



MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION
Federal state autonomous educational institution
of higher education
«Far Eastern Federal University»
(FEFU)

SCHOOL OF BIOMEDICINE

«AGREED»

Head of education program
«General medicine»



(signature) Khotimchenko Yu.S.
(Full name)
«09» of July 2019

«APPROVED»

Director of the Department of Clinical
Medicine



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«09» of July 2019



WORKING PROGRAM OF ACADEMIC DISCIPLINE (WPAD)

«Medical materials and products»

Education program

Specialty 31.05.01 «General medicine»

Form of study: full time

Year 2, semester 3
Lectures 18 hours
Practical classes 54 hours
laboratory works not provided
total amount of in-classroom works 72 hours
including using MAO 8.
independent self-work 72 hours
reference works not provided
control work not provided
exam – 3 semester

The working program is drawn up in accordance with the requirements of the Federal state educational standard of higher education (level of training), approved by the order of the Ministry of education and science of the Russian Federation from 09.02.2016 № 95.

The working program of the discipline was discussed at the meeting of the Department of fundamental and clinical medicine. Protocol No. 8, 09 of July 2019

Author: M.D., professor Serebrenaya N.B.

ANNOTATION

The discipline “Medical materials and products” is intended for students enrolled in the educational program 31.05.01 “General Medicine”, is included in the variable part of the curriculum by the discipline of choice, is implemented in the 2nd year in the 3rd semester. The total complexity of the discipline is 108 hours, 3 credit units. The curriculum provides 18 hours of lectures, practical classes (54 hours), independent student work (72 hours).

In developing the work program of the discipline, the Federal State Educational Standard of Higher Education in the specialty 31.05.01 “General Medicine” was used, the curriculum for training specialists in the specialty 31.05.01 “General Medicine”.

The study of the discipline is based on the knowledge acquired as a result of mastering the following disciplines of the Base Education Program: «Biology», «General and Medical Genetics», «Morphology: Human Anatomy, Histology, Cytology», «General and Medical Chemistry». The acquired knowledge and skills are necessary for the development of the following disciplines: «Surgery», «Internal diseases», «Neurology and psychiatry», «Pediatrics», «Technologies of reproductive medicine», etc.

The purpose of mastering the discipline: to familiarize students with modern materials for medical purposes and products from them.

Tasks of mastering the discipline:

1. Expanding the outlook of students in the field of medical materials science at the present stage of development of medical and pharmaceutical science;
2. Formation of knowledge about the interaction of various materials and products with living tissue
3. Formation of students' ability to determine the purpose and the possibility of using medical devices in medical and diagnostic practice

Competence and its	Stages of competence formation
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code		
GPC-11 readiness for the use of medical products under the procedures for providing medical care	Knows	Properties and purpose and the possibility of using medical products and equipment provided by the procedures for providing medical care
	Able to	Determine the purpose and the possibility of using medical devices and equipment provided by the procedures for providing medical care
	Masters	Skill in determining the purpose and possibility of using medical products and equipment as provided by the procedures for providing medical care
PC-22 willingness to participate in the introduction of new methods and techniques aimed at protecting the health of citizens	Knows	The current state of the medical industry and the main types of manufactured medical equipment
	Able to	Identify the possibilities of new methods and techniques aimed at protecting the health of citizens
	Masters	Skillful application of some methods and techniques aimed at protecting the health of citizens.

I. THE STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE

Module 1. Medical materials and their properties

Lecture 1. Introduction to medical materials. Medical supplies - special purpose materials. Analysis of the characteristics of the use of materials in biotechnical systems and medicine. Properties of materials and their combination, necessary for their use in medicine.

Lecture 2. General properties of materials for medical purposes. Mechanical properties. Chemical properties. Electrical properties. Magnetic properties. Resistance of materials to various influences.

Lecture 2. General properties of materials for medical purposes. Mechanical properties. Chemical properties. Electrical properties. Magnetic properties. Resistance of materials to various influences.

Lecture 4. Non-metallic materials for medical purposes. Non-metallic, polymeric materials, glass. Processing and production of products from them. Marking of materials Dielectric materials for various purposes: plastics, elastomers, materials based on fibers, plastics, glass and ceramics.

Module 2. Interaction of living tissue and medical products

Lecture 5. Properties of living tissues. Features of a living organism. Biological properties of living tissue. Classification of living organisms by the nature of electrical conductivity. Magnetic properties of biological objects. Optical properties of living tissue. Acoustic properties of living tissue.

Lecture 6. Compatibility of materials with biological media. Requirements for materials for biomedical applications. Biological compatibility: cellular reactions to foreign bodies; material toxicity; tumor formation. The stability of the functional properties of materials: metal corrosion, destruction of polymers, sterilization treatment.

Module 3. Basic requirements for medical devices

Lecture 7. Basic requirements for surgical instruments. General surgical instruments. Classification. Cutting and clamping tools. Classification. Purpose Raw material Commercial types, design features. Requirements. Packaging, labeling, storage. Surgical needles. Types of needles. Stitching machines. Requirements. Sterilization. Instruments and apparatus for punctures, injections, transfusions, suction. Syringes, tubular needles. Requirements. Sterilization. Expanding, pushing and other tools. Classification. Purpose Raw material Design features. Requirements. Packaging, labeling, storage.

Lecture 8. Requirements for dental, ophthalmological and ENT instruments. ENT instruments. Ophthalmic instruments. Purpose Raw material Commodity types. Design features. Dental instruments. Purpose Raw material Commodity types. Design features. Requirements. Packaging, labeling, storage.

Lecture 9. Requirements for urological and obstetric-gynecological instruments.

Urological instruments. Obstetric and gynecological instruments. Purpose Raw material Commodity types. Design features. Requirements. Packaging, labeling, storage.

II. THE STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE

Lesson 1. Introduction to medical equipment. The role and place of technical means in modern medical and diagnostic processes. Basic terms and concepts of discipline. Classification of medical equipment. The structure of electronic equipment for measuring biomedical indicators. Trends in the development of modern medical technology.

Lesson 2. Equipment for the study of biopotentials. Devices and systems for the study of biopotentials: basic research methods; general principles of construction of devices and systems for the study of biopotentials: electrocardiographs, Holter monitors, equipment for automatic analysis of electrocardiograms. MPASK for the study of the nervous system: electroencephalograph and electromyography, classification and main components of the electroencephalograph; requirements for EEG equipment. Technical means of studying the electrical activity of muscle tissue: instruments for measuring the parameters of the musculoskeletal system and parameters of the digestive system; electromyograph, electrogastrograph.

Lesson 3. Apparatus for the study of hemodynamics. Devices and systems for the study of hemodynamics: instruments for measuring pressure, blood filling and pulse of blood vessels; rheography, principles of construction of equipment for eographical research, reograf, reoplethysmograph, plethysmography; methods of analysis of hemodynamics and apparatus based on the Doppler effect.

Lesson 4. Apparatus for examining the respiratory system Instruments for examining the respiratory system: indicators of respiratory function, spirometry; spirometers, device and principle of operation; instrumentation for measuring flow rate and volume; gas exchange study.

Lesson 5. Apparatus for examining hearing, temperature, and functional systems of the body during physical exertion. Techniques for examining hearing: diagnostic apparatus for examining hearing; objective and subjective methods of hearing research; audiometers classification. Devices and systems for temperature measurement: the basic principles and features of measuring the temperature of a bio-object; thermometer designs; electronic digital thermometer. Dynamometer and ergometry; equipment and instrument complexes for the study of the state of

the functional systems of the body during physical exertion; systems for the study of biomechanical indicators; podometric systems; technical means for fitness complexes.

Lesson 6. X-ray diagnostic systems Classification of X-ray machines. X-ray machines and their main units. X-ray tubes. Characteristics and designations. X-ray emitters. Feeding devices. Digital radiography. Apparatus for fluorography and radiography. Complexes and systems for conducting angiographic and X-ray endoscopic examinations. Computer tomographs: stages of development, principle of operation, classification, device and varieties.

Lesson 7. Ultrasonic diagnostic equipment Classification and device of ultrasonic diagnostic equipment. The main modes of operation. Features of ultrasound scanning. Ultrasonic transducers. scanning methods. Formation of an ultrasonic beam, transmission, reception and processing of signals.

Lesson 8. Apparatus for magnetic resonance, radioisotope and thermal diagnostics Nuclear magnetic resonance physics. Magnetic resonance diagnostic tools. Receipt, registration and reconstruction of NMR images. Equipment for spatial NMR spectroscopy. Problems arising from the creation of NMR equipment. Safety issues in NMR diagnostics. Magnetic resonance tomographs. Radionuclide technology. Basic research methods and equipment. Automatic sample changers. Radiographs, scanners, gamma scintillation cameras. Safety issues when using equipment for radioisotope diagnostics. Instruments and complexes for thermal diagnostics: Thermal imagers and thermographs. The principle of operation and device. Apparatus for imaging tissue images by electrical impedance distribution Methods for imaging impedance distribution. Impedance tomograph.

Lesson 9. Endoscopic and television medical equipment Obtaining an optical image of the internal organs and their cavities. The main endoscopic devices and systems for various areas of clinical medicine (endoscopes, ophthalmoscopes, laparoscopes, etc.). The use of TV systems in the tasks of optical imaging. systems in the practice of laboratory studies (analysis of morphological preparations in histology, cytology, microbiology, immunology, hematology).

Lesson 10. Therapeutic apparatus acting on electric current. Classification of therapeutic equipment. Therapeutic effects of physical factors of different nature. Therapeutic apparatus for the treatment of currents of various shapes and frequencies Purpose, basic methods, principle of operation and design of devices for therapy with currents of various shapes and frequencies (galvanization, electrophoresis, electro-electric, amplipulse therapy, etc.). Reflexotherapy equipment: electroacupuncture. The principle of therapeutic effects of electric current on biologically active points. Reflexotherapy equipment.

Lesson 11. Therapeutic apparatus for the treatment of electric, electromagnetic and magnetic fields. Equipment for magnetotherapy, inductothermy, micro- and DCV-therapy, UHF-, UHF-, EHF-therapy. Instruments for laser therapy: devices and methods based on the effects of laser radiation. The impact of laser radiation on biological objects. Laser therapy Classification and device of laser therapy. UV and IR radiation equipment.

Occupation. 12. Ultrasonic therapeutic equipment Devices based on the effects of ultrasonic radiation: The impact of ultrasound radiation on biological objects. Ultrasonic therapeutic devices Classification and device of medical ultrasound equipment. Dental equipment using the phenomenon of ultrasound. Features of the application.

Session 13. Apparatus for radiation, cryo and barotherapy The effects of radioactive radiation on biological environments. Devices and complexes for radiation therapy. Devices based on the action of low temperatures: the effect of low temperatures on biological objects. Apparatus for hypothermia. Cryosurgery equipment. Equipment for hyperbaric oxygenation.

Lesson 14. Surgical equipment. The use of physical fields for the destruction of biological tissues. Laser ultrasonic and electric high-frequency "scalpels". Technical equipment for surgery and microsurgery.

Lesson 15. Mechanical ventilation equipment The process of gas exchange in the lungs. Artificial ventilation. The principle of construction and the main units of anesthesia and respiratory equipment.

Lesson 16. Blood circulation and extracorporeal blood purification equipment. Artificial blood circulation. The principle of the construction of the artificial blood circulation apparatus and oxygenation. Extracorporeal blood purification equipment Principles of hemosorption. Hemodialysis and ultrafiltration. Plasmapheresis. Requirements for blood purification equipment. The principle of designing blood purification equipment. Artificial kidney. The principle of magnetosorption. Equipment for magnetosorption. Equipment for blood fractionation.

Lesson 17. Equipment for correction of hearing and speech impairment Equipment for correction of hearing impairment. Hearing Aids. Equipment for the correction of speech disorders.

Lesson 18. Equipment for pacing and artificial organs of the cardiovascular system. Methods for the correction of disturbances in the work of pacemakers. Pacemakers. Classification, design, basic requirements. Instruments for monitoring the parameters of implantable pacemakers. Defibrillators. Artificial replacement organs of the cardiovascular system. Artificial heart. Artificial heart valves. Classification, principles of operation. Technical means of angioplasty. Main directions and development trends of MPAS

III. TRAINING AND METHODOLOGICAL SUPPORT OF INDEPENDENT WORK OF STUDENTS

The educational and methodological support of students' independent work in the discipline “Medical materials and products” is presented in Appendix 1 and includes:

the schedule for the performance of independent work on the discipline, including approximate norms of time for execution for each task;

characteristics of tasks for independent work of students and methodological recommendations for their implementation;

requirements for the presentation and presentation of the results of independent work;

criteria for assessing the performance of independent work.

IV. MONITORING THE ACHIEVEMENT OF THE COURSE OBJECTIVES

No.	Controlled modules / sections / topics of the discipline	Codes and stages of competence formation		Evaluation tools	
				Current control	Interim certification / examination
1	Module 1. Medical materials and their properties Module 3. Basic requirements for medical devices	GPC-11 readiness for the use of medical products under the procedures for providing medical care	knows	Questioning, Presentation	Credit question 1-34
			able to	IT №1 Test	
			masters	Report	
2	Module 1. Medical materials and their properties Module 3. Basic requirements for medical devices	PC-22 willingness to participate in the introduction of new methods and techniques aimed at protecting the health of citizens	knows	Questioning, Presentation	Credit question 35-48
			able to	OA-1 Interview	
			masters	Report	

Control and methodological materials, as well as criteria and indicators necessary for the assessment of knowledge, skills and characterizing the stages of formation of competencies in the process of development of the educational program are presented in Appendix 2.

V. LIST OF TEXTBOOKS AND METHODOLOGICAL SUPPORT OF THE DISCIPLINE

Main literature

1. Progress in the Chemistry of Organic Natural Products / Springer International Publishing Switzerland 2016
<https://link.springer.com/book/10.1007/978-3-319-33172-0#editorsandaffiliations>
2. Synthetic and Biophysical Studies on the Tridachiahdropyrone Family of Natural Products / Springer International Publishing Switzerland 2016
<https://link.springer.com/book/10.1007/978-3-319-22069-7#authorsandaffiliationsbook>

Additional literature:

1. Ethics and Epistemology in Big Data Research / Springer Netherlands 2016
<https://link.springer.com/article/10.1007/s11673-017-9771-3>
2. Perspective from Industry: AROMICS / Springer, Cham 2018
https://link.springer.com/chapter/10.1007/978-3-319-66647-1_5

The list of resources information and telecommunications network

"Internet"

1. Scientific Electronic Library e-Library [Electronic resource] / Access Mode:
<http://elibrary.ru/defaultx.asp>
2. Electronic physical encyclopedia [Electronic resource] // Access mode: <http://femto.com.u/index1.html>

LIST OF INFORMATION TECHNOLOGIES AND SOFTWARE

The location of the computer equipment on which the software is installed, the number of jobs	List of licensed software
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<p>Multimedia auditorium Vladivostok Russian island, Ayaks 10, building 25.1, RM. M723 Area of 80.3 m2 (Room for independent work)</p>	<p>Windows Seven enterprice SP3x64 Operating System Microsoft Office Professional Plus 2010 office suite that includes software for working with various types of documents (texts, spreadsheets, databases, etc.); 7Zip 9.20 - free file archiver with a high degree of data compression; ABBYY FineReader 11 - a program for optical character recognition; Adobe Acrobat XI Pro 11.0.00 - software package for creating and viewing electronic publications in PDF; WinDjView 2.0.2 - a program for recognizing and viewing files with the same format DJV and DjVu.</p>
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METHODICAL INDICATIONS ON THE DEVELOPMENT OF DISCIPLINE

Work at the lecture. The main task in listening to a lecture is to learn to think, to understand the ideas presented by the lecturer. Lectures are one of the main types of studies in high school. The lectures mainly studies theoretical material. The introduction of new technical means and programmed instruction into the educational process should improve the quality and effectiveness of the lectures. Nevertheless, the well-known specialist in the field of mechanics, Professor V.L. Kirpichev argued that "as long as humanity lives, live speech and the transmission of the provisions of science by this speech will not be silent."

Two forms of lectures are possible: first, the student is acquainted in advance with the content of the lecture on literature recommended by the lecturer; the second - the student comes to the lecture, not knowing what it will be about. The first form is ideal for learning theoretical material, but in practice it is rare. More often the second form takes place.

Lecture recording. It is considered to be necessary to write down the main, the main thing in the lecture. It's right. But what is the main thing? If a student does not prepare for a lecture, he does not know its content, therefore it is sometimes difficult to select the most important thing during the lecture itself.

One of the central physical concepts is the concept of a physical phenomenon. In one lecture, two or three physical phenomena are usually considered. Therefore, it is important to note the moment when the lecturer begins to talk about a

particular physical phenomenon. The presentation of the essence of the physical phenomenon of the lecturer begins with the characteristics of its quality. The lecturer usually formulates the essence of the phenomenon after the demonstration of experience, the drawing on the board (the drawing allows you to visualize the essence of the phenomenon), or after the verbal formulation of the phenomenon. The quality of a phenomenon is structurally determined by three major elements: the physical system, the characteristics of the system objects and the physical processes that occur in the system. These elements of the quality of the phenomenon must be recorded in its outline.

Next, it is necessary to note the moment of transition to the presentation of the quantitative aspect of the phenomenon, when the lecturer will begin to derive the basic physical law. Usually, the basic statements of the physical model of the phenomenon are first formulated, additional assumptions are made, or conditions are formulated. Then everything goes according to the usual scheme: the corresponding physical laws are applied, and a closed system of equations is compiled; then comes the stage of mathematical transformations, as a result of which an analytical expression of the desired physical law is obtained. What is important in the quantitative aspect of phenomena? First, these are the basic elements of the physical model, additional assumptions and conditions. Secondly, it is a record of basic physical laws. The stage of mathematical transformations, mathematical calculations can be partially fixed. Thirdly, this is the final analytical expression of the law.

Then we can talk about the consequences of the law, the practical application of this phenomenon.

Extracurricular work on the outline. It would be nice to process the outline on the same day or the next day. To restore all intermediate calculations missed on lectures at conclusions of laws. It is necessary to analyze the law (definitions of physical quantities, physical meaning, conditions of applicability, practical application of laws), as well as the quantitative aspect and possibilities of practical application of all physical phenomena that were discussed in the lecture.

Questions to the lecturer. At the lecture, you can ask questions in written and oral forms, at the end of the lecture and during the presentation of the material. Questions are an important element of the lecture. They help to establish closer contact between the lecturer and the audience. The content of the questions should reflect the material of this lecture or the previous one. The wording of the questions should be clear and concise. The question should be specific. General questions are useless. For example, a lecturer, for a long time, say, for forty minutes, derived a complex physical law. A question arrived: "I don't understand the conclusion of the law. Can it be repeated?" The question is general and non-specific. It can not be that the student was not clear everything, all the calculations and stages. Unclear, as a rule, any one element, stage. This is the element that the lecturer must pay attention to.

MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

For practical work, as well as for the organization of independent work, students have access to the following laboratory equipment and specialized classrooms that meet applicable sanitary and fire regulations, as well as safety requirements during educational and research and production work:

Name of equipped premises and rooms for independent work.	List of main equipment
Computer class of the School of Biomedicine aud. M723, 15 jobs	Screen with an electric drive 236 * 147 cm Trim Screen Line; DLP Projector, 3000 ANSI Lm, WXGA 1280x800, 2000: 1 EW330U Mitsubishi; The subsystem of specialized fixing equipment CORSA-2007 Tuarex; Video switching subsystem: DVI DXP 44 DVI Pro Extron matrix switcher; DVI extension cable for twisted pair DVI 201 Tx / Rx Extron; Audio switching and sound reinforcement subsystem; ceiling speaker system SI 3CT LP Extron; DMP 44 LC Extron digital audio processor; extension for IPL control controller T CR48; Wireless LANs for students are provided with a system based on 802.11a / b / g / n access points 2x2 MIMO (2SS). Monoblock HP RgoOpe 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
690922, Primorsky Krai, Vladivostok, Russky	Multimedia audience: Monoblock Lenovo C360G-i34164G500UDK; Projection screen

<p>Island, Saperny Peninsula, Ajax Village, 10, Multimedia audience</p>	<p>Projecta Elpro Electrol, 300x173 cm; Multimedia projector, Mitsubishi FD630U, 4000 ANSI Lumen, 1920x1080; Mortise interface with TLS TAM 201 Stan automatic cable retractor; Document Camera Avervision CP355AF; Sennheiser EW 122 G3 UHF range microphone microphone wireless system as part of a wireless microphone and receiver; Video conferencing codec LifeSizeExpress 220- Codeconly- Non-AES; Network video camera Multipix MP-HD718; Dual LCD panels 47 ", Full HD, LG M4716CCBA; Audio switching and sound reinforcement subsystem; centralized uninterrupted power supply</p>
<p>Reading rooms of the FEFU Scientific Library with open access to the Foundation (Building A - Level 10)</p>	<p>Monoblock HP RgoOpe 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 Mbit / s. Jobs for people with disabilities are equipped with braille displays and printers; equipped with: portable devices for reading flat-print texts, scanning and reading machines with a video optimizer with adjustable color spectra; magnifying electronic loops and ultrasonic markers</p>

In order to provide special conditions for the education of persons with disabilities and persons with disabilities in FEFU, all buildings are equipped with ramps, elevators, lifts, specialized places equipped with toilet rooms, information and navigation support plates.



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**TRAINING AND METHODOLOGICAL SUPPORT OF INDEPENDENT
WORK OF STUDENTS**
on discipline «Medical materials and products»
Specialty 31.05.01 «General medicine»
Form of study: full time

**Vladivostok
2016**

Schedule of independent work on the discipline:

No.	Date / Deadline	Type of independent work	Estimated norms of time for execution (hour)	Form of control
1	During the semester	Essay writing Writing a literature review on the topic Preparation of presentations on the topic of the abstract	9	Abstract text file Presentation on the abstract Text and electronic version of the literary review of the abstract
3	Session	Exam preparation	63	Exam

Approximate guidelines for writing and design of an essays

Essay is a creative activity of the student reproducing in its structure the research activities to solve theoretical and applied problems in a particular branch of scientific knowledge. That is why the course certification work is an essential component of the educational process in higher education.

The essay is a model of scientific research, independent self-work in which a student solves a problem of a theoretical or practical nature, applying the scientific principles and methods of a given branch of scientific knowledge. The result of this scientific search may have not only subjective, but also objective scientific novelty, and therefore can be presented for discussion by the scientific community in the form of a scientific report or presentation at scientific-practical conferences, as well as in a form of research article.

Essay involves the acquisition of skills for building business cooperation, based on ethical standards of scientific activity. Purposefulness, initiative, disinterested cognitive interest, responsibility for the results of their actions, conscientiousness, competence - personality traits that characterize the subject of research activities corresponding to the ideals and norms of modern science.

The essay is an independent educational and research activity of the student. The teacher assists in a consultative manner and assesses the process and the results of the activity. Teacher provides an approximate topic of the essay work, specifies the problem and topic of research with a student or intern, helps to plan

and organize research activities, assigns time and a minimum number of consultations.

The teacher receives the text of the essay for verification at least ten days before the defense.

Generally there is a certain structure of the essay, the main elements of which in order of their location are the following:

1. Title page.
2. Goal.
3. Table of Contents
4. List of abbreviations, symbols and terms (if necessary).
5. Introduction.
6. Main part.
7. Conclusion.
8. Reference list.
9. Appendixes.

The title page contains educational institution, graduating department, author, teacher or supervisor, research topic, place and year of the essay.

The title of the essay should be as short as possible and fully consistent with its content.

The table of contents (content) reflects the names of the structural parts of the essay and the pages on which they are located. The table of contents should be placed at the beginning of work on one page.

The presence of a detailed introduction - a mandatory requirement for the abstract. Despite the small volume of this structural part, its preparation causes considerable difficulties. However, this is a qualitatively executed introduction that is the key to understanding the entire work, which testifies to the professionalism of the author.

Thus, the introduction is a very crucial part of the essay. The introduction should start with a justification of the relevance of the chosen topic. As applied to the essay, the concept of "relevance" has one feature. From how the author of the

essay can choose a topic and how correctly he understands and evaluates this topic from the point of view of modernity and social significance, characterizes his scientific maturity and professional preparedness.

In addition, in the introduction it is necessary to isolate the methodological basis of the essay, name the authors, whose works constituted the theoretical basis of the study. A review of the literature on the topic should show the author's thorough acquaintance with special literature, his ability to systematize sources, critically examine them, highlight the essential and determine the most important in the up-to-date state of knowledge of the topic.

The introduction reflects the importance and relevance of the chosen topic, defines the object and subject, purpose and objectives, and the chronological framework of the study.

The introduction ends with a statement of the general conclusions about the scientific and practical significance of the topic, the degree of its knowledge and sources, and the hypothesis being put forward.

The main part describes the essence of the problem, reveals the topic, determines the author's position, factual material is given as an argument and for display of further provisions. The author must demonstrate the ability to consistently present the material while analyzing it simultaneously. Preference is given to the main facts, rather than small details.

The essay ends with the final part called "conclusion". Like any conclusion, this part of the essay serves as a conclusion due to the logic of the study which is a form of synthesis accumulated in the main part of scientific information. This synthesis is a consistent, coherent presentation of the results obtained and their relation to a common goal and specific tasks set and formulated in the introduction. At this place there is a so-called "output" knowledge, which is new in relation to the original knowledge. The conclusion may include suggestions of practical matter, thereby increasing the value of theoretical materials.

So, the conclusion of the essay should contain: a) presents the conclusions of the study; b) theoretical and practical significance, novelty of the essay; c) indicated the possibility of applying the results of the study.

After conclusion it is acceptable to place the reference list of the literature used throughout. This list is one of the essential parts of the essay and reflects the independent creative work of the author of the essay.

The list of sources used is placed at the end of the work. It is made either in alphabetical order (by the name of the author or the name of the book), or in the order in which the references appear in the text of the prepared work. In all cases, the full title of the work, the names of the authors or the editor of publication are indicated if the writing team involved a group of authors, data on the number of volumes, the name of the city and publisher in which the work was published, year of publication, number of pages.

Methodical recommendations for the presentation preparation

For preparation of presentation it is recommended to use: PowerPoint, MS Word, Acrobat Reader, LaTeX-bev package. The simplest program for creation of presentations is Microsoft PowerPoint. To prepare a presentation, it is necessary to process the information collected while writing the essay.

The sequence of preparation of the presentation:

1. Clearly state the purpose of the presentation.
2. Determine what the presentation format will be: live presentation (then how long it will be) or e-mail (what will be the context of the presentation).
3. Select the entire content of the presentation and build a logical chain of presentation.
4. Identify key points in the content of the text and highlight them.
5. Determine the types of visualization (pictures) to display them on slides in accordance with the logic, purpose and specificity of the material.
6. Choose the design and format the slides (the number of pictures and text, their location, color and size).

7. Check the visual perception of the presentation.

The types of visualization include illustrations, images, charts, tables. The illustration is a representation of a real-life visual. The images - as opposed to illustrations - are metaphor. Their purpose is to cause an emotion and create an attitude towards it, to influence the audience. With the help of well-designed and presented images, information can remain permanently in a person's memory. Chart is visualization of quantitative and qualitative relationships. They are used for convincing data demonstration, for spatial thinking in addition to the logical one. Table is a specific, visual and accurate data display. Its main purpose is to structure information, which sometimes facilitates the perception of data by the audience.

Practical hints on preparing a presentation

- printed text + slides + handouts are prepared separately;
- slides -visual presentation of information that should contain a minimum of text and maximum of images that bring a meaning, to look visually and simply;
- textual content of the presentation - oral speech or reading, which should include arguments, facts, evidence and emotions;
- recommended number of slides 17-22;
- mandatory information for the presentation: the subject, surname and initials of the speaker; message plan; brief conclusions from all that has been said; list of sources used;
- handouts should be provided with the same depth and coverage as the live performance: people trust more what they can carry with them than disappear images, words and slides are forgotten, and handouts remain a constant tangible reminder; handouts are important to distribute at the end of the presentation; Handouts should be different from slides, should be more informative.

Evaluation criteria for essays.

The stated understanding of the essay as a holistic copyright text defines the criteria for its evaluation: the novelty of the text; the validity of the source choice; the degree of disclosure of the issue essence; compliance with the requirements for registration.

Essay novelty: a) the relevance of the research topic; b) novelty and independence in the problem formulation, formulation of a new aspect of the well-known problem in the establishment of new connections (interdisciplinary, intra-subject, integration); c) ability to work with research and critical literature, systematize and structure research material; d) the appearance of the author's position, independence of assessments and judgments; d) stylistic unity of the text, the unity of genre features.

The degree of disclosure of the question essence: a) the plan compliance with an essay; b) compliance with the content of topic and plan of an essay; c) completeness and depth of knowledge on the topic; d) the validity of the methods and techniques of work with the material; e) ability to generalize, draw conclusions, compare different points of view on one issue (problem).

The validity of the source choice: a) evaluation of the used literature: whether the most famous works on the research topic are involved (including recent journal publications, recent statistics, reports, references, etc.)

Compliance with the requirements for registration: a) How true are the references to the used literature, quotes; b) assessment of literacy and presentation culture (including spelling, punctuation, stylistic culture), knowledge of terminology; c) compliance with the requirements for the volume of essay.

The reviewer should clearly state the remarks and questions, preferably with references to the work (possible on specific pages of the work), to research and evidence that the author did not take into account.

The reviewer may also indicate: whether student has addressed the topic earlier (essays, written works, creative works, olympic works, etc.) and whether there are any preliminary results; how the graduate has conducted the work (plan,

intermediate stages, consultation, revision and processing of the written or lack of a clear plan, rejection of the head recommendations).

The student submits an essay for review no later than a week before the defense. The reviewer is the teacher. Experience shows that it is advisable to acquaint the student with the review a few days before the defense. Opponents are appointed by the teacher from the students. For an oral presentation a student needs about 10–20 minutes (approximately as long as he answers with tasks for the exam).

Grade 5 is given if all the requirements for writing and defending an essay are fulfilled: the problem is indicated and its relevance is justified, a brief analysis of different points of view on the problem under consideration is made and one's own position is logically presented, conclusions are formulated, the topic is fully disclosed, the volume is met, external requirements are met design, given the correct answers to additional questions.

Grade 4 is given if the basic requirements for the essay and its defense are met, but there are some shortcomings. In particular, there are inaccuracies in the presentation of the material; or there is no logical sequence in the judgments; not sufficient volume of the essay; there are omissions in the design; additional questions for the defense are accompanied with incomplete answers.

Grade 3 is given if there are significant deviations from the requirements for referencing. In particular: the topic is covered only partially; factual errors in the content of an essay or when answering additional questions; there is no output c.

Grade 2 - the topic of an essay is not disclosed, a significant misunderstanding of the problem is found.

Grade 1 - student's essay is not presented.

The organization of independent work of students involves a number of individual homework (IHW) on a given topic.

IHW is one of the forms of educational and scientific work of students. The purpose of the IHW is to teach students to connect theory with practice, to instill

the ability to develop researching plans, to calculate various indicators and build forecasts on the basis of their analysis, to investigate the current situation and offer solutions to problems, to freely navigate in the modern economy, to present complex issues in a popular way.

The work is provided in paper form and is defended by the student. In the end, a pass grade is to be given.

The presentation of the material must meet the requirements for research work. The research should be based on authoritative sources, text is qualitatively worked out and edited (clarity, perceptibility, clarity, scientific style). The completeness of the material is taken into account. Registration of the executed IHM is made according to the standard of performance of course and final qualifying works of FEFU. The volume of tasks, etc is about 20-25 pages.

IHM No. 1.

To carry out research work on the theme "national innovation system of the state". The country of study is chosen at random by the student from the proposed list or in agreement with the teacher. The paper should consider the formation of NIS, the structure of NIS, the role of the state in the process of formation of NIS, the existing problems and opportunities to solve them.

List of countries: USA, UK, Sweden, Canada, Japan, Israel, India, China, France, South Korea, Hong Kong, Singapore, Germany.

IHM No. 2.

To carry out research work on the topic "Characteristics of the infrastructure of scientific, technical and innovative activities in Russia: *element*". The element of infrastructure for the study is chosen arbitrarily by the student from the proposed list or in agreement with the teacher.

Contents of infrastructure elements: information support; system of coordination and regulation; financial and economic support; system of production and technological support and certification of high-tech products; system of promotion of scientific and medical developments and high-tech products; system of training and retraining.

EXAMPLE THEMATICS ABSTRACT

1. Classification of medical equipment
2. Surgical equipment
3. Functionally - diagnostic equipment
4. Laboratory equipment
5. X-ray equipment
6. Physiotherapy equipment
7. Sterilization equipment
8. Ultrasound equipment
9. Tomographs
10. Resuscitation equipment
11. Medical devices for the study of the central nervous system
12. Nuclear magnetic resonance (NMR) and its biomedical applications.
13. Physical principles of positron emission tomography (PET).
Application of PET methods in medicine
14. Medical imaging. Medical imaging techniques.



MINISTRY OF EDUCATION AND SCIENCE OF THE RUSSIAN FEDERATION
Federal state autonomous educational institution
of higher education
« Far Eastern Federal University »
(FEFU)

SCHOOL OF BIOMEDICINE

ASSESSMENT FUND
on discipline «Medical materials and products»
Specialty 31.05.01 «General medicine»
Form of study: full time

Vladivostok
2016

Competence and its code	Stages of competence formation	
GPC-11 readiness for the use of medical products under the procedures for providing medical care	Knows	Properties and purpose and the possibility of using medical products and equipment provided by the procedures for providing medical care
	Able to	Determine the purpose and the possibility of using medical devices and equipment provided by the procedures for providing medical care
	Masters	Skill in determining the purpose and possibility of using medical products and equipment as provided by the procedures for providing medical care
PC-22 willingness to participate in the introduction of new methods and techniques aimed at protecting the health of citizens	Knows	The current state of the medical industry and the main types of manufactured medical equipment
	Able to	Identify the possibilities of new methods and techniques aimed at protecting the health of citizens
	Masters	Skillful application of some methods and techniques aimed at protecting the health of citizens.

MONITORING THE ACHIEVEMENT OF THE COURSE OBJECTIVES

No.	Controlled modules / sections / topics of the discipline	Codes and stages of competence formation	Evaluation tools		
			Current control	Interim certification / examination	
1	Module 1. Medical materials and their properties Module 3. Basic requirements for medical devices	GPC-11 readiness for the use of medical products under the procedures for providing medical care	knows	Questioning, Presentation IT №1 Test Report	Credit question 1-34
			able to		
			masters		
2	Module 1. Medical materials and their properties Module 3. Basic requirements for medical devices	PC-22 willingness to participate in the introduction of new methods and techniques aimed at protecting the health of citizens	knows	Questioning, Presentation OA-1 Interview Report	Credit question 35-48
			able to		
			masters		

The scale of assessment of the level of formation of competencies

Code and formulation of competence	Stages of the formation of competencies		Criteria	Indicators
GPC-11 readiness for the use of medical products under the procedures for providing medical care	knows (threshold level)	Properties and purpose and the possibility of using medical products and equipment provided by the procedures for providing medical care	Knowledge of the properties and purpose and the possibility of using medical products and equipment provided by the procedures for providing medical care	Formed knowledge of the properties and purpose and the possibility of using medical products and equipment provided by the procedures for providing medical care
	able to (advances)	Determine the purpose and the possibility of using medical devices and equipment provided by the procedures for providing medical care	Determine the purpose and the possibility of using medical devices and equipment as stipulated by the procedures for providing medical care	Determine the purpose and the possibility of using medical devices and equipment as stipulated by the procedures for providing medical care
	masters (high)	Skill in determining the purpose and possibility of using medical products and equipment as provided by the procedures for providing medical care	Skills of determining the purpose and the possibility of using medical products and equipment provided by the procedures for providing medical care	The ability to determine the purpose and the possibility of using medical devices and equipment provided by the procedures for providing medical care
the willingness to participate in implementation of new methods and techniques aimed at protection of public health. (PC – 22)	knows (threshold level)	Principles of participation in introduction of new methods and techniques aimed at protecting the health of citizens. Methods of application of professional knowledge in the field of scientific research in the formulation and solution of problems	Knowledge of the principles of participation in the introduction of new methods and techniques aimed at protecting the health of citizens	Knows the basics of the principles of participation in the introduction of new methods and techniques aimed at protecting the health of citizens
	able to (advances)	Use in the implementation of new methods and techniques aimed at protecting the health of citizens. To use scientific, scientific and technological results and intellectual potential in order to obtain	Ability to use scientific, scientific and technological results and intellectual potential in order to obtain new products, technology of its production.	Able to use scientific, scientific and technological results and intellectual potential in order to obtain new products, technology of its production.

		new products, technology of its production.		
	masters (high)	Skills of use and introduction of new methods and techniques aimed at protecting the health of citizens. Methods of application of methods of expert assessments and forecasting of innovative solutions	Skills in the use and implementation of new methods and techniques aimed at protecting the health of citizens.	knows how to apply the methods of expert evaluation and forecasting of innovative solutions

Test items

1. What of the listed devices is not intended for registration and research of biopotentials
 - a. electrocardioscope
 - b. electroencephalograph
 - c. reoplethysmograph
 - d. electrogastrograph

2. A device for measuring respiratory volumes and lung capacities is called
 - a. rheometer
 - b. spirometer
 - c. stabilometer
 - d. oximeter

3. Which of the elements listed below is not a type of inductors in magnetic therapy devices?
 - a. solenoid
 - b. flat capacitor
 - c. electromagnet
 - d. flat cylinder coil

4. At what type of medical introscopy is the radiation source located inside the biological object under study

- a. ultrasound diagnostics
- b. X-ray diagnostics
- c. radionuclide diagnostics
- d. endoscopy

5. What material is used for joint replacement?

- a. Stainless steel
- b. Titanium nickelide
- c. Porous titanium
- d. Hydroxyapatite

6. What method can be used to determine the activity of metabolic processes in living tissues:

- a. MRI
- b. CT
- c. PET CT
- d. Scintigraphy

7. To diagnose the pathology of the spinal cord is the most informative.

- a. CT
- b. CT with contrast
- c. MRI
- d. MRI with contrast

8. What materials have “shape memory”?

- a. Stainless steel
- b. Titanium nickelide
- c. Porous titanium

d. Hydroxyapatite

9. Bioabsorbable surgical sutures are made from:

- a. Silks
- b. Capron
- c. Polyglycolic acid
- d. Laysan

10. Doppler ultrasound is used to determine:

- a. Density of parenchymal organs
- b. Degree of tissue hydration
- c. Blood flow velocity in the vessels
- d. Nerve impulse rates

Situational tasks

Task 1. The patient enters the hospital with signs of bleeding from the stomach. What type of research will you use?

Task 2. The patient enters the hospital with pain in the epigastric region. The doctor suggests inflammation of the gallbladder. What type of study should be prescribed to the patient?

Task 3. The patient was hospitalized with a diagnosis of heart disease. What types of research should be prescribed to the patient?

Task 4. In a patient, the doctor suspects a fracture of the bones of the leg. What research needs to be done by the patient?

Task 5. In a patient, the doctor discovered a violation of the venous blood flow in the lower extremities. What method of examination should be prescribed to the patient?

Task 6. A patient with pneumonia performed a chest X-ray. What method of research can be assigned additionally to clarify the diagnosis?

Task 7. The patient went to the doctor about a tumor in the breast. What research methods should be used for diagnosis?

Evaluation tools for intermediate certification

Questions for the exam in the discipline

«Medical materials and products»

1. The value of medical equipment in the treatment and diagnostic process
2. Classification of medical equipment. General requirements for medical devices, devices, systems and complexes.
3. Technical means of phonocardiography. Purpose, principle of operation, structure.
4. Technical means of pulse oximetry. Purpose, principle of operation, structure
5. Technical tools for the study of the nervous system (electroencephalographs). Purpose, principle of operation, structure
6. Technical means of research of muscular potentials (myographs). Purpose, principle of operation
7. Devices for bio-impedance research (rheograph, reoplethysmograph). Purpose, principle of operation, structure
8. Instruments for measuring external respiration parameters (spirometers and spirographs). Purpose, principle of operation, device, varieties.
9. Methods and means of measuring blood pressure. Device for measuring blood pressure.
10. Medical thermometers. Electronic digital thermometer. Technical means of thermal imaging
11. Apparatus for visualization of internal organs. General principles of obtaining images. Classification of TS introscopy.
12. Technical means of ultrasound imaging. The principle of operation, device classification.
13. Modes of operation of ultrasonic diagnostic systems.
14. Technical means of X-ray diagnostics. The principle of operation, device classification.
15. Technical means of X-ray computed tomography.
16. Technical means of visualization based on magnetic resonance.

17. Technical means of radionuclide diagnostics. Gamma camera. Positron emission tomography.
18. Equipment for endoscopy
19. Classification of therapeutic equipment. Therapeutic effects of physical factors of different nature.
20. Therapeutic equipment for the treatment of currents of various shapes and frequencies: the purpose, basic methods, principle of operation and device.
21. Therapeutic apparatus for the treatment of electric fields
22. Therapeutic equipment for the treatment of electromagnetic fields
23. Therapeutic Apparatus for Treating Magnetic Fields
24. Instruments for laser therapy.
25. Ultrasonic therapeutic devices: classification, device, features of the application.
26. Therapeutic apparatus of complex effects.
27. Equipment for radiation therapy
28. Equipment for aeroionotherapy and aerosol therapy. Inhalers. Nebulizers.
29. Apparatus based on the action of low temperatures: the effect of low temperatures on biological objects; apparatus for hypothermia and cryosurgery.
30. Therapeutic effects of electric current on biologically active points. Reflexotherapy equipment.
31. Barotherapy equipment. Pressure Chamber
32. The use of physical fields for the destruction of biological tissues. Laser ultrasonic and electric high-frequency "scalpels".
33. Technical means for surgery and microsurgery. Surgical robots
34. Mechanical ventilation equipment
35. The principle of construction and the main nodes of anesthesia and respiratory equipment.
36. Blood circulation equipment.
37. Extracorporeal blood purification equipment
38. Equipment for blood fractionation.

39. Endoscopic diagnostic equipment. General principles of obtaining images.
Classification
40. Endoscopic surgical equipment. General principles of obtaining images.
Classification. Instrumentation in endoscopic surgery.

Criteria for evaluation.

Excellent - if the answer shows knowledge of the basic processes of the studied subject area, it is distinguished by the completeness of the disclosure of the topic; possession of terminological apparatus; the ability to explain the essence of phenomena, processes, events, give reasoned answers, give examples;

Well - points - the answer that reveals knowledge of the basic processes of the studied subject area, is characterized by the completeness of the disclosure of the topic; possession of terminological apparatus; the ability to explain the essence of phenomena, processes, events, give reasoned answers, give examples; However, one or two inaccuracies in the response are allowed.

Satisfactory - a response is evaluated that testifies mainly to the knowledge of the processes of the subject area being studied, which is characterized by insufficient completeness of the topic disclosure; knowledge of the main issues of the theory; weakly formed skills of analyzing phenomena, processes, insufficient ability to give reasoned answers and give examples; Several errors in the content of the response are allowed;

Unsatisfactory - a response that reveals ignorance of the processes of the subject area being studied, which is characterized by a shallow disclosure of the topic; ignorance of the main issues of the theory, unformed skills of phenomena, processes; the inability to give reasoned answers, weak possession of monologue speech, lack of consistency and consistency. Serious errors are made in the content of the response; ignorance of modern problems of the studied area.