



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

SCHOOL OF BIOMEDICINE

AGREED

Head of OP

(Signed)

(Full name)

CLAIM

Director of the Department of Medical Biology and
Biotechnology

(Signed)

(Acting Name)

December 30, 2021



WORK PROGRAM OF THE DISCIPLINE

Development and pathology of the brain

Direction of training 06.04.01 Biology

(Molecular and Cell Biology)

Form of training: full-time

Course 2 semester 3

lectures 10 hours.

practical exercises - hour.

laboratory work 26 hours.

total hours of classroom load 36 hours.

independent work 72 hours.

Credit 3 semester

exam is not provided

The work program is drawn up in accordance with the requirements of the Federal State Educational Standard in the direction of training 19.03.01 Biotechnology, approved by the order of the Ministry of Education and Science of Russia dated 10.08.2021. №736.

The work program was discussed at the meeting of the Department of Medical Biology and Biotechnology Protocol dated December 30, 2021 No. 5

Director of the Department of Implementing Structural Unit of the Cand. Biol. Ph.D., Associate Professor V.V. Kumeiko

Authors: Candidate of Biological Sciences, Associate Professor V.V. Kumeiko, Associate Professor Zinoviev S.V.

Vladivostok
2021

Reverse side of the RPD cover page

1. The work program was revised at the meeting of the Department / department / department (implementing the discipline) and approved at the meeting of the Department / department / department (issuing structural unit), the protocol from " _____ № _____

2. The work program was revised at the meeting of the Department / department / department (implementing the discipline) and approved at the meeting of the Department / department / department (issuing structural unit), the protocol from " _____ № _____

3. The work program was revised at the meeting of the Department / Department / Department (implementing the discipline) and approved at the meeting of the Department / Department / Department (issuing structural unit), the protocol from " _____ № _____

4. The work program was revised at the meeting of the Department / Department / Department (implementing the discipline) and approved at the meeting of the Department / Department / Department (issuing structural unit), the protocol from " _____ № _____

5. The work program was revised at the meeting of the Department / Department / Department (implementing the discipline) and approved at the meeting of the Department / Department / Department (issuing structural unit), the protocol from " _____ № _____

1. Goals and objectives of mastering the discipline:

Purpose: formation of ideas about the functional organization of the nervous system, the neural mechanisms of the organization of reflex behavior and the principles of the systemic organization of brain functions; the basics of the physiology of the nervous tissue and the central nervous system of a person; the principles of the systemic organization of brain functions; physiological mechanisms for receiving and processing information by a living organism; groups of benign and malignant neoplasms; features of brain aging.

Tasks:

1) present the most significant achievements of world and domestic science in the field of development and pathology of the brain, which studies the structure, functioning, development, biochemistry, physiology and pathology of the nervous system and brain;

2) to develop in students the skills and abilities of analytical and critical development of the works of outstanding researchers of the brain;

3) show that the structure and functions of the human brain include different levels of study: from molecular to cellular (individual neurons), from relatively small associations of neurons, to large systems, such as the cerebral cortex or cerebellum, and the highest level - the nervous system as a whole;

4) to contribute to the expansion of scientific horizons and the improvement of the culture of psychological thinking of students.

Professional competencies of graduates and indicators of their achievement:

Task type	Code and name of professional competence (the result of mastery)	Code and name of the competency achievement indicator
research	PC-5 Is able to conduct a systematic analysis of the relationship between cells, tissues and functional systems of organisms.	PC-5.1 Studies the relationship between cells, tissues and functional systems of organisms.
		PC-5.2 Investigates the relationship between cells, tissues and functional systems of organisms.
		PC-5.3 Conducts a systematic analysis of the relationship between cells, tissues and functional systems of organisms.

Code and name of the competency achievement indicator	Name of the assessment indicator (the result of training in the discipline)
PC-5.1 Studies the relationship between cells, tissues and functional systems of organisms.	Knows – the relationship of cells, tissues and functional systems of organisms Can – independently work with scientific and reference literature

	Owns – basic concepts and terminology on the topic of the relationship between cells, tissues and functional systems of organisms
PC-5.2 Investigates the relationship between cells, tissues and functional systems of organisms.	Knows – molecular, immunological and physiological aspects of the study of cells of multicellular and unicellular organisms Can – to conduct and investigate the adaptation of tissue elements to the action of various biological, physical, chemical and other factors Owns – skills with the analysis of the relationship between cells, tissues and functional systems of organisms – representatives of all kingdoms
PC-5.3 Conducts a systematic analysis of the relationship between cells, tissues and functional systems of organisms.	Knows – the theoretical part of the analysis of the relationship between cells, tissues and functional systems of organisms Can – to conduct a systematic analysis of the relationship between cells, tissues and functional systems of organisms Owns – a method of conducting an analysis of the relationship between cells, tissues and functional systems of organisms

1. Labor intensity of discipline and types of training sessions in the discipline
The total labor intensity of the discipline is 3 credited units (108 academic hours), (1 credit unit corresponds to 36 academic hours).

Types of training sessions and work of the student in the discipline are:

Designation	Types of training sessions and work of the student
Lek	Lecture
Lek electr.	
Lab	Labs
Lab Electr.	
WED:	Independent work of the student during the period of theoretical training
including control	Independent work of the student and contact work of the student with the teacher during the period of intermediate certification

Structure of the discipline:

The form of training is full-time.

№	Name of the section Discipline	Se me ster	Number of hours by types of training sessions and work of the student						Intermediate attestation forms
			Lek	Lab	Av e	OK	WE D	Cont rol	
1.	Topic 1-2	3	1	3	-	-	12	-	Questions for credit

2.	Topic 3-4		2	5	-	-	12	-	Questions for credit
3.	Topic 5-6		2	4	-	-	12	-	Questions for credit
4.	Topic 7-8		2	4	-	-	12	-	Questions for credit
5.	Topic 9-10		2	5	-	-	12	-	Questions for credit
6.	Topic 11-12		1	5	-	-	12	-	Questions for credit
	Total:	3	10	26	-	-	72	-	Credit

THE STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE

Lectures of 10 hours.

Topic 1. The structure of the human brain. Anatomy and histology, cytology.

Topic 2. Molecular biological features of the structure and function of neuroblasts.

Topic 3. Features of the embryonic development of the nervous system in the lanceolate.

Topic 4. Features of embryonic development of the nervous system in birds.

Topic 5. Features of embryonic development of the neural tube in humans.

Topic 6. Organogenesis of the brain in humans.

Topic 7. Features of the structure of the brain in ontogenesis.

Topic 8. Cellular basis of basic pathological reactions of neurons and glia.

Topic 9. Blood-brain barrier and brain pathology.

Topic 10. Malformations of embryonic development of the tin brain.

Topic 11. Brain tumors.

Topic 12. Brain and aging.

IV. STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE AND INDEPENDENT WORK

Laboratory work 26 hours.

Laboratory work 1. Topic Structure of the human brain. Anatomy and histology, cytology.

Laboratory work 2. Topic Molecular biological features of the structure and function of neuroblasts.

Laboratory work 3. Topic Features of embryonic development of the nervous system in the lanceolate.

Laboratory work 4. Topic Features of embryonic development of the nervous system in birds.

Laboratory work 5. Topics Features of embryonic development of the neural tube in humans.

Laboratory work 6. Topic Organogenesis of the brain in humans.

Laboratory work 7. Topic Features of the structure of the brain in ontogenesis.

Laboratory work 8. Topic Cellular basis of basic pathological reactions of neurons and glia.

Laboratory work 9. Topic Blood-brain barrier and brain pathology.

Laboratory work 10. Topic Malformations of embryonic development of the Brain.

Laboratory work 11. Topic Brain tumors.

Laboratory work 12. Topic Brain and aging.

Independent work

Sample abstract topics

1. Cerebral edema and hydrocephalus. Definition of the concept, classification, causes, morphogenesis, outcomes, significance in pathology.

2. Damage to brain tissue in traumatic brain injury. Definition of the concept, classification, causes, morphogenesis, outcomes, significance in pathology.

3. Inflammatory and infectious diseases of the brain and membranes. Definition of the concept, classification, causes, morphogenesis, outcomes, significance in pathology.

4. Destructive and metabolic comas. Chronic vegetative state, brain death. Electrophysiological research methods – EEG evoked potentials of the brain. Principles of management of patients in a coma.

5. Membranes of the brain. Cerebrospinal fluid. Examination of cerebrospinal fluid.

6. Syndromes of lesions of the frontal, parietal, temporal and occipital lobes of the brain.

7. Chronic disorders of cerebral circulation. Neuro-imaging research methods. Vascular dementia. Differential diagnosis with Alzheimer's disease.

8. Paraclinical methods in the diagnosis of paroxysmal disorders of consciousness - electroencephalography, CT and MRI of the brain.

9. Hereditary diseases of the nervous system with a predominant lesion of the spinal cord, cerebellum. Familial spastic paraplegia. Cerebellar degeneration.

10. Classification of vascular diseases of the brain. Etiology of vascular diseases of the brain.

V. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF INDEPENDENT WORK OF STUDENTS

Recommendations for independent work of students

The purpose of the independent work of the student is to work meaningfully and independently first with educational material, then with scientific information, to lay the foundations of self-organization and self-education in order to instill the ability to further continuously improve their professional qualifications.

The process of organizing the independent work of the student includes the following stages:

- preparatory (setting goals, drawing up a program, preparing methodological support, preparing equipment);
- basic (implementation of the program, the use of methods of information retrieval, assimilation, processing, application, transfer of knowledge, fixation of results, self-organization of the work process);
- final (assessment of the significance and analysis of the results, their systematization, assessment of the effectiveness of the program and methods of work, conclusions on the directions of labor optimization).

In the process of independent work, the student acquires the skills of self-organization, self-control, self-government, self-reflection and becomes an active independent subject of educational activity. Independent work of students should have an important impact on the formation of the personality of the future specialist, it is planned by the student independently. Each student independently determines the mode of his work and the measure of work spent on mastering the educational content in each discipline. He performs extracurricular work according to a personal individual plan, depending on his preparation, time and other conditions.

Methodical recommendations for independent work of students

As the material on the subject of the discipline is mastered, it is planned to perform independent work of students on the collection and processing of literary material to expand the field of knowledge in the discipline under study, which allows you to deepen and consolidate specific practical knowledge gained in classroom classes. To study and fully master the program material on the discipline, educational, reference and other literature recommended by this program, as well as specialized periodicals, are used.

When independently preparing for classes, students take notes on the material, independently study the issues on the topics covered, using the educational literature from the proposed list, periodicals, scientific and methodological information, databases of information networks.

Independent work consists of such types of work as the study of material on textbooks, reference books, videos and presentations, as well as other reliable sources of information; preparation for the zechet. To consolidate the material, it is enough, flipping through the notes or reading it, mentally restore the material. If necessary, refer to the recommended educational and reference literature, write down incomprehensible moments in the questions to understand them in the upcoming lesson.

Preparation for practical exercises. This type of independent work consists of several stages:

- 1) Repetition of the studied material. For this purpose, lecture notes, recommended basic and additional literature are used;
- 2) Deepening knowledge on the proposed topics. It is necessary to differentiate the available material in lectures, textbooks in accordance with the points of the plan of the practical lesson. Separately write out unclear questions, terms. It is better to do this in the margins of the lecture notes or textbook. Clarification should be carried out with the help of reference literature (dictionaries, encyclopedic publications, etc.);
- 3) Drawing up a detailed plan for the speech, or conducting calculations, solving problems, exercises, etc. In preparation for practical exercises, students take notes on the material, prepare answers to the above questions on the topics of practical exercises. In addition to the practical material, students independently study questions on the proposed topics, using educational literature from the proposed list, periodicals, scientific and methodological information, databases of information networks (Internet, etc.).

Requirements for the presentation and design of the results of independent work

There are no special requirements for the provision and design of the results of this independent work.

Control over the implementation of the plan of independent work of students is carried out by the teacher in practical classes by interviewing and by including in the final tasks specified in the lesson from the plan of independent work.

VI. MONITORING THE ACHIEVEMENT OF COURSE OBJECTIVES

No p/n	Supervised sections / topics of the discipline	Achievement indicator code and name	Learning outcomes	Assessment tools	
				current control	Intermediate-accurate certification
1.	Topic 1-2	PC-5.1 Studies the relationship between cells, tissues and functional systems of organisms.	Knows – the relationship of cells, tissues and functional systems of organisms Can – independently work with scientific and reference literature Owns – basic concepts and terminology on the topic of the relationship between cells, tissues and functional systems of organisms	Oral questioning	Questions for credit
2.	Topic 3-4				
3.	Topic 5-6	PC-5.2 Investigates the relationship between cells, tissues and functional systems of organisms.	Knows – molecular, immunological and physiological aspects of the study of cells of multicellular and unicellular organisms Can – to conduct and investigate the adaptation of tissue elements to the action of various biological, physical,	Test	Questions for credit
4.	Topic 7-8				

			chemical and other factors Owns – skills with the analysis of the relationship between cells, tissues and functional systems of organisms – representatives of all kingdoms		
5.	Topic 9-10	PC-5.3 Conducts a systematic analysis of the relationship between cells, tissues and functional systems of organisms.	Knows – the theoretical part of the analysis of the relationship between cells, tissues and functional systems of organisms Can – to conduct a systematic analysis of the relationship between cells, tissues and functional systems of organisms Owns – a method of conducting an analysis of the relationship between cells, tissues and functional systems of organisms	Oral questioning	Questions for credit
6.	Topic 11-12				

VII. LIST OF REFERENCES AND INFORMATION AND METHODOLOGICAL SUPPORT OF THE DISCIPLINE

Main literature

1. Babenko, V. V. Central nervous system: anatomy and physiology: Textbook / Babenko V.V. - Rostov-on-Don : Southern Federal University, 2016. - 214 p.: ISBN 978-5-9275-2031-2. - Text : electronic. - URL: <https://znanium.com/catalog/product/991882>

2. Aizman, R. I. *Physiologiya cheloveka : uchebnoe posobie* / R. I. Aizman, N. P. Abaskalova, N. S. Shulenina. — 2-e ed., pererab. i dop. — Moscow : INFRA-M, 2022. — 432 p. — (Higher education: Bachelor's degree). - ISBN 978-5-16-009279-9. - Text : electronic. - URL: <https://znanium.com/catalog/product/1844262>
3. Fonsova, N. A. *Anatomy of the Central Nervous System : a textbook for universities* / N. A. Fonsova, I. Y. Sergeev, V. A. Dubynin. — Moscow : Izdatelstvo Yurait, 2023. — 338 p. — (Higher education). — ISBN 978-5-9916-3504-2. — Text : electronic // Educational platform Yurait [site]. — URL: <https://urait.ru/bcode/511844>
4. Kulbakh, O. S. *Structure and functions of the developing brain : a textbook* / O. S. Kulbakh. — Sankt-Peterburg : Foliant, 2012. — 86 c. — ISBN 978-5-93929-233-7. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/60948.html>
5. Babenko, V. V. *Central nervous system: anatomy and physiology: Textbook* / Babenko V.V. - Rostov-on-Don : Southern Federal University, 2016. - 214 p.: ISBN 978-5-9275-2031-2. - Text : electronic. - URL: <https://znanium.com/catalog/product/991882>
6. Aizman, R. I. *Physiological foundations of mental activity : uchebnoe posobie* / R.I. Aizman, S.G. Krivoshekov. — Moscow : INFRA-M, 2023. — 192 p. — (Higher education: Bachelor's degree). - ISBN 978-5-16-006165-8. - Text : electronic. - URL: <https://znanium.com/catalog/product/1914156>
7. Bizyuk, A. P. *Neuropsychologiya : uchebnoe posobie* / A.P. Bizyuk. — Moscow : INFRA-M, 2023. — 539 p. — (Higher education: Specialist's degree). — DOI 10.12737/1039182. - ISBN 978-5-16-015501-2. - Text : electronic. - URL: <https://znanium.com/catalog/product/1894201>
8. Aizman, R. I. *Age physiology and psychophysiology : uchebnoe posobie* / R.I. Aizman, N.F. Lysova. — Moscow : INFRA-M, 2021. — 352 p. — (Secondary vocational education). - ISBN 978-5-16-013904-3. - Text : electronic. - URL: <https://znanium.com/catalog/product/1206690>
9. *Pathology : textbook* / ed. by A.I. Tyukavina. — Moscow : INFRA-M, 2022. — 844 p. + Add. materialy [Elektronnyi resurs]. — (Higher education: Specialist's degree). — DOI 10.12737/1090595. - ISBN 978-5-16-016260-7. - Text : electronic. - URL: <https://znanium.com/catalog/product/1945327>
10. Tyukavin, A. I. *Osnovy patologii : uchebnik* / A.I. Tyukavin. — Moscow : INFRA-M, 2022. — 344 p. + Add. materialy [Elektronnyi resurs]. — (Secondary vocational education). — DOI 10.12737/1242551. - ISBN 978-5-16-016832-6. - Text : electronic. - URL: <https://znanium.com/catalog/product/1242551>

Further reading

1. Psychophysiology: [textbook] / O. M. Razumnikova. Novosibirsk : Izd-vo Novosibirskogo tekhnicheskogo universiteta, 2016. 306 s.
<http://lib.dvfu.ru:8080/lib/item?id=chamo:843116&theme=FEFU>
2. Physiology of higher nervous activity : textbook for universities / V. V. Shulgovskiy. Moscow: Akademiya, 2014. 384 s.
<http://lib.dvfu.ru:8080/lib/item?id=chamo:813667&theme=FEFU>
3. Physiologiya chelya [Elektronnyi resurs]: uchebnik / Pod red. V.M. Pokrovskogo, G.F. Korotko - 3-e izd. - M.:Meditsina, 2011.
<http://www.studmedlib.ru/ru/book/ISBN9785225100087.html>
4. Normal physiology [Elektronnyi resurs] : uchebnik / Pod red. K.V. Sudakova - M.: GEOTAR-Media, 2012.
<http://www.studmedlib.ru/book/ISBN9785970419656.html>

List of resources of the information and telecommunication network "Internet"

1. <http://elibrary.ru/> - scientific electronic library
2. <http://molbiol.ru/> is an information resource on molecular biology
3. <http://macroevolution.narod.ru/> is an electronic resource on evolutionary biology.
4. <http://science.km.ru/> - electronic resource on different sections of biology
5. <http://elementy.ru/> is an information and cognitive resource dedicated to the natural sciences.
6. <http://www.iprbookshop.ru/> is an electronic library system IPRbooks.
7. <http://znanium.com/> - EBS "Znanium".
8. <https://nplus1.ru/> - N+1, a popular science online publication on science, engineering and technology
9. <http://antropogenez.ru/> - popular science information resource about human evolution
10. <http://web.a.ebscohost.com/ehost/search/basic?sid=851485f8-6200-4b3e-aaab-df4ba7be3576@sessionmgr4008&vid=1&tid=2003EB> is a collection of books on various sections from the EBSCOhost database.
11. <http://rosalind.info/problems/locations/> - resource for self-study of bioinformatics Rosalind.
12. <http://www.ncbi.nlm.nih.gov/> - website of the National Center for Biotechnology Information NCBI.
13. <http://www.mendeley.com/> - Mendeley: Free reference manager and PDF organizer; bibliothecar program.
14. <http://www.ebi.ac.uk> - website of the European Bioinformatics Institute

15. [http:// www.scopus.com](http://www.scopus.com) – Bibliographic database and Scopus citation index

16. <http://thomsonreuters.com/thomson-reuters-web-of-science/> bibliographic database and Web of Science citation index/

List of information technologies and software

1. Microsoft Office Professional Plus 2013 is an office suite that includes software for working with various types of documents (texts, spreadsheets, databases, etc.);
2. 7Zip 16.04 - free file archiver with a high degree of data compression;
3. Adobe Acrobat XI Pro – a software package for creating and viewing electronic publications in PDF format;
4. AutoCAD Electrical 2015 - three-dimensional computer-aided design and drafting system;
5. ESET Endpoint Security 5 is a comprehensive protection for Windows-based workstations. Virtualization support + new technologies;
6. WinDjView 2.0.2 - a software to recognize and view files with the same format DJV and DjVu; SolidWorks 2016 - CAD software package for automation of industrial enterprise operations at the stages of design and technological preparation of production
7. Compass-3D LT V12 - three-dimensional modeling system
8. Notepad++ 6.68 – text editor

VIII.METHODICAL INSTRUCTIONS FOR MASTERING THE DISCIPLINE

Lecture

The lecture- is the main active form of conducting classroom classes, explaining the fundamental and most difficult theoretical sections of molecular biology and the theory of genetic engineering, which involves intensive mental activity of the student and is especially important for mastering the subject. The lecture should always be cognitive, developmental, educational and organizing in nature. Lecture notes help to assimilate the theoretical material of the discipline. When listening to the lecture, it is necessary to take notes main information, preferably in your own wording, which allows you to better remember the material. The abstract is useful when it is written by the student independently.

In a lecture, the teacher gives only a small fraction of the material on certain topics that are presented in the textbooks. In addition, the teacher informs students about what additional information can be obtained on the topics discussed, and from

what sources. Therefore, when working with lecture notes, it is always necessary to use the main textbooks, additional literature and other recommended sources on this discipline. It is such a serious work of the student with the lecture material that allows him to achieve success in mastering new knowledge.

To present a lecture course in the discipline "Neurobiology", the following are used as forms of active learning: lecture-conversation, lecture-visualization, which are based on the knowledge gained by students in the framework of the subjects preceding the course. To illustrate verbal information, electronic presentations, tables, video files, diagrams on the board are used. In the course of the presentation of the lecture material, problematic questions or questions with elements of discussion are posed.

Lecture – visualization

The lecture is accompanied by the display of tables, electronic presentations, video files - such a combination of methods of presenting information greatly simplifies its development by students. Verbal presentation of the material should be accompanied and combined with the visual form. Information presented in the form of diagrams on the board, tables, slides, allows you to form problematic issues, and contribute to the development of professional thinking of future specialists.

Lecture - conversation

Lecture-conversation, "dialogue with the audience", is the most common form of active learning and allows you to involve students in the educational process, as there is a direct contact of the teacher with the audience. Such contact is achieved during the lecture, when students are asked questions of a problematic or informational nature or when they are invited to ask the teacher questions themselves. Questions are offered to the entire audience, and any of the students can offer their answer; another can complement it. During the educational process, this allows you to identify the most active students and activate those who do not participate in the work. This form of lecture allows you to involve students in the work process, attract their attention, stimulate thinking, gain collective experience, learn how to form questions. The advantage of the lecture-conversation is that it allows you to attract the attention of students to the most important issues of the topic, determine the content and pace of presentation of the educational material, as well as determine the topics of interest to students, with the aim of possibly adjusting the form of the material taught.

Labs

They are used for conducting experiments, observations of phenomena, processes mainly in the conditions of special laboratories, offices and with the use of technical means. This method stimulates the activity of actions both at the stage of preparation for research and in the process of its implementation.

Laboratory work improves the quality of learning, contributes to the development of cognitive activity in students, their logical thinking and creative independence. In the process of performing laboratory work, theoretical knowledge is deepened and concretized, the ability to apply them in practice is developed. Skills in working with microscopes, tables and atlases are acquired. The student learns to analyze the data obtained, identify the norm and deviation from it, acquires the skills of working with a living object and physiological measuring devices, performing operations, conducting a comparative analysis, summarizing the material obtained and drawing conclusions. All this allows us to better understand the mechanisms of functioning of a living organism and the principles of its interaction with the environment. Research skills and professional competencies are formed.

Traditionally, laboratory classes are the main type of training sessions aimed at experimental confirmation of theoretical positions. In the process of laboratory classes, students perform one or more laboratory work (tasks) under the guidance of a teacher in accordance with the studied content of the educational material. Students perform laboratory work is aimed at:

- generalization, systematization, deepening of theoretical knowledge on specific topics of the academic discipline;
- formation of skills to accept the acquired knowledge in practical activities;
- development of analytical, design, constructive skills;
- development of independence, responsibility and creative initiative.

Necessary structural elements of the laboratory lesson:

- instruction conducted by the teacher;
- independent activity of students;
- discussion of the results of the laboratory work (task).

Before performing a laboratory task (work), students' knowledge is tested - their theoretical readiness to perform the task.

Laboratory task (work) can be reproductive, partially search and search in nature.

Works of a **reproductive** nature are distinguished by the fact that when conducting them, students use detailed instructions, which indicate: the purpose of the work, explanations (theory, main characteristics), equipment, equipment, materials and their characteristics, the order of work, tables, conclusions (without wording), control questions, educational and special literature.

The works, which are **of a partial-exploratory** nature, differ in that when conducting students do not use detailed instructions, they are not given the order of performing the necessary actions, students are required to independently select equipment, choose ways to perform work, instructional and reference literature.

Works of a **exploratory** nature are distinguished by the fact that students must solve a new problem for them, relying on their theoretical knowledge.

The forms of organization of students for conducting a laboratory lesson - frontal, group and individual - is determined by the teacher, based on the topic, purpose, order of work. With the frontal form of organization of classes, all students perform the same work. In the group form of organizing classes, the same work is performed in teams of 2-5 people. With an individual form of organization of classes, each student performs an individual task.

The results of the laboratory task (work) are drawn up by students in the form of a report, grades for the implementation of the laboratory task (work) are indicators of the current performance of students in the academic discipline.

Research skills and professional competencies are formed.

IX. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

Training sessions on the discipline are held in rooms equipped with appropriate equipment and software.

The list of material and technical and software of the discipline is given in the table.

Logistics and Software Discipline

Name of special premises and premises for independent work	Equipment special premises and rooms for independent work	List of licensed software. Details of the supporting document
690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 605	Multimedia audience: Screen with electric drive 236 * 147 cm Trim Screen Line; Projector DLP, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; Subsystem of specialized fasteners of equipment CORSA-2007 Tuarex; Video switching subsystem: DVI DXP 44 DVI Pro Extron matrix switch; DVI twisted pair extender DVI 201 Tx/Rx Extron; Subsystem of audio switching and sound amplification; acoustic system for ceiling mounting	-

	<p>SI 3CT LP Extron; digital audio processor DMP 44 LC Extron; extension for IPL T CR48 management controller; Wireless LANs for trainees are provided with a system based on 802.11a/b/g/n 2x2 MIMO(2SS) access points.</p> <p>HP All-in-One 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi-Fi, WT, usb kbd/mse, Win7Pro (64-bit)+Win8.1Pro(64-bit), 1-1-1 Wty</p>	
<p>690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 422</p>	<p>Multimedia audience: Monoblock HP ProOne 400 G1 AiO 19.5" Intel Core i3-4130T 4GB DDR3-1600 SODIMM (1x4GB)500GB; Projection screen Projecta Elpro Electrol, 300x173 cm; Multimedia projector, Mitsubishi FD630U, 4000 ANSI Lumen, 1920x1080; Mortise interface with TLS TAM 201 Stan automatic cable retraction system; Avervision CP355AF Visualizer; Microphone cordless radio system UHF band Sennheiser EW 122 G3 consisting of a wireless microphone and receiver; LifeSizeExpress 220-Codeonly- Non-AES video conferencing codec; Network video camera Multipix MP-HD718; Two 47" LCD panels, Full HD, LG M4716CCBA; Subsystem of audio switching and sound amplification; centralized uninterrupted power supply</p>	-
<p>690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 627</p>	<p>Light microscope Carl Zeiss GmbH Primo Star 3144014501 (13 pcs.); Light microscope with digital camera Altami BIO8 (2 pcs).</p>	-

<p>Computer Class of the School of Biomedicine Aud. M723, 15 workplaces</p>	<p>Screen with electric drive 236 * 147 cm Trim Screen Line; Projector DLP, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; Subsystem of specialized fasteners of equipment CORSA-2007 Tuarex; Video switching subsystem: DVI DXP 44 DVI Pro Extron matrix switch; DVI twisted pair extender DVI 201 Tx/Rx Extron; Subsystem of audio switching and sound amplification; acoustic system for ceiling mounting SI 3CT LP Extron; digital audio processor DMP 44 LC Extron; extension for IPL T CR48 management controller; Wireless LANs for trainees are provided with a system based on 802.11a/b/g/n 2x2 MIMO(2SS) access points. HP All-in-One 400 All-in- One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi- Fi, WT, usb kbd/mse, Win7Pro (64- bit)+Win8.1Pro(64-bit), 1-1- 1 Wty</p>	<p>-</p>
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X. VALUATION FUNDS

Code and name of the competency achievement indicator	Name of the assessment indicator (the result of training in the discipline)
PC-5.1 Studies the relationship between cells, tissues and functional systems of organisms.	<p>Knows</p> <ul style="list-style-type: none"> – the relationship of cells, tissues and functional systems of organisms <p>Can</p> <ul style="list-style-type: none"> – independently work with scientific and reference literature <p>Owns</p> <ul style="list-style-type: none"> – basic concepts and terminology on the topic of the relationship between cells, tissues and functional systems of organisms
PC-5.2 Investigates the relationship between cells, tissues and functional systems of organisms.	<p>Knows</p> <ul style="list-style-type: none"> – molecular, immunological and physiological aspects of the study of cells of multicellular and unicellular organisms <p>Can</p> <ul style="list-style-type: none"> – to conduct and investigate the adaptation of tissue elements to the action of various biological, physical, chemical and other factors <p>Owns</p> <ul style="list-style-type: none"> – skills with the analysis of the relationship between cells, tissues and functional systems of organisms – representatives of all kingdoms
PC-5.3 Conducts a systematic analysis of the relationship between cells, tissues and functional systems of organisms.	<p>Knows</p> <ul style="list-style-type: none"> – the theoretical part of the analysis of the relationship between cells, tissues and functional systems of organisms <p>Can</p> <ul style="list-style-type: none"> – to conduct a systematic analysis of the relationship between cells, tissues and functional systems of organisms <p>Owns</p> <ul style="list-style-type: none"> – a method of conducting an analysis of the relationship between cells, tissues and functional systems of organisms

No p/n	Supervised sections / topics of the discipline	Achievement indicator code and name	Learning outcomes	Assessment tools	
				current control	Intermediate-accurate certification
1.	Topic 1-2	PC-5.1 Studies the relationship between cells, tissues and functional systems of organisms.	Knows – the relationship of cells, tissues and functional systems of organisms Can – independently work with scientific and reference literature Owns – basic concepts and terminology on the topic of the relationship between cells, tissues and functional systems of organisms	Oral questioning	Questions for credit
2.	Topic 3-4				
3.	Topic 5-6	PC-5.2 Investigates the relationship between cells, tissues and functional systems of organisms.	Knows – molecular, immunological and physiological aspects of the study of cells of multicellular and unicellular organisms Can – to conduct and investigate the adaptation of tissue elements to the action of various biological, physical, chemical and other factors Owns – skills with the analysis of the relationship between cells, tissues and functional systems of organisms – representatives of all kingdoms	Test	Questions for credit
4.	Topic 7-8				
5.	Topic 9-10	PC-5.3 Conducts a systematic analysis of the relationship between cells, tissues and functional systems of organisms.	Knows – the theoretical part of the analysis of the relationship between cells, tissues and functional systems of organisms Can – to conduct a systematic analysis of the relationship between cells, tissues and functional systems of organisms Owns – a method of conducting an analysis of the relationship between cells, tissues and functional systems of organisms	Oral questioning	Questions for credit
6.	Topic 11-12				

The following assessment tools are used for discipline:

1. Poll
2. Testing

Oral questioning.

Oral questioning allows you to assess the knowledge and logic of the student, the ability to use terminology, speech skills and other communication skills.

The training function is to identify details that for some reason were not sufficiently understood during the training sessions and in preparation for the test.

A survey is a means of control, organized as a special conversation of the teacher with the student on topics related to the discipline being studied, and designed to clarify the amount of knowledge of the student on a certain section, topic, problem, etc.

1. The structure of the human brain. Anatomy and histology, cytology.
2. Molecular biological features of the structure and function of neuroblasts.
3. Features of the embryonic development of the nervous system in the lanceolate.
4. Features of embryonic development of the nervous system in birds.
5. Features of embryonic development of the neural tube in humans.
6. Organogenesis of the brain in humans.
7. Features of the structure of the brain in ontogenesis.
8. Cellular basis of basic pathological reactions of neurons and glia.
9. Blood-brain barrier and brain pathology.
10. Malformations of embryonic development of the brain.
11. Brain tumors.
12. Brain and aging.

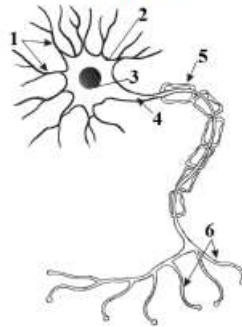
Testing.

Testing is the most effective and objective form of assessing knowledge, skills and abilities, which allows to identify not only the level of educational achievements, but also the structure of knowledge, the degree of its deviation from the norm. Testing involves a standardized, verified procedure for collecting and processing data, as well as their interpretation, allows you to check the knowledge of students on a wide range of issues. Testing excludes the subjectivity of the teacher, both in the process of control and in the process of assessment.

Examples of test tasks

Т1р-1

Рис.1. СХЕМА НЕЙРОНА

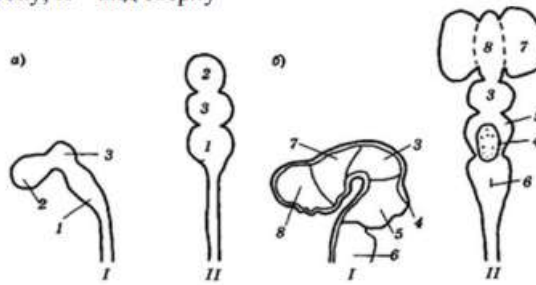


- синапсы
- тело нейрона
- ядро нейрона
- Швановская клетка
- аксон
- дендриты

Т1р-2

Рис.2. СТАДИИ РАННЕГО РАЗВИТИЯ ГОЛОВНОГО МОЗГА

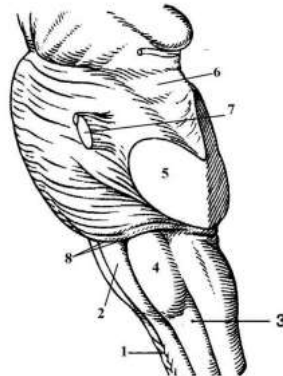
I – вид сбоку, II – вид сверху



- конечный мозг,
- передний мозг,
- промежуточный мозг,
- мозжечок,
- мост,
- продолговатый мозг,
- средний мозг,
- задний мозг

Т1р-18

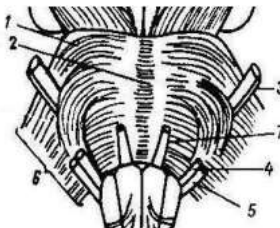
Рис. 18. СТВОЛ ГОЛОВНОГО МОЗГА латеральная поверхность



- верхняя мозжечковая ножка,
- средняя мозжечковая ножка,
- перекрест пирамид,
- боковой канатик,
- бульбарно-мостовая борозда,
- олива,
- пирамида,
- корешок тройничного нерва

Т1р-19

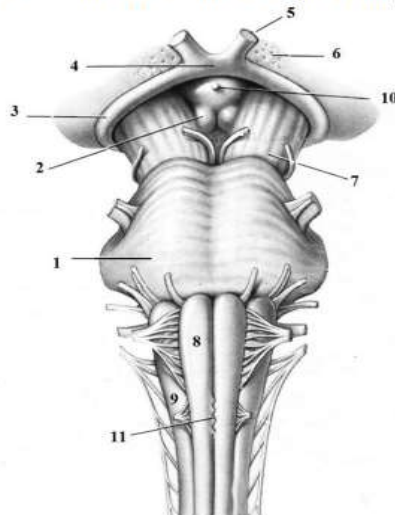
Рис. 19. МОСТ КОРЕШКИ ЧЕРЕПНЫХ НЕРВОВ



- отводящий нерв
- базилярная борозда
- мост
- лицевой нерв
- средняя мозжечковая ножка
- тройничный нерв
- преддверно-улитковый нерв

Т1р-34

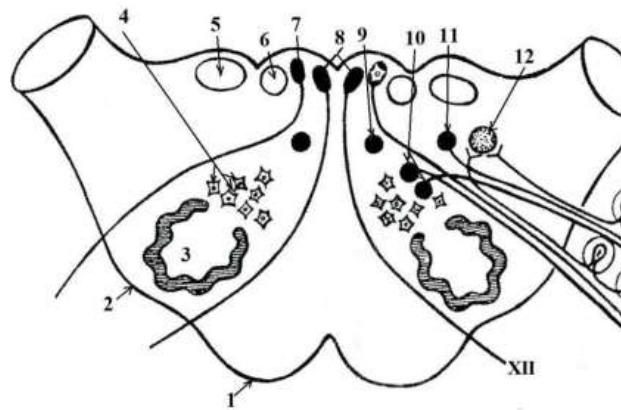
Рис. 34. СТВОЛ ГОЛОВНОГО МОЗГА 1 вентральная поверхность



- зрительный нерв,
- воронка,
- пирамида,
- мост,
- перекрест пирамид,
- зрительный тракт,
- олива,
- зрительный перекрест,
- переднее продырявленное вещество,
- сосцевидные тела,
- ножка мозга

T2p-20

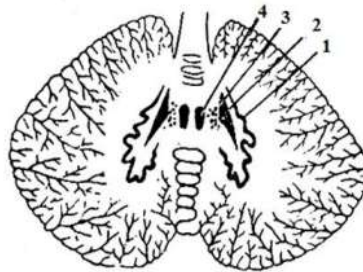
Рис.20. ЯДРА ПРОДОЛГОВАТОГО МОЗГА



- двигательные ядра подъязычного нерва,
- олива,
- тонкое ядро,
- пирамида,
- ядро одиночного пути
- ретикулярная формация,
- клиновидное ядро,
- ядро оливы,
- дорсальное ядро блуждающего нерва,
- нижнее слюноотделительное ядро,
- двойное ядро,
- двигательное ядро добавочного нерва

T1p-24

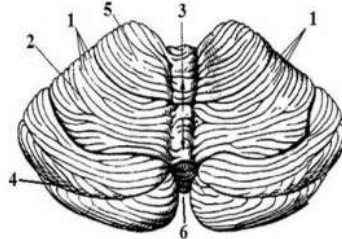
Рис. 24. ЯДРА МОЗЖЕЧКА



- шаровидное ядро,
- пробковидное ядро,
- зубчатое ядро,
- ядро шатра.

T2p-25

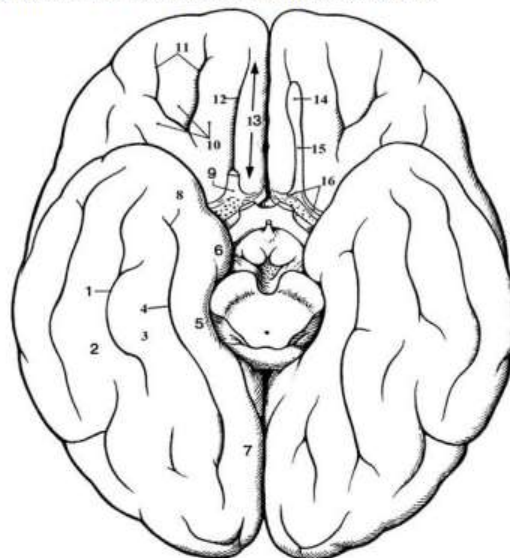
Рис. 25. МОЗЖЕЧОК. ВЕРХНЯЯ ПОВЕРХНОСТЬ



- нижняя вырезка мозжечка 2 – щель мозжечка,
- червь мозжечка,
- передняя долька мозжечка,
- листки мозжечка,
- горизонтальная щель,

Т1р-58

Рис. 58. ОСНОВАНИЕ ПОЛУШАРИЙ БОЛЬШОГО МОЗГА



- | | |
|--|---|
| <input type="checkbox"/> – язычная извилина, | <input type="checkbox"/> – коллатеральная борозда, |
| <input type="checkbox"/> – глазничные извилины, | <input type="checkbox"/> – носовая борозда, |
| <input type="checkbox"/> – медиальная затылочно-височная извилина, | <input type="checkbox"/> – обонятельный треугольник, |
| <input type="checkbox"/> – крючок, | <input type="checkbox"/> – глазничные борозды, |
| <input type="checkbox"/> – затылочно-височная борозда, | <input type="checkbox"/> – латеральная затылочно-височная извилина, |
| <input type="checkbox"/> – прямая извилина, | <input type="checkbox"/> – обонятельная луковица, |
| <input type="checkbox"/> – извилина гиппокампа (парагиппокампальная извилина), | <input type="checkbox"/> – медиальная и латеральная |
| <input type="checkbox"/> – обонятельная борозда, | |
| <input type="checkbox"/> обонятельный тракт, | |
| <input type="checkbox"/> обонятельные полоски | |

Test Evaluation Criteria

evaluation	50-60 points (unsatisfactory)	61-75 points (satisfactory)	76-85 points (good)	86-100 points (excellent)

Methodological recommendations that determine the procedures for assessing the results of mastering the discipline

Assessment tools for intermediate attestation

Intermediate certification of students in the discipline is carried out in accordance with local fefu regulations and is mandatory. The form of reporting on the discipline is zaeven. Zaeven for the discipline includes answers to 2 questions.

Methodical instructions for the delivery of zachyota

Credit is taken by the leading teacher (associate professor, professor), for whom this type of educational load is assigned in the individual plan. The form of the event is oral.

During the study, students can use the work program of the discipline, as well as with the permission of the teacher conducting the test, reference literature and other manuals.

The time allowed to the student to prepare for the answer to the z couple should be no more than 40 minutes.

The presence of unauthorized persons (except for persons carrying out the inspection) without the permission of the relevant persons (rector or vice-rector for academic affairs, director of the School, head of the OBOR or director of the department) is not allowed. Disabled persons and persons with disabilities who do not have the opportunity to move independently are allowed to take the exam with accompanying persons.

With an intermediate attestation, students are given a grade of "zaread" or "not credited". If the student does not appear for credit, an entry "did not appear" is made in the statement.

Questions for credit

1. The structure of the human brain. Anatomy and histology, cytology.
2. The internal structure of the cerebral hemisphere. Basal (subcortical) nuclei.
3. Blood supply to the brain (arteries, veins, sinuses of the dura mater).
4. Molecular biological features of the structure and function of neuroblasts.
5. Features of the embryonic development of the nervous system in the lanceolate.
6. Features of embryonic development of the nervous system in birds.
7. Features of embryonic development of the neural tube in humans.
8. Organogenesis of the brain in humans.
9. Features of the structure of the brain in ontogenesis.
10. Cellular basis of basic pathological reactions of neurons and glia.
11. Blood-brain barrier and brain pathology.
12. Brain stem. Symptoms of damage at different levels. Alternating syndromes.
13. Hypoxic-ischemic brain lesions in newborns.
14. Malformations of embryonic development of the brain.
15. Brain tumors.
16. Brain and aging.
17. Structural changes in the brain during aging.
18. Age-related features of the blood supply to the brain.
19. Structural, functional, metabolic changes in the brain stem during st.

20. Bioelectrical activity of the brain during aging.

Criteria for assigning a grade to a student on the test

Evaluation of the test	Requirements for the formed competencies
"credited"	"credited" is exhibited to the student if he has deeply and firmly mastered the program material, exhaustively, consistently, clearly and logically coherently presents it, is able to closely link the theory with practice, freely copes with tasks, questions and other types of application of knowledge, and does not find it difficult to answer when modifying tasks, uses in the answer the material of monographic literature, correctly justifies the decision made, has versatile skills and techniques for performing practical tasks in the methodology of scientific research.
"credited"	The grade "credited" is given to the student if he firmly knows the material, correctly and substantively presents it, avoiding significant inaccuracies in the answer to the question, correctly applies theoretical provisions when solving practical questions and tasks, possesses the necessary skills and techniques for their implementation.
"credited"	The grade "credited" is given to the student if he has knowledge only of the basic material, but has not mastered its details, allows inaccuracies, insufficiently correct wording, violations of the logical sequence in the presentation of the program material, has difficulties in performing practical work.
"not credited"	The grade "not credited" is given to a student who does not know a significant part of the program material, makes significant mistakes, uncertainly, with great difficulties performs practical work. As a rule, it is not credited to students who cannot continue their studies without additional classes in the relevant discipline.