO | 05/02/19 - 05/01/20 |
| Contract No. R-396-17 dated 03/05/2017. LLC "IVIS" Library Science | 01.06.19-31.05.20 |
| Contract R-472-17 dated 05.24.17. RUKONT electronic versions of educational and scientific publications in Russian | 05.06.2019-04.06.2020 |
| Contract R-473-17 of 05.24.17 Electronic library of dissertations of the RSL | 12.07.2019-11.07.2020 |
| Contract R-470-17 of 05.24.17 EBS "University Library Online" | 06.06.2019-05.06.2020 |
| Contract R-505-17 of 05/31/17 EBS Lan "Technology of food production" | 01.07.2019-30.06.2020 |
| Contract No. R-699-17 dated 01.08.2017 EBS INFRA-M (EBS ZNANIUM.COM) | 08/01/2019 - 07/31/2020 |
| Contract No. R-595-17 dated June 19, 2017 IVIS LLC Questions of history | 07/05/2019 - 07/06/2020 |
| Contract No. R-596-17 dated June 19, 2017 IVIS LLC Literature Questions | 07/05/2019 - 07/06/2020 |
| Agreement N2931 / 17 (EU0181626) dated 07/03/17 IPR Media LLC EBS IPRbooks (basic version) | 01.09.2019-31.08.2020 |
| Contract No. R-889-17 of 08/28/17 IVIS LLC “Publications on defense and security issues”. | 01.09.2019-31.08.2020 |
| Contract No. P-880-17 of 08/28/17 IVIS LLC database of electronic periodicals of the East View company "Publications on social sciences and humanities" | 01.09.2019-31.08.2020 |
| Contract No. R-882-17 of 08/28/17 IVIS LLC database of electronic periodicals of the East View company "Statistical publications of Russia and the CIS countries" | 09/01/2019- 08/31/2020 |
| Contract 1-12310992873 dated 01.06.2017 Publishing house Elsevier BV Sci Val integrated modular platform: SciVal Collaboration; SciVal Trends; SciVal Overview; Scival benchmarking | 06/01/19 - 05/31/20 |
| Agreement (LICENSE AGREEMENT) R-672-17 dated 08.25.2017 Tongfang Knowledge Network Technology Co., Ltd., Beijing, China. | 08/25/19 - 08/25/20 |
| Sublicense agreement No. P-700-17 (ЭУ0182507) dated August 03, 2017 Journal Citation Report database by Clarivate Analytics (US) LLC on the InCites platform | 08/03/17 - 08/02/20 |
| Contract R-1377-17 of 12/27/17 Non-commercial partnership "National | 12/27/19 - 12/27/20 |

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|---|---|
| Electronic Information Consortium" NP "NEICON". Clarivate Analytics (US) LLC InCites Benchmarking & Analitics databases and software | |
| Sublicense agreement No. Scopus / 261 dated 09.01. 2018 Scopus | 09 / 01.2018 -31.12.2020 |
| Sublicense agreement No. IEEE / 34 dated January 09, 2018. IEEE / IEL database (The Institute of Electrical and Electronics Engineers, Inc) | 09.01.18-30.06.20 |
| Sublicense agreement No. RSC / 34 dated May 25, 2018 | 05.25.18-30.06.20 |
| Sublicense agreement No. Wiley / 34 dated 01/09/18 Wiley Journals (Wiley Online Library by Wiley Subscription Services). Competition of the Ministry of Education and Science | 09.01.18-30.06.20 |
| Sublicense agreement No. SCI / 34 dated 09.01.18 | 09.01.18-30.06.20 |
| Sublicense agreement No. Questel / 34 dated 09/01/18 ORBIT patent base Competition of the Ministry of Education | 09.01.18-30.06.20 |
| Sublicense agreement No. ProQuest / 34 dated January 09, 2018 | 09.01.18-30.06.20 |
| Sublicense agreement MathSciNet / 34 dated January 01, 2018 American Mathematical Society MathSciNet database | 09.01.18-30.06.20 |
| Sublicense agreement No. INSPEC / 34 of 09.01.18 INSPEC database Competition of the Ministry of Education | 09.01.18-30.06.20 |
| Sublicense agreement No. CUP / 34 dated 09/01/18 Scientific journals published by Cambridge University Press. | 09.01.18-30.06.20 |
| Sublicense agreement No. CASC / 34 dated January 9, 2018 Computer Applied Sciences Complete database from EBSCO Publishing | 09.01.18-30.06.20 |
| Sublicense Agreement No. AIP / 34 dated January 9, 2018. Scientific journals by the American Institute of Physics Publishing House. | 09.01.18-30.06.20 |
| Sublicense Agreement No. APS / 34 dated January 9, 2018 APS Online Journals Database | 09.01.18-30.06.20 |
| Sublicense agreement No. IOP / 34 dated 09.01.18 Scientific journals of the Institute of Physics Publishing House (Great Britain) | 09.01.18-30.06.20 |
| Sublicense Agreement No. T & F / 34 01/09/18 Magazines of the Taylor & Francis Group Publishing House "Social Sciences and Humanities" and "Natural Sciences and Technologies" Competition of the Ministry of Education and Science | 09.01.18-30.06.20 |
| Contract No. 1415-17 dated 26.01.2018. EBS "Lan" Engineering and technical sciences. Mathematics. Computer science. Physics. Theoretical mechanics. Chemistry | 01.02.2018-31.01.2020 |
| Contract No. P-70-18 dated 05/30/2018 EBS "Doe" Psychology. Pedagogy, Physical Education and Sports | 01.07.2018-30.06.2020 |
| Contract No. R-509-18 dated 15.06.2018. EBS "Student Consultant" "Medicine. Healthcare "," Architecture and Construction "," Mechanical Engineering "," Energy "," Vostochnaya Kniga "Publishing House," Flint "Publishing House" Linguistics and Literary Studies " | 01.07.2019-30.06.2020 |
| Contract No. 24 / ИА / 18 dated 15.06.2018 EB of the Grebennikov | 01.07.2019- 30.06.2020 |

| | |
|---|---|
| Publishing House | |
| Contract No.P-672-18 dated 11.07.2018 EBS_YURAYT | 17.09.2019 -16.09.2020 |
| Contract No. RT-046/18 of 15.06.2018 RUKONT electronic versions of educational and scientific publications in Russian | 01.03.2019-28.02.2020 |
| Contract No. P-699-18 of 03.07.2018 EBS "Lan" Food production technology | 08/01/2019 - 07/31/2020 |
| Contract No. R-656-18 of 12.07.2018 EBS INFRA-M (EBS ZNANIUM.COM) | 08/01/2019 - 07/31/2020 |
| Contract No.P-803-18 dated 14.08.2018 IPR Media LLC EBS IPRbooks (basic version) | 09/01/2019- 08/31/2020 |
| License Agreement No. P-979-18_ with Tongfang Knowledge Network Technology Co., Ltd., Beijing China dated September 24, 2018. | 01.10.19 - 30.09.20 |
| Agreement No. P-978-18 dated 09.29.2018 with EBSCO Publishing | 01.10.2019 - 30.09.2020 |

**Compiled by:**

Associate Professor, Cand. biol. sciences,
Head of OPOP Molecular Biotechnology V.V. Kumeiko

**The research program was discussed at a meeting of the Department of Clinical and Fundamental Medicine, minutes of February 19, 2021 No. 6.**

Attachment 1

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**

APPROVED
Head of the OBOR
_____AND ABOUT.
Surname
(signature)
"_____" _____ 20___

# RESEARCH PROGRAM

**main professional educational program**
**higher education**
**Undergraduate program** 19.03.01 Biotechnology
**on the profile "Molecular Biotechnology"**

Vladivostok

2021

**Individual research plan**

Full Name _____
Topic of the final qualifying work _____
_____
Scientific adviser _____
Head of OBOR _____

**Student research work plan**

1. Work on the final qualifying work:

_____
_____
_____
_____

2. Scientific activity (publications, participation in conferences, round tables and other scientific events):

_____
_____
_____
_____

3. Undergraduate practice. Place of internship. Purpose, tasks of practice

_____
_____
_____
_____

Certification:

_____
_____
_____
_____

Main results achieved:

_____
_____
_____

**Scientific adviser _____**

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

## SCHOOL OF BIOMEDICINE

AGREED
Head of EP

V.V. Kumeiko

February 19, 2021

APPROVED
Director of the Department of Medical Biology and Biotechnology

V.V. Kumeiko

February 19, 2021

# PRACTICE WORK PROGRAM

**Undergraduate program**
**19.03.01 Biotechnology**
**Molecular Biotechnology program**

Vladivostok
2021

## 1. Normative documentation governing the process of organizing and passing practice

The internship program is developed in accordance with the requirements of:

– Educational standard independently established by FEFU, approved by the order of the rector dated March 22, 2017 No. 12-13-485;

– Main professional educational program of bachelor's degree "Molecular Biotechnology" 03/19/01 Biotechnology;

– Regulations on the procedure for the practice of students studying at the Federal State Autonomous Educational Institution of Higher Professional Education "Far Eastern Federal University" under higher education programs (for bachelor's, specialist's, master's programs), approved by order No. 12-13-2030 of 23.10.2015;

– with the Regulations on the Funds for Assessment Means of Educational Programs of Higher Education - Bachelor's, Specialist's, Master's programs at FEFU, approved by order of the rector of 12.05.2015 No. 12-13-850.

## 2. OBJECTIVES OF LEARNING PRE-DIPLOMA PRACTICE

The goals of pre-graduation practice are to consolidate the theoretical knowledge gained in the study of basic and professional disciplines; acquisition of professional skills in future professional activities; the formation of competencies that meet the requirements of the main professionaleducational program of the bachelor's degree "Molecular Biotechnology" 03/19/01 Biotechnology.

## 3. OBJECTIVES OF PRE-DIPLOMA PRACTICE

The objectives of the undergraduate practice are:

– studying scientific and technical information, performing literary and patent searches on the research topic;

– collection and analysis of biomedical and scientific and technical information, as well as generalization of domestic and foreign experience in the field of biotechnology, analysis of patent literature;

– experimental research and testing according to a given method, mathematical processing of experimental data;

– carrying out computational experiments using standard software in order to obtain mathematical models of biological and biotechnical processes and objects;

– preparation of data, preparation of reports and scientific publications on the results of the work carried out, participation in the implementation of the results in biomedical practice;

– organization of the protection of intellectual property objects and the results of research and development as a commercial secret of the enterprise.

– preparation of data for the preparation of reports, reviews, scientific publications.

## 4. GENERAL INFORMATION ON PRACTICE

General information about the practice is presented in table 1.

Table 1

| | |
|---|---|
| Practice type | *Pre-graduation* |
| Practice type | *Pre-graduation* |
| Method of carrying out | *Outgoing* |
| Form (forms) of conducting | *Concentrated* |
| The amount of practice in credit units<br>Duration of practice<br>Course, semester | *4th year, 8th semester: 3 dollars, 2 weeks, 108 academic. hour.* |
| Practice bases | *1) Center for Genomic Medicine, BMS FEFU, laboratory of biomedical cell technologies;*<br>*2) FSBI Science "National Research Center for Marine Biology named after A.V. Zhirmunsky "FEB RAS, Vladivostok;*<br>3) *Federal Research Center for Biodiversity, Far East Branch, Russian Academy of Sciences, Vladivostok;*<br>*4) Pacific Institute of Bioorganic Chemistry. G.B. Elyakova FEB RAS, Vladivostok;*<br>*5) Research Institute of Epidemiology and Microbiology named after G.P. Somova, Laboratory of Molecular Microbiology, Vladivostok* |

## 5. PLANNED PRACTICE OUTCOMES

Table 2 presents the planned results of the practice.

table 2

| View professional activities | Planned results of practice (code, wording competencies or competency elements) |
|---|---|

| | |
|---|---|
| Production and technological<br>Organizational and managerial<br>Research activities<br>Design | PC-1 demonstrates the ability to carry out the technological process in accordance with the regulations and use technical means to measure the main parameters of biotechnological processes, properties of raw materials and products;<br>PC-2 demonstrates the ability to implement and manage biotechnological processes;<br>PC-3 possesses methods for assessing technical means and technology, taking into account the environmental consequences of their use;<br>PC-4 demonstrates the ability to ensure compliance with safety regulations, industrial sanitation, fire safety and Undergraduate program ;<br>PC-5 demonstrates the ability to organize the work of performers, find and make managerial decisions in the field of organizing and rationing work;<br>PC-6 demonstrates readiness to implement a quality management system for biotechnological products in accordance with the requirements of Russian and international quality standards;<br>PC-7 demonstrates the ability to systematize and generalize information on the formation and use of enterprise resources;<br>PC-8 demonstrates the ability to work with scientific and technical information, use Russian and international experience in professional activities;<br>PK-9 possesses the basic methods and techniques of experimental research in its professional field;<br>PK-10 demonstrates the ability to conduct standard and certification tests of raw materials, finished products and technological processes;<br>PK-11 possesses methods of experiment planning, processing and presentation of the obtained results;<br>PC-12 demonstrates its readiness to use modern information technologies in its professional field, including databases and software packages;<br>PK-13 demonstrates the ability to participate in the development of technological projects as part of the team of authors; |

| | |
|---|---|
| | PK-14 demonstrates readiness to use modern computer-aided design systems;<br>PK-15 demonstrates the ability to design technological processes using automated systems for technological preparation of production as part of the team of authors;<br>PK-16 demonstrates readiness to negotiate with design organizations and suppliers of technological equipment, evaluate the design results of biotechnological enterprises at the project stage;<br>PC-17 demonstrates the ability to develop the main stages of the biotechnological process;<br>PK-18 demonstrates readiness to participate in research of the biotechnological process at pilot and pilot industrial installations;<br>PK-19 demonstrates readiness to participate in the development of design and working technical documentation;<br>UK-1 demonstrates the ability to apply knowledge of the principles of cellular organization of biological objects, biophysical and biochemical bases, membrane processes and molecular mechanisms of life;<br>UK-2 demonstrates the ability and readiness to understand and analyze biochemical, physicochemical, molecular biological mechanisms of the development of pathological processes in the cells and tissues of the human body<br>UK-3 demonstrates the ability to apply basic ideas about the basic laws and modern achievements of genetics and selection, about genomics, proteomics;<br>UK-4 demonstrates the ability to assess morphofunctional, physiological conditions and pathological processes in the human body for solving professional problems<br>UK-5 demonstrates the ability and readiness to implement applied and practical projects for research and study of biochemical, biophysical and physiological processes and phenomena occurring at the cellular, organ and systemic levels in the human body;<br>UK-6 possesses knowledge about the basics of |

| | |
|---|---|
| | biotechnological and biomedical industries, microbiological synthesis, biocatalysis, genetic engineering, nanobiotechnology, molecular modeling;<br>UK-7 demonstrates the ability and readiness to apply new research methods in research activities in the field of biotechnology, taking into account the rules of copyright compliance;<br>UK-8 possesses the principles of obtaining and using enzymes, viruses, microorganisms, cell cultures of animals and plants, products of their biosynthesis and biotransformation;<br>UK-9 possesses modern approaches to the design of medicines and diagnostic products |

## 6. PLACE OF PRE-DEGREE PRACTICE IN THE STRUCTURE OF OP

Block B2.P "Pre-diploma practice"educational standard towards 19.03.01 Biotechnologyindependently installed by FEFU, approved by order of the rector of March 22, 2017 No. 12-13-485, is mandatory and is a type of training sessions directly focused on the professional and practical training of students.

Undergraduate practice is the final stage of practical training at the level of higher education– bachelor degree – and is aimed at obtaining students of professional skills and experience in professional activities in the direction of training.

Undergraduate practice is carried out both in third-party organizations that have the necessary human and scientific and technical potential (offsite), and on the basis of the Far Eastern Federal University (stationary).

Undergraduate practice is based on the theoretical development of such disciplines as: "Chemistry of biologically active substances", "Industrial microbiology and biotechnology", "Engineering enzymology", "Scientific design and research methodology", "Bioengineering" etc.

The passage of pre-diploma practice by students is an integral part of the educational process and is necessary to consolidate the acquired competencies in the learning process and preparation for the state final certification.

## 7. STRUCTURE AND CONTENTPRE-DIPLOMA PRACTICE

Practice content is determined by its type and type.

The total workload of the training practice is 2 weeks / 3 credits, 108 hours.

| Practice phase | Types of work in practice, including independent work of students | Labor intensity (in hours) | Monitoring forms |
|---|---|---|---|
| Preparatory (organizational) stage:<br>– obtaining documents for practice (direction, diary, individual assignment);<br>– arrival at the practice site and passing the introductory and initial briefing;<br>– organization of the workplace and getting to know the team. | – orientation lecture;<br>– safety briefing. | 2 h<br>2 h | diary entry; answers on questions |
| The main stage:<br>– study of the organizational structure of the practice base;<br>– study of the management structure of an enterprise (organization, institution);<br>– familiarization with the research and production structure and program of the enterprise, prospects and plans for its development;<br>– familiarization with plans to expand the range and improve the quality of services provided by the enterprise;<br>– performance of a technical assignment for a diploma design or a thesis scientific work;<br>– conducting a patent search and review of literature on the topic of attestation work;<br>– selection and study of regulatory and technical documents and reference materials required for use in the performance of certification work;<br>– development of a program and methodology for experimental research;<br>– carrying out (if possible) experimental work on key issues of certification work;<br>– participation in the solution of individual production and scientific tasks of the enterprise (organization, institution). | – safety briefing at the enterprise;<br>– performing practice assignments in accordance with the program and individual assignment;<br>– study of materials and documents at the place of internship;<br>– processing and analysis of the received practice materials. | 2 h<br>40 h<br>20 h<br>20 h | diary entry; answers on questions |

| | | | |
|---|---|---|---|
| Final stage:<br>– processing and systematization of the received material;<br>– preparation of a report on the passage of pre-diploma practice;<br>– defense of the report on undergraduate practice. | – systematization of the material;<br>– registration of an individual assignment;<br>– writing a report;<br>– preparation of presentation;<br>– protection of the report. | 8 h<br>6 h<br><br>6 h<br>2 h | graded credit |

## 8. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF INDEPENDENT WORK OF STUDENTS ONPRE-DIPLOMA PRACTICE

The pre-diploma practice is aimed at familiarizing students with the research and production structure and program of the enterprise, the prospects for its development, at preparing the student for the independent solution of scientific and technological problems and for completing the final certification work.

During undergraduatepractice, regardless of the place of its passage, students should pay special attention to issues related to life safety, Undergraduate program and industrial sanitation. For this, it is necessary to consider the principles of state and public control over the observance of labor legislation, the organization of the life safety service and its tasks.

Undergraduate practice begins with the compilation of a general description of the enterprise (organization, institution), which includes the history of its development, structure, program of production activities, analysis of the management scheme, study of promising directions of development.

The acquisition of skills and experience in research activities in the field of molecular biotechnology should be carried out through the following types of work:

1) analysis of biomedical and scientific and technical information in the field of molecular biotechnology;

2) analysis of patent literature;

3) participation in planning and conducting biomedical experiments according to a given methodology, processing the results using modern information technologies and technical means;

4) participation in computational experiments using standard software in order to obtain mathematical models of biological and biotechnical processes and objects;

5) preparation of data, preparation of reports and scientific publications based on the results of the work carried out;

6) participation in the implementation of the results in biomedical practice;

7) participation in the organization of the protection of intellectual property objects and the results of research and development as a commercial secret of the enterprise.

An individual task (Appendix 1) is given to a student at the university by the head of the practice before the start of the practice. It should be aimed atcollection and analysis of biomedical and scientific and technical information, as well as generalization of domestic and foreign experience in the field of molecular biotechnology, analysis of patent literature, preparedkuoriginalwowmaterialbutfor graduationOhqualificationOhworkss.

## 9. FORMS OF CERTIFICATION (ON THE RESULTS OF PRACTICE)

Before passing the undergraduate practice, the student receives an individual task from the head of the practice from the university, the content and scope of which is negotiated with the head of the practice.

Based on the results of practice, the student draws up a report on the passage of the practice, participates in the final conference with the presentation of the results of the practice, and then receives a credit with an assessment.

**The practice report should contain the following elements:**

− title page (Appendix 3);

− assignment and schedule of practice (Appendix 1);

− a document confirming the fact of passing the practice;

− a description drawn up by the head of the practice from an organization or structural unit, if the practice is conducted on the basis of FEFU;

− content;

− introduction;

− the main part about the activities in the process of passing the internship (including the experimental part with methods and research results);

− completed individual task;

− conclusion;

− information sources;

The report is drawn up in accordance with the "Requirements for the design of written work performed by students and students of FEFU".

**The approximate structure of the main part of the report:**

1. General information about the enterprise (organization, institution) and its brief description (history, geographical location, structure of the organization and its individual divisions, a list of main divisions indicating their purpose, information about the main services of the enterprise, information about the organization of work of small groups of performers).

2. Analysis of biomedical and scientific and technical information in the field of molecular biotechnology.

3. Analysis of the patent literature.

4. Description of biomedical experiments according to a given method, processing of results using modern information technologies and technical means.

5. Description of computational experiments using standard software to obtain mathematical models of biological and biotechnical processes and objects.

6. Description of the implementation of the results in biomedical practice.

7. Description of the organization of protection of intellectual property objects and the results of research and development as a commercial secret of the enterprise.

8. Conclusion.

By agreement with the head of the practice from the university and depending on the place of this type of practice, the structure of the report or its individual parts may change.

After completing the internship and completing the report in accordance with the requirements, the student submits his report for the protection of the head from the university. Based on the results of the defense, a test is given with an assessment (excellent, good, satisfactory, unsatisfactory):

“Excellent” - the necessary practical work skills and professional competencies provided by the program of educational practice are fully formed, the tasks are completed, the quality of their implementation is assessed by the number of points close to the maximum.

"Good" - the necessary practical work skills and professional competencies provided by the program of educational practice are fully formed, the tasks are completed, the quality of the performance of none of them is not assessed by the minimum number of points, some types of tasks were performed with errors or insufficiently thoroughly.

“Satisfactory” - the necessary practical work skills and professional competencies are basically formed, the gaps are not significant, some of the completed tasks contain errors.

"Unsatisfactory" - the necessary practical skills and professional competencies provided for by the program of educational practice are not formed, all completed study tasks contain gross errors, additional independent work on the

report materials will not lead to any significant improvement in the quality of assignments.

## 10. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT OF PRE-DIPLOMA PRACTICE

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## 11. MATERIAL AND TECHNICAL SUPPORT OF PRE-DIPLOMA PRACTICE

Scientific laboratories for biomedical cell technologies, equipped with the following equipment:

– Robotic system for automated cultivation of cells CompacT SelecT SC - ARM, with a module for preparing a plate for analysis, THE AUTOMATION PARTNERSHIP;

– System for continuous monitoring of living cells in culture, formation and analysis of images Cell-IQ MLF, Chip Technologies, Czech Republic;

– FluoView FV1200MPE deep optical imaging system for biomaterials (FV12M-5XX-ZXX);

– Personal CO2 incubator - with a system for monitoring and increasing the vitality of Galaxy cells (CO48R-230-1200);

– Spectrophotometer with accessories for sample processing BioSpectrometer-kinetic;

– CFX96 Touch Real Time System device for polymerase chain reaction with detection of amplification products in "real time" mode;

– System for volumetric fixation and preparation of deposited biosamples included in the Volume Fixation System;

– Multimodular station for rotary sedimentation processing of samples Sediment Modules;

– Automated system Biacore X100 System for the analysis of intermolecular interactions with a set of additional parts and software;

– Ion S5 ™ XL System for DNA Sequence Analysis + Starter kit for testing and commissioning the system;

– Genetic analyzer Applied Biosystems 3500 + Starter kit consumables for testing and commissioning the system;

– High-speed cell sorter MoFlo Astrios EQ + A set of consumables starter kit for testing the performance and commissioning of the system;

– System for preparation of samples for whole genome sequencing Ion Chef ™ Instrument + A set of consumables starter kit for validation and commissioning of the system.

For persons with disabilities and disabled people, the choice of places for training is consistent with the requirement of their accessibility for these students and the practice is carried out taking into account the peculiarities of their psychophysical development, individual capabilities and state of health.

**Compiled by:**

Associate Professor, Cand. biol. sciences,
Head of EP Molecular Biotechnology V.V. Kumeiko

**The internship program was discussed at a meeting of the Department of Medical Biology and Biotechnology,**

**Minutes dated February 19, 2021 No. 6.**

ATTACHMENT 1

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

**I APPROVE:**
Head of OP
_____
_____FULL NAME.
"____" _____20__

# INDIVIDUAL MISSION

by _____
(type of practice)

student _____ group _____
(Name of student)

Educational program _____

Base (place, organization) of practice _____
_____

Dates of practice from _____20___ to _____ 20___

| | |
|---|---|
| Generalized formulation of the task | |

Schedule for the task

| The name of the tasks (activities) that make up the task | Date of completion of the task (event) |
|---|---|
| one. | |
| 2. | |
| 3. | |
| | |

Practice leader _____ _____
*signature, full name, position*

APPENDIX 2

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

# DIARY

according to _____

practice

student _____ group _____

program_____

Place of practice _____

Practice period _____ weeks _____

Practice head from FEFU

_____

Practice manager from a specialized organization

_____

1. Student work schedule

| No. p \ p | Name of works | Calendar dates | | Surname of the head of practice |
|---|---|---|---|---|
| | | Start | ending | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

2. Student work diary

| date | A summary of the trainee's work | Signature the head |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

3. Results of report protection

The report is protected by "____" _____ 20___

Rated _____

Head of EP _____ AND ABOUT. Surname

APPENDIX 3

**Practice Report Cover Page Form**

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

The report is protected with a rating of
_____
"_____" _____ 20__

Leader
educational program
_____ AND ABOUT.
Surname

**REPORT**
**about passing** undergraduate **practice**

_____
(full name of the profile organization)

Group student _____ _____ (_____)
*Signature name*
Practice leader
from the profile organization _____ (_____)
*Signature name*
Practice leader
from FEFU _____ (_____)

*Signature name*

APPENDIX 4

## Internship referral form

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
**Far Eastern Federal University**
(FEFU)

**SCHOOL OF BIOMEDICINE**
**DEPARTMENT** _____

# DIRECTION
**for undergraduate practice**

**4-year undergraduate student (s)**
**Last name First name Patronymic of the group _____**
**(Full Name)**

sent to _____
name of the parent organization

address _____

Order on the direction to pre-diploma practice from No.
for _____ practice
in the field of training _____
for a period of
***from _____ 20 ___.***until _____ 20___ (continuous / discrete)

Head of undergraduate practice

M.P. _____ _____ _____
(position, academic title) (signature) (I.O.F)

**Notes on the implementation and terms of practice**

| Company name | Arrival and departure mark | Signature, decryption of signature, seal |
|---|---|---|
| *Name of the enterprise, organization in accordance with the contract* | Arrived on __.__. 20__ | |
| | Retired on __.__. 20__ | |