Ministry of Health of Ukraine
Poltava State Medical University
Department of Nervous Diseases

SYLLABUS

NEUROLOGY

(compulsory discipline)

academic and professional level	the second (master's) level of higher education
field of knowledge	22 «Healthcare»
Specialty	222 «Medicine»
academic qualification	Master of Medicine
professional qualification	Medical Doctor
academic and professional program	«Medicine»
mode of study	full-time
course(s) and semester(s) of study of the discipline	4 course, 7 semester

Poltava – 2024

INFORMATION ABOUT LECTURERS WHO DELIVER THE ACADEMIC DISCIPLINE

Surname, name, patronymic of the lecturer (lecturers), scientific degree, academic title	Delva Mykhaylo, PhD, Dr. Med. Sci., professor Delva Iryna, PhD, Dr. Med. Sci., professor Taryanyk Kateryna, PhD, docent
Profile of the lecturer (lecturers)	https://ndiseases.pdmu.edu.ua/
Contact phone	Neurological department of Poltava regional hospital named after M.V. Sklyfosovsky. – 23 Shevcenko str., tel. (053) 56-42-37, (0532) 52-49-05.
E-mail:	neurology@pdmu.edu.ua
Department page at the website of PSMU	https://ndiseases.pdmu.edu.ua/

MAIN CHARACTERISTICS OF THE ACADEMIC DISCIPLINE

The scope of the academic discipline (module)

Number of credits / hours – 4 /120, of which:
Lectures (hours) – 10
Seminar classes (hours) – 0
Practical classes (hours) – 70
Self-directed work (hours) – 40
Type of control – semester final certification (SFC)

The policy of the academic discipline

When organizing the educational process in PSMU, teachers and applicants for higher education act in accordance with:

- "Regulations on the organization of the educational process in the Poltava State Medical University";
- "Regulations on the academic integrity of applicants for higher education and employees of the Poltava State Medical University";
- "Rules of Procedure for students of the Poltava State Medical University";
- "Regulations on the organization and methodology of assessment of educational activities of higher education in the Poltava State Medical University";
- "Regulations on the organization of independent work of students at the Poltava State Medical University";
- "Regulations on the completion of missed classes and unsatisfactory grades by applicants for higher education of the Poltava State Medical University";
- "Regulations on the procedure for the formation of individual educational trajectories by students of PDMU";

- "Regulations on the rating of applicants for higher education of the Poltava State Medical University";
- "Regulations on the procedure for re-enrollment of academic disciplines and determination of academic difference";
- "Regulations on the appeal of the results of the final control of knowledge of applicants for higher education", etc.

You can get acquainted with the above provisions at (https://www.umsa.edu.ua/n-process/department-npr/normativni-dokumenti).

While studying at the Department of Nervous Diseases, applicants for higher education must follow the rules of conduct adopted by PDMU. The applicant of PDMU, as a future doctor, must have a high level of culture of behavior, behave with dignity, tact, maintain endurance and self-control both during training in practice and when working with patients in the department.

Applicants for higher education are required to attend classes on time, according to the class schedule. It is not allowed to violate the schedule of the educational process and to allow non-fulfillment of the curriculum, to be late for classes and to miss classes without good reasons. Missed classes must be completed for all students, regardless of the sources of funding for their education. Applicants for higher education at the Poltava State Medical University work off missed classes regardless of the reason for admission, in electronic classes № 1, № 2, № 3, according to the schedule, in accordance with the "Regulations on working off missed classes and unsatisfactory grades by applicants for higher education at the Poltava State Medical University "

During their stay at the department and clinical bases, participants of the educational process must comply with the requirements for the appearance of persons who work and study at the academy and be dressed in appropriate medical uniforms.

Applicants for higher education are prohibited from leaving the classroom without the teacher's permission, using a mobile phone and other means of communication and receiving information without the teacher's permission, engaging in extraneous activities, distracting other students and disturbing the teacher. During the stay at the clinical base and in the surrounding areas, participants in the educational process are prohibited from smoking.

During the study of the discipline, higher education students are required to adhere to the rules of academic integrity, which includes: independent performance of educational tasks, tasks of current and final control of learning outcomes; links to sources of information in the case of the use of ideas, developments, statements and information; compliance with the law on copyright and related rights; providing reliable information about the results of their own educational (scientific, creative) activities, used research methods and sources of information.

Description of the academic discipline (summary)

Neurology is one of the disciplines of the clinical stage of undergraduate physician training, during which the students learn theoretical basics, skills of neurological patients examination, methodology of making a diagnosis of a neurological disease, choice of treatment tactics and providing urgent medical care in case of medical emergencies. A special place is given to the study of acute conditions - disorders of the cerebral blood flow, neurological pain syndromes, disorders of the functions of the autonomic and peripheral nervous systems.

A sick person with all his / her peculiarities is the main subject of study at lectures and practical classes. At practical classes the attention is paid to students' acquisition of examination skills, making topical and clinical diagnosis, treatment prescription and providing urgent medical care for patients with various diseases of the nervous system.

It is important to create in higher education students an idea of the pathogenetic mechanisms of diseases of the nervous system, methods of prevention of lesions of the nervous system.

Thus, neurology is an academic clinical discipline that studies the methods and techniques of clinical examination, features of professional communication of the doctor with the patient, subjective and objective manifestations of the disease (symptoms and syndromes), causes and mechanisms of their origin and development (semiology) with the purpose of making a diagnosis.

The study of discipline carries out in two logical stages: the first − mastering of the basic methods of physical, instrumental and laboratory examination of the patient, after which students define a topical diagnosis of the nervous system disorder, and the second − clinical neurology, where students learn the theoretical bases of specific neurology (pathogenetic mechanisms of origin, features of clinics, diagnostics, treatment and prevention of nervous system diseases).

Pre-requisites and post-requisites of the academic discipline (interdisciplinary links)

Neurology as a discipline:

a) is based on the study of medical biology, biological and bioorganic chemistry, medical and biological physics, microbiology, virology and immunology, histology, physiology and pathological physiology, human anatomy and pathomorphology and integrates with these disciplines;

b) is based on the study of higher education propaedeutic disciplines of therapeutic profile, pharmacology, radiology, tuberculosis, otorhinolaryngology and is integrated with these disciplines;

c) integrates with other clinical disciplines (internal medicine, neurosurgery, oncology, psychiatry, medical genetics, ophthalmology, pediatrics, obstetrics, etc.).

The aim and tasks of the academic discipline:

The aim of studying the academic discipline "neurology" is the ultimate goals set on the basis of the educational and professional program of training of a doctor in the specialty in accordance with the block of its content module (professional and practical training) and is the basis for building the content of the discipline. The description of goals is formulated through skills in the form of target tasks (actions).

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The main tasks of studying the discipline "Neurology" are:

- to determine the main symptoms and syndromes of lesions of different parts of the nervous system;
- interpret the data of functional anatomy and clinical physiology of the nervous system

systems;

- to determine the etiological factors and pathogenetic mechanisms of the development of major neurological diseases;
- make a preliminary diagnosis of major neurological diseases;
- to analyze the main indicators of laboratory and instrumental research methods in neurological practice;
- plan the practice of managing a patient with neurological pathology.

Competences and learning outcomes in accordance with the academic and professional program, the formation of which is facilitated by the discipline (integral, general, special):

The discipline provides students with the acquisition of **competencies:**

– *integral**:***

Ability to solve typical and complex specialized tasks and practical problems in professional health care activities, or in the process of study that involves research and/or innovation, and is characterized by complexity and uncertainty of conditions and requirements.

– *general:*

1. Ability to abstract thinking, analysis and synthesis, the ability to learn and master modern knowledge.
2. Ability to apply knowledge in practical situations.
3. Knowledge and understanding of the subject area and understanding of professional activity.
4. Ability to adapt and act in a new situation.
5. Ability to make informed decisions; work in a team; interpersonal skills.
6. Ability to communicate in the state language both orally and in writing; ability to communicate in a foreign language. Ability to use international Greco-Latin terms, abbreviations and clichés in professional oral and written speech.
7. The ability to act socially responsibly and consciously.

– *special (professional, subject matter):*

1. Skills of interviewing and clinical examination of the patient.
2. Ability to determine the required list of laboratory and instrumental studies and evaluate their results.
3. Ability to establish a syndromic diagnosis of the disease.
4. Ability to establish a preliminary and clinical diagnosis of the disease

5. Ability to diagnose emergencies.
6. Emergency care skills.
7. Skills to perform medical manipulations.
8. Ability to keep medical records.
9. Ability to carry out sanitary and hygienic and preventive measures.
10. Skills of medical manipulations.
11. Ability to carry out sanitary and hygienic and preventive measures.
12. Ability to plan and carry out preventive and anti-epidemic measures against infectious diseases.
13. Ability to determine the tactics of management of persons subject dispensary supervision.
14. Ability to conduct a performance examination.
15. Ability to keep medical records.

Program learning outcomes, the formation of which is facilitated by the discipline "Neurology":

1. Collect data on patient complaints, life history (including professional history) in a health care facility and / or at the patient's home, according to the standard survey scheme.

2. Assign and analyze additional (mandatory and optional) investigational methods (laboratory, radiological, functional and / or instrumental). Evaluate information for the purpose of differential diagnosis of diseases (according to list 2), using knowledge about the person, his organs and systems, based on the results of laboratory and instrumental research (according to list 4).

3. Establish a preliminary and clinical diagnosis of the disease (according to list 2) on the basis of leading clinical symptoms or syndromes (according to list 1) by making an informed decision and logical analysis, using the most probable or syndrome diagnosis, laboratory and instrumental examination of the patient, conclusions of differential diagnosis, knowledge of person, his organs and systems, adhering to the relevant ethical and legal norms.

4. To determine the necessary mode of work and rest in the treatment of the disease (according to list 2) in the health care facility, at the patient's home and at the stages of medical evacuation, including in the field, on the basis of a preliminary clinical diagnosis, using knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision according to existing algorithms and standard schemes.

5. Prescribe the necessary medical nutrition in the treatment of the disease (according to list 2), in a health care facility, at the patient's home and at the stages of medical evacuation, including in the field on the basis of a preliminary clinical diagnosis, using knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision according to existing algorithms and standard schemes.

6. To determine the nature of treatment of the disease (conservative, operative) and its principles (according to list 2) in the conditions of the health care institution,

at the patient's home and at the stages of medical evacuation, including in the field on the basis of a preliminary clinical diagnosis, using knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision according to existing algorithms and standard schemes.

7. Diagnose emergencies and establish a diagnosis (according to list 3) by making an informed decision and assessing the human condition under any circumstances (at home, on the street, in a health care facility), including in emergency situations, in field conditions, in conditions of lack of information and limited time, using standard methods of physical examination and possible anamnesis, knowledge about a person, his organs and systems, adhering to the relevant ethical and legal norms.

8. Determine the tactics of emergency medical care, under any circumstances, using knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision, based on the diagnosis (list 3) in a limited time using standard schemes.

9. Provide emergency medical care under any circumstances, using knowledge of the person, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision, based on a diagnosis of emergency (list 3) for a limited time according to certain tactics, using standard schemes.

10. Perform medical manipulations (according to list 5) in a health care facility, at home or at work on the basis of a previous clinical diagnosis and / or indicators of the patient's condition, using knowledge about the person, his organs and systems, adhering to relevant ethical and legal norms, by making an informed decision and using standard techniques.

11. Implement a system of anti-epidemic and preventive measures, including primary prevention measures in the health care institution and beyond, on the basis of data on the health of the population served, the presence of environmental impact, the determinant of health using existing methods, within the framework of primary health care. Organize secondary and tertiary prevention measures among the assigned contingent of the population, using a generalized procedure for assessing human health (screening, preventive medical examination, seeking medical care).

12. Plan and carry out preventive and anti-epidemic measures to prevent the spread of infectious diseases (according to list 2) in a health care facility based on the results of epidemiological surveys of infectious diseases, epidemiological analysis, using existing preventive and anti-epidemic methods. Identify in the health care facility, using statistical and laboratory methods of risk group, risk areas, time of risk, risk factors and carry out epidemiological analysis of infectious diseases of the population. Diagnose infectious diseases in the early stages (according to list 2), carry out primary anti-epidemic measures in the center of infectious diseases.

13. To determine the tactics of management of persons subject to dispensary supervision in a health care institution or at the patient's home on the basis of the obtained data on the patient's state of health, using standard schemes, using knowledge about the person, his organs and systems, and legal norms, by making an informed decision.

14. Carry out examination of working capacity by determining the presence and degree of disability, type, degree and duration of incapacity with the relevant documents, in a health care facility on the basis of data on the disease and its course, features of professional activity.

15. Maintain medical records of the patient and the population on the basis of regulations, using standard technology. Prepare reports on personal production activities, using official accounting documents in a generalized form.

16. Adhere to the requirements of ethics, bioethics and deontology in their professional activities.

Learning outcomes of the academic discipline:

upon completing their study in the academic discipline, students must

know:

- the place of neurology as a science, a field of practical medicine and a subject;
- methodological bases and schemes of clinical neurological examination of the patient: examination of higher cortical functions, cranial nerves, motor, sensory functions, etc.;
- changes in cerebrospinal fluid and meningeal symptom complex;
- paraclinical methods of examination of patients (neuroimaging, ultrasound and electrophysiological);
- - clinical and diagnostic interpretations of indicators of main laboratory and instrumental tests;
- - the most important symptoms and syndromes in the clinic of nervous diseases and their semiological interpretation;
- - main points of clinical neurology: vascular, inflammatory brain diseases, autonomic nervous system diseases, progressive and demyelinating diseases, peripheral nervous system diseases, vertebrogenic diseases, hereditary and degenerative diseases, etc.; the etiological and pathogenetic formation factors of these diseases;
- - modern methods of diagnosis, treatment and prevention of the nervous system diseases, taking into account the principles of scientific-based medicine.

be able to:

- collect data on patient complaints, medical history, life history (including occupational history), in a health care facility, its unit or at the patient's home, using the results of the interview with the patient, according to the standard scheme of the patient;

- assess the neurological status of the patient (examination of the volume of active and passive movements, muscle tone and strength, tendon, periosteal, skin reflexes (stylo-carpo-radial, biceps, triceps, knee, Achilles, abdominal), pathological reflexes (Babinsky , Oppenheim, Gordon, Schaeffer, Rossolimo, Bekhterev, Zhukovsky and others) and synkinesis, coordination of movements (finger-nose, knee-heel tests, diadochokinesis, dysmetry tests), detection of static, dynamic ataxia, sensitivity (superficial, deep and complex species), symptoms of tension, smell and taste, visual

acuity, visual fields, color perception, functions of oculomotor nerves, functions of V nerve, functions of VII nerve, functions of IX-X nerves, functions of XI-XII nerves, autonomic nervous system, meningeal symptoms (rigidity of the occipital muscles, symptoms of Kernig, Brudzinsky), reactive pain phenomena: Mendel, Platau, small and large occipital nerves, speech, praxis, gnosis, writing, reading , account).

- identify and record the leading topical syndrome and establish a preliminary and clinical diagnosis of the disease;

- determine the necessary list of laboratory and instrumental studies and evaluation of their results;

- to interpret the main indicators of auxiliary methods of examination in the neurological clinic (electrophysiological, ultrasound, X-ray, computed tomography);

- independently examine patients with neurological pathology with the compilation of medical history and the appointment of modern diagnosis and treatment, taking into account the principles of evidence-based medicine;

- to determine the necessary mode of work and rest in the treatment of diseases of the nervous system in a health care facility, at the patient's home and at the stages of medical evacuation, including in the field, on the basis of a preliminary clinical diagnosis, using knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision according to existing algorithms and standard schemes.

- to determine the necessary medical nutrition in the treatment of diseases of the nervous system;

- to determine the nature of treatment (conservative, operative) of the disease;

- identify signs of emergency human condition, under any circumstances (at home, on the street, health care facilities, its units), using standard methods of physical examination and possible history, knowledge of the person, his organs and systems, adhering to the relevant ethical and legal norms;

- determine the tactics of emergency medical care, under any circumstances, using knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision, based on the diagnosis of emergency in a limited time with standard schemes;

- provide emergency medical care, under any circumstances, using knowledge about the person, his organs and systems, adhering to the relevant ethical and legal norms, by making an informed decision, based on the diagnosis of emergency in a limited time according to certain tactics, using standard schemes;

- perform medical manipulations in a health care facility, at home or at work on the basis of a previous clinical diagnosis and / or indicators of the patient's condition, using knowledge of the person, his organs and systems, adhering to relevant ethical and legal norms, by making informed decisions and using standard techniques;

- be able to form the conduct of sanitary and hygienic and preventive measures;

- plan and carry out preventive and anti-epidemic measures against infectious diseases;

- to determine the tactics of management of persons subject to dispensary supervision;

- to conduct an examination of working capacity, determine the presence and degree of limitations of life, type, degree and duration of incapacity for work with the relevant documents, in a health care facility based on data about the disease and its course, features of professional activity;

- keep medical records of the patient and the population (outpatient / inpatient card, medical history, individual pregnancy card, exchange card, birth history, sanatorium card, sick leave, documentation for MSEC, etc.), using standard technology, based on regulatory documents;

- to demonstrate mastery of ethical, biotic and moral-deontological principles of a medical specialist and the principles of professional subordination in the clinic of nervous diseases.

Thematic plan of lectures (by modules), specifying the basic issues, which are considered at the lecture

Seq. No.	Title of the topic	Number of hours
	Module 1. General neurology.	
1	**Introduction to neurology. Principles of structure and functions of the nervous system. Movement syndromes. Parkinson's syndrome and its neurochemical mechanisms.** 1.Functional unit of the nervous system. 2.Representation of reflex and reflex arc. 3. Pyramid system. Cortico-nuclear and cortico-spinal pathways. Symptoms of central and peripheral paresis, pathogenesis of symptoms. 4. Pathological reflexes, examination. 5. Syndromes of movement disorders at defeat of various levels of a cortico-muscular way. 6. Anatomy of the cerebellum, the leading pathways of the lower, middle and upper legs of the cerebellum. Cerebellar lesion syndromes. Types of ataxia. 7. Examination of coordination of movements. 8. Differential diagnosis of ataxia. 9. Anatomy of the striopalidar system - striatal and pallidar departments. 10. Biochemistry of the extrapyramidal system - modern ideas about the metabolism of catecholamines in the negro-striatal system. 11. Functions of the extrapyramidal system 12. Lesion syndromes: hypertonic-hypokinetic (parkinsonism) and hypotonic-hyperkinetic (hyperkinesis). Examination.	2
2	**Higher cerebral functions and their disorders.** 1. Functional features of the frontal, parietal, temporal, occipital lobes of the cerebral hemispheres. 2. Projection fields. 3. The concept of functional asymmetry of the hemispheres. 4. Apraxia, agnosia, their types. 5. Aphasia, clinical forms, topical diagnosis. 6. Alexia, agraphy, acalculia. 7. Syndromes of lesions of different parts of the brain in the right and left hemispheres. Syndromes of irritation of the cortex of the hemispheres.	2
	Module 2. Special Neurology.	
1	**Cerebrovascular disease (transient disorders of cerebral**	2

	circulation, ischemic and hemorrhagic strokes). 1. Blood supply to the brain. 2. Classification of cerebrovascular disorders. 3. Initial manifestations of cerebrovascular disease. 4. Dyscirculatory encephalopathy. 5. Vascular cerebral crisis (hypertensive, hypotonic). 6. Transient disorders of cerebral circulation. 7. Syndromes of lesions of the anterior, middle, posterior cerebral arteries. 8. Classification, etiology and pathogenesis of ischemic strokes. 9. Differential diagnosis of ischemic and hemorrhagic strokes. 10. Principles of treatment. Undifferentiated and differentiated treatment of strokes. 11. Treatment of patients after cerebral strokes. Rehabilitation and examination of able-bodied patients. 12. Prevention of vascular diseases of the brain. 13. Modern principles of treatment using treatment standards and principles of evidence-based medicine. 14. Prevention of cerebrovascular disease. 15. Classification, etiology and pathogenesis of hemorrhagic strokes. Indications and contraindications to surgical treatment of acute cerebrovascular disorders.	
2	**Cerebrum Inflammatory diseases (meningitis, encephalitis).** 1. Meningitis. Classification of meningitis: primary and secondary, purulent and serous. 2. Purulent meningitis. Primary meningococcal meningitis, clinic, diagnosis, features of the course, atypical forms. Secondary meningitis: pneumococcal, staphylococcal. Clinic, diagnosis, cerebrospinal fluid indicators, treatment, prevention. 3. Serous meningitis. Primary viral: lymphocytic choriomeningitis, enteroviral meningitis (ECHO, Coxsackie), mumps and others. Secondary: tuberculous meningitis and meningitis in other infections. Clinic, diagnosis, significance of cerebrospinal fluid research in differential diagnosis, treatment, prevention. 4. Arachnoiditis. Etiology, pathogenesis. Pathomorphology: adhesive, cystic. Classification by localization: arachnoiditis of the posterior cranial fossa, basal, convex. Clinic, course, diagnosis. Differential diagnosis. Treatment and prevention. 5.Independent work - examination of the patient (according to the scheme), topical diagnosis, acquaintance with paraclinical and laboratory data, carrying out differential diagnostics, substantiation of the clinical diagnosis, treatment. 6.Encephalitis. Classification. Primary encephalitis: epidemic, tick-borne spring-summer, herpetic. Secondary encephalitis: rheumatic (small chorea), post-vaccination, chickenpox, measles, rubella. Clinic, course, forms of the disease, diagnosis. Lyme disease. 7. Lesions of the nervous system in influenza (influenza hemorrhagic encephalitis, encephalopathy). 8. Infectious encephalopathy - dyscirculatory-dystrophic changes of the brain without severe focal lesions with a predominance in the clinic of asthenic manifestations, autonomic dystonia, intracranial hypertension. Course, diagnosis, differential diagnosis, treatment, prevention.	2
3	**Nervous system demyelinating diseases (multiple sclerosis, multiple encephalomyelitis) and nervous system progressive diseases (myasthenia, syringomyelia, lateral amyotrophic sclerosis).** 1. Multiple Sclerosis. Etiology, pathogenesis, clinic, diagnosis, differential diagnosis. Treatment, examination of working capacity. 2. Acute Multiple Encephalomyelitis. Etiology, pathogenesis, clinic, diagnosis, differential	2

	diagnosis. Treatment, examination of working capacity. 3. Acute transverse myelitis. Etiology, pathogenesis, clinic, diagnosis, differential diagnosis. Treatment, examination of working capacity. **Progressive diseases of the nervous system (myasthenia, syringomyelia, amyotrophic lateral sclerosis).** 1. Syringomyelia. Etiology, pathogenesis, clinical symptoms and clinical forms. Treatment, examination of working capacity. 2. Amyotrophic lateral sclerosis. Etiology, pathogenesis, clinical symptoms and clinical forms. Treatment, examination of working capacity. 3. Myasthenia. Etiology, pathogenesis, clinical symptoms and clinical forms. Treatment, examination of working capacity. 4. Myasthenic and cholinergic crises, diff. diagnostics, emergency care.	
	Total	10

Seminar themes (modules and content modules)

Seminars are not included in the syllabus.

Thematic plan of practical classes by modules and content modules, specifying the basic issues, which are considered at the practical class

Seq. No.	Title of the topic	Number of hours
	Module 1: General Neurology.	
1.	**Principles of structure and functioning of the nervous system.** 1. Anatomy and physiology of the nervous system. 2. The concept of a neuron. Peripheral nerves. Spinal cord: segmental apparatus and conduction pathways. Brain stem. Cerebellum. Subcortical nuclei, inner capsule. Hemispheres of the brain. 3.Ventricles, meninges, cerebrospinal fluid 4. The concept of topical diagnosis. 5. Reflex and reflex arc. 6. Classification of reflexes. Reflex arcs of deep and superficial reflexes. Pathological reflexes. 7. Examination of reflexes.	2
2.	**Voluntary movements and their disorders.** **1.** Pyramid system. Cortico-nuclear and cortico-spinal pathways. 2. Symptoms of central and peripheral paresis, pathogenesis of symptoms. 3. Pathological reflexes, examination. 4. Syndromes of movement disorders at defeat of various levels of a cortico-muscular tract.	2
3.	**Cerebellum.** 1. Anatomy of the cerebellum, the leading pathways of the lower, middle, upper legs of the cerebellum. Cerebellar lesion syndromes. 2. Types of ataxia. 3. Differential diagnosis of ataxia. 4. Examination of coordination of movements.	2
4.	**Extrapyramidal system and its impairment syndromes.** 1. Anatomy of the striopalidar system - its striatal and pallidar departments. 2. Biochemistry of the extrapyramidal system - current data on the metabolism of neurotransmitters in the nigrostriatal system. 3. Functions of the extrapyramidal system and syndromes of its disorders: hypertonic-hypokinetic (parkinsonism) and hypotonic-hyperkinetic (hyperkinesis). 4. Examination.	2
5.	**Sensitive system and its impairment symptoms.** 1. Classification of sensitivity. 2. Pathways of superficial and deep sensitivity. 3. Types and syndromes of sensitive disorders. 4. Examination of different types of sensitivity. 5. The concept of nociceptive and antinociceptive system of the brain.	2

	6. Clinical syndromes of sensitivity disorders: peripheral, segmental, conductive, cortical. 7. Topical diagnosis of sensitivity disorders.	
6.	**Practical skills. Microcuracy and topical diagnosis of the disorders of motor and sensory systems.**	2
7.	**Pathology of IX-XII cranial nerves. Bulbar and pseudobulbar syndromes.** 1. Topography of nuclei: pathways of the glosso-pharyngeal, vagus, accessory and sublingual nerves. 2. Functions of the caudal group of cranial nerves. 3. Examination, clinical signs of damage. 4. Alternating syndromes of Jackson, Wallenberg. 5. Bulbar and pseudobulbar syndromes, differential diagnosis.	2
8.	**The trigeminal, facial, vestibule-cochlear nerves and symptoms of their impairment.** 1. Cranial nerves of the pons-cerebellar angle and pathways of the trigeminal, facial, vestibulocochlear nerves, their function. 2. Examination, clinical syndromes of lesions at different levels 3. Alternating Millard-Gubler syndrome.	2
9.	**Pathology of olfactory and visual analyzers.** **1.** The pathways of olfactory, visual analyzers. 2. Reflex arc of the pupillary reflex. 3. Clinical signs of lesions at different levels. Examination. **Syndromes of oculomotor nerves lesions.** 1. Topography of nuclei and pathways of oculomotor, block, abducent nerves. Functions of oculomotor nerves. 2. Examination. 3. Clinical signs of the lesion. 4. Innervation of sight. 5. Sympathetic innervation of the eye. 6. Alternating syndromes of Weber, Foville and Argyll-Robertson syndrome.	2
10.	**Localization of functions in the cerebral cortex. Symptoms of cerebral cortex lesions.** 1. Functional features of the cortical areas of the frontal, parietal, temporal, occipital lobes of the cerebral hemispheres. 2. Projection fields. 3. The concept of functional asymmetry of the hemispheres. 4. Apraxia, agnosia, their types. 5. Aphasia, clinical forms, topical diagnosis. 6. Alexia, agraphy, acalculia. 7. Syndromes of lesions of different parts of the brain, right and left hemispheres. Syndromes of irritation of the cerebral cortex. **Syndromes of the meninges lesions. Meningeal syndrome. Meninges of the brain and spinal cord.** 1. Physiology of cerebrospinal fluid formation. 2. Meningeal symptoms: headache, vomiting, general hyperesthesia, photophobia, occipital muscle rigidity, Kernig's symptom, Brudzinski's symptoms (upper, middle, lower), trismus, local reactive pain phenomena of Mendel, zygomatic ankle pain, pain when pressing the exit points of the small and large occipital nerves. Meningeal posture of the patient. Lessage's symptom.	2
11.	**Autonomic nervous system, syndroms of their impairment.** 1. Anatomy, physiology, symptoms of lesions of suprasegmental and segmental structures of the autonomic nervous system of its sympathetic and parasympathetic divisions at different levels. 2. Examination of autonomic functions. Individual work.	2
12.	**Paraclinical investigation in neurology:** 1. Radiological (radiography of the skull, spine, angiography, ventriculography, computed tomography). 2. ECHO-EG, REG, EEG, ENMG, electrical excitability	2

	3. Studies of hemostasis systems 4. Scintigraphy 5. MRI 6. Doppler sonography. **Cerebrospinal fluid investigation.** 1. Normal composition of cerebrospinal fluid and its changes in meningitis, tumors, hemorrhagic stroke and tuberculosis. 2. Cell-protein, protein-cell dissociation. Pleocytosis.	
13.	**Practical skills.**	2
14.	***Final modular control:***	**2**
	TOTAL	**28**
	Module 2: Special Neurology.	
15.	**Cerebrovascular disease (initial manifestations of cerebrovascular disorders, transient cerebrovascular disorders, chronic cerebrovascular disorders).** 1. Blood supply to the brain. 2. Classification of cerebrovascular disorders. 3. Initial manifestations of cerebrovascular disorders. 4. Dyscirculatory encephalopathy. 5. Vascular cerebral crisis (hypertensive, hypotonic). 6. Transient cerebrovascular disorders. 7. Syndromes of lesions of the anterior, middle, posterior cerebral arteries.	2
16.	**Ischemic strokes.** 1. Classification. Etiological factors and pathogenesis of ischemic strokes. 2. Differential diagnosis of ischemic and hemorrhagic strokes. 3. Principles of treatment. Undifferentiated and differentiated treatment of strokes. Indications and contraindications to surgical treatment of acute cerebrovascular disorders. 4. Treatment of patients after cerebral strokes. Rehabilitation and examination of able-bodied patients. 5. Prevention of cerebrovascular diseases. 6. Modern principles of treatment using treatment standards and principles of evidence-based medicine.	2
17.	**Hemorrhagic strokes.** 1. Classification. Etiological factors and pathogenesis of hemorrhagic strokes. Differential diagnosis of ischemic and hemorrhagic strokes. 2. Principles of treatment. Undifferentiated and differentiated treatment of strokes. Indications and contraindications to surgical treatment of acute cerebrovascular disorders. 3. Treatment of patients after cerebral strokes. 4. Rehabilitation and examination of able-bodied patients. Stroke prevention.	2
18.	**Vascular diseases of the spinal cord.** 1. Classification. Etiological factors, pathogenesis 2. Differential diagnosis of spinal strokes. 3. Principles of treatment. Undifferentiated and differentiated treatment of strokes. Chronic ischemia of the spinal cord (myelopathy). 4. Treatment of patients after spinal strokes. 5. Rehabilitation and examination of able-bodied patients. 6. Prevention of vascular diseases of the spinal cord.	2

19.	**Practical skills. Individual patient care with preparation of medical case history.**	2
20.	**Autonomic nervous system diseases.** 1. Hypothalamic syndrome - neuroendocrine, neurodystrophic, vegetative-vascular forms. Autonomic dysfunction. 2. Panic attacks. Clinic, diagnosis, treatment. 3. Raynaud's disease, erythromelalgia. Meniere's disease, Quincke's edema. Sympathoganglionitis. Clinic, diagnosis and treatment.	2
21.	**Neurodental syndromes.** 1. Classification of neurostomatological diseases (VE Grechko, MN Puzin). 2. Neuritis and neuralgia of the trigeminal, glosso-pharyngeal, lingual, nasal nerves. 3. Trigeminal ganglioneuritis.	2
22.	**Meningitis. Arachnoidites.** 1. Meningitis. Classification of meningitis: primary and secondary, purulent and serous. 2. Purulent meningitis. Primary meningococcal meningitis, clinic, diagnosis, features of the course, atypical forms. 3. Secondary meningitis: pneumococcal, staphylococcal. Clinic, diagnosis, cerebrospinal fluid, treatment and prevention. 4. Serous meningitis. Primary viral: lymphocytic choriomeningitis, enterovirus meningitis (ECHO, Coxsackie), mumps and others. 5. Secondary: tuberculous meningitis and meningitis in other infections. Clinic, diagnosis, the importance of cerebrospinal fluid research in differential diagnosis, treatment and prevention. 6. Arachnoiditis. Etiology, pathogenesis. Pathomorphology: adhesive, cystic. Classification by localization: posterior cranial fossa, basal, convex. Clinic, course and diagnosis. Differential diagnosis.	2
23.	**Encephalitis.** 1. Classification. 2. Primary encephalitis: epidemic, tick-borne spring-summer, herpetic. 3. Secondary encephalitis: rheumatic (small chorea), post-vaccination, chickenpox, measles, rubella. 4. Lyme disease. Clinic, course, forms of the disease, diagnosis. 5. Lesions of the nervous system in influenza (influenza hemorrhagic encephalitis, encephalopathy). 6. Infectious encephalopathy - dyscirculatory-dystrophic changes of the brain without severe focal lesions with a predominance of asthenic manifestations, autonomic dysfunction and intracranial hypertension. Course, diagnosis, differential diagnosis, treatment and prevention.	2
24.	**Neurosyphilis. Neuro-rheumatism. Neurological manifestations of polymyositis and dermatomyositis.** 1. Neurorheumatism, etiology, pathogenesis, basic clinical forms, diagnosis, treatment. 2. Neurosyphilis, etiology, pathogenesis, early- and late-onset of clinical forms of the disease, diagnosis, treatment. 3. Poliomyositis-dermatomyositis, etiology, pathogenesis, diagnosis, treatment.	2
25.	**Nervous system impairments caused by HIV infection. Poliomyelitis. Slow neuroinfection. Tuberculosis of the nervous system.** 1. Nervous system impairments caused by HIV infection (basic clinical forms, diagnosis, treatment). 2. Poliomyelitis (basic clinical forms, diagnosis, treatment). 3. Tuberculosis of the nervous system (basic clinical forms, diagnosis, treatment). 4. Slow neuroinfection. 5. Creutzfeldt–Jakob's disease (etiology, pathogenesis, clinic, diagnosis, prevention). 6. Gerstmann-Straussler-Scheinker's Disease, fatal familial insomnia (FFI) (etiology,	2

	pathogenesis, clinic, diagnosis, prevention).	
26.	**Nervous system progressive diseases.** 1. Syringomyelia. 2. Lateral amyotrophic sclerosis. 3. Myasthenia. Etiology, pathogenesis, clinical symptoms and clinical forms. Treatment, vital capacity test. 4. Myasthenic and cholinergic crisis, differential diagnostics, emergency management.	2
27.	**Nervous system demyelinating diseases.** 1. Multiple Sclerosis. Etiology, pathogenesis, clinic, diagnosis, differential diagnosis. Treatment, vital capacity test. 2. Acute Multiple Encephalomyelitis. Etiology, pathogenesis, clinic, diagnosis, differential diagnosis. Treatment, vital capacity test. 3. Acute transverse myelitis. Etiology, pathogenesis, clinic, diagnosis, differential diagnosis. Treatment, vital capacity test.	2
28.	**Nervous system progressive diseases.** 1. Clinical classification of peripheral nervous system diseases (1987). 2. The concept of neuropathy and neuralgia. 3. Neuropathies of radial, ulnar, medius, ischiadic, fibular, tibial nerves). Vital capacity test.	2
29.	**Peripheral nervous system diseases.** 1. Radiculitis, ganglionitis, truncite. 2. Polyradiculitis (Guillain-Barre's syndrome). 3. Secondary polyneuropathies − diabetic, alcoholic, toxic. 4. Brachial plexitis. Etiology, pathogenesis, clinic, diagnosis and treatment. 5. Vital capacity test. Practical skills based on the topic.	2
30.	**Neurological syndromes of osteochondrosis of the spine. Vertebrogenic lesions of the peripheral nervous system.** 1. Cervical level: reflex syndromes (cervicago, cervicalgia; cervico-cranialgia or posterior vertebral artery syndrome and cervico-brachialgia with muscular, vegetative-vascular or neuro-dystrophic manifestations). Discogenic radiculopathy. Radicular and vascular syndromes (radiculoischemia). 2. Thoracal level: reflex syndromes (thoracic, thoracalgia with muscular-tonic vegetative-visceral or neurodystrophic manifestations). 3. Discogenic radiculopathy. 4. Lumbosacral level: reflex syndromes (lumbago, lumbalgia, lumbo-sciatica with muscular-tonic, vegetative-vascular or neurodystrophic manifestations). 5. Discogenic radiculopathy. . Radicular and vascular syndromes (radiculoischemia). 6. Compression-ischemic mononeuropathy (tunnel syndromes). On the upper extremities: carpal tunnel syndrome (median nerve); Guyon canal syndrome (ulnar nerve). 7. Compression-ischemic mononeuropathy (tunnel syndromes) on the lower extremities: tarsal canal syndrome (tibial nerve); Roth-Bernhard's paresthetic meralgia (pinching of the lateral cutaneous nerve of the thigh under the Poupart's ligament).	2
31.	**Hereditary and degenerative diseases of the neuromuscular system.** 1. Primary progressive muscular dystrophy (myopathy): Duchenne's pseudohypertrophic, juvenile Erb-Roth's, humeral-scapulo-facial Landouzy-Dejerine's. 2. Secondary amyotrophies – neural Charcot-Marie's and spinal Werdnig-Hoffman's, Kugelberg-Welander's. 3. Diseases of the neuromuscular system: Thomsen's myotonia, Myotonic dystrophy, paroxysmal myoplegia.	1
32.	**Hereditary and degenerative diseases of cerebellum, pyramid and extrapyramidal system.** 1. Pyramid system diseases - Strumpell's spastic paraplegia; 2. Extrapyramidal system diseases - Parkinson's disease, Wilson's disease, Huntington's disease. Heredity, clinic, treatment, vital capacity test. 3. Chromosomal diseases, Down's disease. Medical and genetic examinations. 4. Practical skills based on the topic.	2

33.	**Practical skills (medical cases history defense).**	2
34.	**Theoretical control (solution of test tasks of Krok-2) and control of practical skills for permission to SFC, *including:***	4
	TOTAL	**42**
	TOTAL number of hours of practical training of discipline, including	**70**
	Final control of 2 modules of the discipline	***6***

Self-directed work

Seq. No.	Title of the topic	Number of hours
	Module 1: General Neurology.	13
1.	Preparation for practical classes – theoretical preparation and development of practical skills	9
2	Preparation for the final control of module 1	4
	Module 2: Special Neurology.	27
1.	Preparation for practical classes – theoretical preparation and development of practical skills	15
2	Writing an educational case history	6
3	Preparation for the exam	6
	Total	40

Individual tasks

1. Composition of tasks involving topical diagnostics; creation of pattern of cortical-muscular and sensitive path.
2. Creation of educational films.
3. Participation in interuniversity Olympiads.
4. Report at inter-departmental, inter-university, All-Ukrainian and international conferences and receiving prizes.
5. Preparation of abstracts and articles in specialist journals and collections (collection of scientific papers of young scientists and students − independently, in journals − co-authors are possible).

The list of theoretical questions for students' preparation for the final module control

a) **Module 1. «General neurology»:**

1. The main anatomical-topographical parts of the nervous system.
2. The functional unit of the nervous system is the neuron. Neurons types, functional significance. Neuroglia, its functional significance.
3. The reflex is the basis of the nervous system. I.S. Sechenov and I.P. Pavlov are the founders of a contemporary view of the nervous system function. Classification of reflexes. The reflex arcs for tendon, periosteal, cutaneous reflexes and reflexes from mucous membranes.

4. The segmental apparatus of the spinal cord: gray matter, radices and spinal segments, spinal autonomic structures, reflex arc, reflex arcs of spinal reflexes. Segmental innervation of the body.
5. The pathways of spinal cord: frontal, lateral and posterior cords.
6. The anatomy of the cortico-spinal pathway. Central paralysis signs. Pathophysiology of muscle hypertension, hyperreflexia (central paralysis symptoms).
7. The anatomy of the spinal-muscular pathway. Signs of peripheral paralysis. Pathophysiology of atony, areflexia, atrophy.
8. The anatomy and physiology of the voluntary movement pathway. Symptoms of lesions at different levels. Examples of diseases.
9. The pathological reflexes: foot, protective, oral automatism, their clinical significance.
10. The concept of reception and sensitivity. Classification of types of sensitivity: superficial, deep, complex. Types of sensitive disorders.
11. The superficial sensitivity pathways. The lesions at different levels (nerve, radix, dorsal horn, lateral column, internal capsule, thalamus, postcentral gyrus). Examples of diseases.
12. The pathways of deep sensitivity. Lesions at different levels (nerve, posterior column, medial lemniscus). Sensitive ataxia, examples of diseases.
13. The clinical syndromes of sensitivity disorders: peripheral, segmental, conductive.
14. The mononeuritic type of sensitive disorders. Examples of diseases, the level of damage of the sensory pathways. The concept of neuritis, neuropathy, neuralgia.
15. The polyneuritic type of sensitive disorders. Examples of diseases, the level of damage of the sensory pathways.
16. The syndromes of damage in: internal capsule, radial crown, anterior and posterior central gyruses. Examples of diseases.
17. The impairment of half of the spinal cord − Brown-Sequard syndrome at different levels (C1 -C4, C5- Th2, Th3-Th6, Th9-Th10, Th11-Th12, L1 - S2). Symptoms, examples of diseases.
18. The spinal cord impairments at different levels (C1- C4, C5-Th2, Th3-Th12, L1-S2). Symptoms, examples of diseases.
19. Intra- and extramedullary syndrome. Examples of diseases.
20. The cerebellum: anatomy and physiology. Afferent and efferent pathways. Symptoms of impairment.
21. The cerebellum connections with different parts of the brain and spinal cord.
22. Types of ataxia (cerebellar, sensitive, vestibular, cortical).
23. The anatomy of the subcortical ganglia, connections with different parts of the brain and spinal cord. General characteristics of the syndromes: pallido-nigral (parkinsonism), striary (hyperkinetic).
24. The physiology of the extrapyramidal system, its participation in providing unconditional reflexes, implementation of stereotyped automatic movements, muscle readiness for action.
25. The extrapyramidal system biochemistry. Current concepts about metabolism of neurotransmitters in the nigro-striatal system.

26. The structures and pathology of the striatal department of the extrapyramidal system, hypotonic-hyperkinetic extrapyramidal syndromes. Examples of diseases.
27. The structures and pathology of the pallidar system of the extrapyramidal system. Parkinsonism. Examples of diseases.
28. The olfactory analyzer (I cranial nerve). Anatomy, physiology. Symptoms of lesion. Examples of diseases.
29. The visual analyzer (II cranial nerve). Pathwayss. Symptoms of lesions at different levels. Examples of diseases.
30. The oculomotor nerves (III, II, II cranial nerves). Anatomy, physiology. Symptoms of lesion. Examples of diseases. The reflex arc of the pupillary reflex.
31. Types of ophthalmoplegies: external, internal, total.
32. The trigeminal nerve (V cranial nerve). Anatomy, physiology, symptoms of lesion. Clinic and treatment of trigeminal neuralgia.
33. The anatomy and functions of the facial nerve (VII cranial nerve). Central and peripheral paralysis of facial muscles. Neuropathy of the facial nerve. Etiology, clinical signs of lesions at different levels, treatment.
34. The anatomy and functions of the auditory and vestibular nerves (VIII cranial nerve). Symptoms of lesion. Examples of diseases.
35. The anatomy and functions of the glossopharyngeal, vagus, accessory and sublingual nerves (IX, X, XI, XII cranial nerves). Examples of diseases.
36. Cortico-nuclear tract. Bulbar and pseudobulbar paralysis. Differential diagnostics. Examples of diseases.
37. Alternating syndromes: peduncular (Weber), pontine (Millard-Gubler, Foville), bulbar (Jackson, Wallenberg).
38. The cerebral cortex, its cytoarchitectonics. The theory of localization of functions. Symptoms of cerebral cortex lesions (examples of symptoms of suppression and irritation). Apraxia, agnosia.
39. Motor and sensory representations in the cortex. The concept of functional asymmetry of hemispheres.
40. Right and left hemisphere damages.
41. Symptoms of damage of the frontal lobes of the brain.
42. Symptoms of damage of the occipital lobe of the brain.
43. Symptoms of damage of the temporal lobe of the brain.
44. Symptoms of damage of the parietal lobe of the brain.
45. Speech pathology. Aphasia (motor, sensory, amnestic). Differential diagnosis of dysarthria and mutism. Topical diagnostics, structures of lesions.
46. The anatomy, physiology and symptoms of damage of the supra-segmental division of the autonomic nervous system. Autonomic disfunction syndrome, hypothalamic syndrome.
47. The anatomy, physiology and syndromes of damage of the segmental department of the autonomic nervous system. Lesions of the brain stem, the lateral horns of the spinal cord, autonomic ganglia, plexuses, nerves.
48. The cerebral meninges. Meningeal syndrome. Cerebrospinal fluid, its circulation. Lumbar puncture. Laboratory study of cerebrospinal fluid.

49. Syndrom of elevated intracranial pressure. Etiology, pathogenesis. Examples of diseases.
50. Paraclinical investigations in neurology: ECHO-EG, REG, EEG, ENMG, plan and contrast radiography, angiography, MRI and CT, Doppler sonography.

b) to prepare students for SFA

Module 1. «General neurology»:

1. The main anatomical-topographical parts of the nervous system.
2. The functional unit of the nervous system is the neuron. Neurons types, functional significance. Neuroglia, its functional significance.
3. The reflex is the basis of the nervous system. I.S. Sechenov and I.P. Pavlov are the founders of a contemporary view of the nervous system function. Classification of reflexes. The reflex arcs for tendon, periosteal, cutaneous reflexes and reflexes from mucous membranes.
4. The segmental apparatus of the spinal cord: gray matter, radices and spinal segments, spinal autonomic structures, reflex arc, reflex arcs of spinal reflexes. Segmental innervation of the body.
5. The pathways of spinal cord: frontal, lateral and posterior cords.
6. The anatomy of the cortico-spinal pathway. Central paralysis signs. Pathophysiology of muscle hypertension, hyperreflexia (central paralysis symptoms).
7. The anatomy of the spinal-muscular pathway. Signs of peripheral paralysis. Pathophysiology of atony, areflexia, atrophy.
8. The anatomy and physiology of the voluntary movement pathway. Symptoms of lesions at different levels. Examples of diseases.
9. The pathological reflexes: foot, protective, oral automatism, their clinical significance.
10. The concept of reception and sensitivity. Classification of types of sensitivity: superficial, deep, complex. Types of sensitive disorders.
11. The superficial sensitivity pathways. The lesions at different levels (nerve, radix, dorsal horn, lateral column, internal capsule, thalamus, postcentral gyrus). Examples of diseases.
12. The pathways of deep sensitivity. Lesions at different levels (nerve, posterior column, medial lemniscus). Sensitive ataxia, examples of diseases.
13. The clinical syndromes of sensitivity disorders: peripheral, segmental, conductive.
14. The mononeuritic type of sensitive disorders. Examples of diseases, the level of damage of the sensory pathways. The concept of neuritis, neuropathy, neuralgia.
15. The polyneuritic type of sensitive disorders. Examples of diseases, the level of damage of the sensory pathways.
16. The syndromes of damage in: internal capsule, radial crown, anterior and posterior central gyruses. Examples of diseases.
17. The impairment of half of the spinal cord − Brown-Sequard syndrome at different levels (C1 -C4, C5- Th2, Th3-Th6, Th9-Th10, Th11-Th12, L1 - S2). Symptoms, examples of diseases.

18. The spinal cord impairments at different levels (C1- C4, C5-Th2, Th3-Th12, L1-S2). Symptoms, examples of diseases.
19. Intra- and extramedullary syndrome. Examples of diseases.
20. The cerebellum: anatomy and physiology. Afferent and efferent pathways. Symptoms of impairment.
21. The cerebellum connections with different parts of the brain and spinal cord.
22. Types of ataxia (cerebellar, sensitive, vestibular, cortical).
23. The anatomy of the subcortical ganglia, connections with different parts of the brain and spinal cord. General characteristics of the syndromes: pallido-nigral (parkinsonism), striary (hyperkinetic).
24. The physiology of the extrapyramidal system, its participation in providing unconditional reflexes, implementation of stereotyped automatic movements, muscle readiness for action.
25. The extrapyramidal system biochemistry. Current concepts about metabolism of neurotransmitters in the nigro-striatal system.
26. The structures and pathology of the striatal department of the extrapyramidal system, hypotonic-hyperkinetic extrapyramidal syndromes. Examples of diseases.
27. The structures and pathology of the pallidar system of the extrapyramidal system. Parkinsonism. Examples of diseases.
28. The olfactory analyzer (I cranial nerve). Anatomy, physiology. Symptoms of lesion. Examples of diseases.
29. The visual analyzer (II cranial nerve). Pathwayss. Symptoms of lesions at different levels. Examples of diseases.
30. The oculomotor nerves (III, II, II cranial nerves). Anatomy, physiology. Symptoms of lesion. Examples of diseases. The reflex arc of the pupillary reflex.
31. Types of ophthalmoplegies: external, internal, total.
32. The trigeminal nerve (V cranial nerve). Anatomy, physiology, symptoms of lesion. Clinic and treatment of trigeminal neuralgia.
33. The anatomy and functions of the facial nerve (VII cranial nerve). Central and peripheral paralysis of facial muscles. Neuropathy of the facial nerve. Etiology, clinical signs of lesions at different levels, treatment.
34. The anatomy and functions of the auditory and vestibular nerves (VIII cranial nerve). Symptoms of lesion. Examples of diseases.
35. The anatomy and functions of the glossopharyngeal, vagus, accessory and sublingual nerves (IX, X, XI, XII cranial nerves). Examples of diseases.
36. Cortico-nuclear tract. Bulbar and pseudobulbar paralysis. Differential diagnostics. Examples of diseases.
37. Alternating syndromes: peduncular (Weber), pontine (Millard-Gubler, Foville), bulbar (Jackson, Wallenberg).
38. The cerebral cortex, its cytoarchitectonics. The theory of localization of functions. Symptoms of cerebral cortex lesions (examples of symptoms of suppression and irritation). Apraxia, agnosia.
39. Motor and sensory representations in the cortex. The concept of functional asymmetry of hemispheres.
40. Right and left hemisphere damages.

41. Symptoms of damage of the frontal lobes of the brain.
42. Symptoms of damage of the occipital lobe of the brain.
43. Symptoms of damage of the temporal lobe of the brain.
44. Symptoms of damage of the parietal lobe of the brain.
45. Speech pathology. Aphasia (motor, sensory, amnestic). Differential diagnosis of dysarthria and mutism. Topical diagnostics, structures of lesions.
46. The anatomy, physiology and symptoms of damage of the supra-segmental division of the autonomic nervous system. Autonomic disfunction syndrome, hypothalamic syndrome.
47. The anatomy, physiology and syndromes of damage of the segmental department of the autonomic nervous system. Lesions of the brain stem, the lateral horns of the spinal cord, autonomic ganglia, plexuses, nerves.
48. The cerebral meninges. Meningeal syndrome. Cerebrospinal fluid, its circulation. Lumbar puncture. Laboratory study of cerebrospinal fluid.
49. Syndrom of elevated intracranial pressure. Etiology, pathogenesis. Examples of diseases.
50. Paraclinical investigations in neurology: ECHO-EG, REG, EEG, ENMG, plan and contrast radiography, angiography, MRI and CT, Doppler sonography.

Module 2. "Special neurology":

1. Blood supply to the brain. Transient cerebrovascular disorders. Etiology, classification, diagnosis, treatment. Examination of working capacity.
2. Classification of cerebrovascular disorders. Dyscirculatory encephalopathy. Etiology, risk factors, clinic, change of REG, indicators of hemocoagulation, blood lipid spectrum. Treatment, prescriptions, phys. methods.
3. Hemorrhagic stroke. Etiology, pathogenesis, classification. Clinic of parenchymal and ventricular hemorrhage. Differential diagnosis. Treatment in acute and rehabilitation periods. Examination of working capacity.
4. Subarachnoid hemorrhage. Etiology, clinic, differential diagnosis. Laboratory tests, cerebrospinal fluid, fundus, echocardiography, angiography, hemocoagulation. Treatment. Examination of working capacity.
5. Ischemic stroke: thrombosis of the common and internal carotid artery, middle cerebral artery. Etiology, pathogenesis, clinic, differential diagnosis. Treatment in acute and recovery periods. Examination of working capacity of patients with cerebrovascular diseases.
6. Ischemic stroke and cerebral embolism. Etiology, pathogenesis, differential diagnosis. Paraclinical methods of diagnosis (hemostasis, REG, Echo-EG, cerebrospinal fluid). Treatment, employment of patients with residual stroke.
7. Serous lymphocytic choriomeningitis and Coxsackie enteroviral meningitis. Etiology, clinic, cerebrospinal fluid diagnosis, treatment, prescriptions, prognosis. Examination of working capacity.
8. Tuberculous meningitis. Clinic, cerebrospinal fluid diagnosis, features of the current course of tuberculous meningitis. Treatments and prescriptions.
9. Meningococcal meningitis. Clinic, diagnosis, treatment, etiology, complications.
10. Neurosyphilis: early - generalized syphilitic meningitis, late – tabes , dorsalis progressive paralysis. Clinic, diagnosis, treatment and prescriptions.

11. Neurosyphilis. Etiology, clinical forms. Tabes dorsalis and progressive paralysis. Clinic, diagnosis, treatment.
12. Epidemic encephalitis. Etiology, pathogenesis, structures of the lesion. Clinic, clinical forms, course, treatment in acute and chronic periods. Examination of working capacity.
13. Tick-borne encephalitis. Epidemiology, structures of the lesion, clinical forms, course, Kozhevnikov's epilepsy, treatment and prevention, examination of working capacity.
14. Secondary encephalitis (influenza, rheumatic, cortical), lesion structures, clinic, differential diagnosis, treatment, examination.
15. Lyme disease. Course, diagnosis, differential diagnosis, treatment, prevention.
16. Infectious encephalopathy - dyscirculatory-dystrophic changes of the brain without severe focal lesions with a predominance of asthenic manifestations, autonomic dysfunction, intracranial hypertension. Course, diagnosis, differential diagnosis, treatment, prevention.
17. Polio. Etiology, pathomorphology, lesion structures, clinical forms, treatment in acute and recovery periods. Prevention of polio.
18. Rheumatic lesions of the nervous system, classification, symptomatology. Rheumatic encephalitis (chorea) - lesion structures, clinic, treatment, formulation, prevention. Examination of working capacity.
19. Multiple sclerosis and acute multiple encephalomyelitis. Etiology, pathogenesis, lesion structures, clinical forms, differential diagnosis, treatment, formulation. Examination of working capacity.
20. Amyotrophic lateral sclerosis. Etiology, pathogenesis. Structures of the lesion, clinic, clinical forms, treatment and prescriptions, prognosis.
21. NeuroAIDS - clinical forms, diagnosis, prevention.
22. Compression syndromes of cervical and lumbar osteochondrosis. Cervical radiculopathy, vertebral artery and nerve syndrome, cervical myelopathy, root compression L5, S1, treatment. Examination of working capacity.
23. Reflex neurological syndromes of cervical and lumbar osteochondrosis. Etiology, clinic. Scalenus syndrome, shoulder-scapular periarthrosis, shoulder-hand syndrome, cervicalgia, cervico-cranialgia, cervico-brachialgia, lumbago, lumbalgia, lumbo-sciatica, treatment and prescriptions, phys. methods.
24. Lumbosacral radiculitis. The role of osteochondrosis, intervertebral disc herniation in the pathogenesis of the disease. Clinic, radiological signs, course, treatment and prescriptions, phys. methods, examination of working capacity.
25. Neuropathy of the femoral, peroneus, tibial nerves. Etiology, clinic, treatment, phys. methods, examination of working capacity.
26. Neuritis of the sciatic nerve. Etiology, clinic, treatment, examination of efficiency.
27. Neuropathy of the radial, ulnar, median nerves, brachial plexitis. Tunnel syndromes. Etiology, clinic, treatment and prescriptions, phys. methods, examination of working capacity.
28. Polyneuropathy: infectious-allergic (Guillain-Barre), diphtheria, arsenic, lead, alcohol, diabetic. Clinic, treatment in acute and recovery periods and prescriptions, phys. methods. Labor and medical examination.

29. Syringomyelia. Etiology, pathomorphology, lesion structures, clinic, treatment and prescriptions, prognosis, examination of working capacity.
30. Myasthenia gravis, myasthenic crisis, cholinergic crisis. Etiology and pathogenesis, lesion structures, clinic, clinical forms, treatment and prescriptions. Examination of working capacity, forecast.
31. Diseases of the autonomic nervous system: angiotrophoneurosis, Raynaud's disease. Clinic, treatment and prescriptions, phys. methods, examination of working capacity.
32. Diseases of the autonomic nervous system: autonomic vascular paroxysms. Erythromelalgia. Meniere's disease. Quincke's angioneurotic edema. Etiology, clinic, diagnosis, treatment and prescriptions.
33. Neurostomatological syndromes: syndromes of lesions of the trigeminal and facial nerves, glosso-pharyngeal, vagus, sublingual nerves.
34. Glossodynia. Etiology, clinic, diagnosis, treatment.
35. Autonomic prosopalgia (Oppenheim, Sludler, Charlin, Frey syndromes).
36. Melkerson-Rosenthal disease, Sjogren's syndrome, facial hemiatrophy, clinic, diagnosis, treatment and prescriptions.
37. Hereditary diseases of the nervous system: myopathy, myoplegia, myotonia, amyotrophy (spinal and neural), Wilson's disease, Parkinson's disease. Pathomorphology, clinical features, types, diagnosis, treatment.
38. Hereditary diseases of the nervous system: Wilson's disease, Parkinson's disease. Pathomorphology, clinical features, types, diagnosis, treatment.
39. Occupational diseases of the nervous system and domestic neurointoxication. Defeat of the nervous system under the influence of physical factors. Vibration disease. Caisson diseas.
40. Radiation lesions of the nervous system. Etiology, clinic, diagnosis, treatment.
41. Exogenous neurointoxication. Clinic and treatment of heavy metal poisoning and carbon monoxide.
42. Lesions of the nervous system in alimentary intoxications. Etiology, clinic, diagnosis, treatment and prescriptions.
43. Basic neurological syndromes. High intracranial pressure syndrome. Etiology, clinic, diagnosis, treatment and prescriptions.
44. Basic neurological syndromes. Disorders of consciousness, Etiology, clinic, diagnosis, treatment and prescriptions.
45. Basic neurological syndromes. Headache: migraine, muscle tension headache, beam headache. Etiology, clinic, diagnosis, treatment and prescriptions.
46. Basic neurological syndromes. Dizziness. Etiology, clinic, diagnosis, treatment and prescriptions.

The list of practical skills required for the final module control and semester final assessment:

1. Examination of superficial reflexes: cutaneous (abdominal, plantar), mucous membranes (conjunctival, pharyngeal, from soft palate).
2. Examination of deep reflexes: tendon (elbow flexor and extensor, knee-jerk, Achilles reflex) and periosteal (superciliary, carporadial).

3. Examination of pathological plantar reflex (Babinski's reflex, Oppenheim's reflex, Rossolimo's reflex, Schaeffer's sign and Bekterev’s reflex) and hand reflexes (Rossolimo's reflex).
4. Examination of primitive oral reflex (subcortical): sucking, distance-oral, palmar, genian, lip reflexes.
5. The muscle strength evaluation on 0 to 5 scale and voluntary movements volume in the extremities.
6. Examination of signs of peripheral and central paralysis.
7. Examination of fibrillary contractions and muscle atrophy.
8. Examination of muscle tone and determination of spastic and plastic muscle hypertension.
9. Examination of extrapyramidal disorders (hyperkinetic-hypotonic and hypokinetic-hypertonic syndromes).
10. Examination of cerebellum functions. Checking of the coordination of movements, muscle tone, nystagmus.
11. Examination of static ataxia.
12. Examination of dynamic ataxia.
13. Examination of surface sensitivity.
14. Examination of deep sensitivity and sensitive ataxia.
15. Examination of complex types of sensitivity (stereognostic sense, sense of localization, discrimination, two-dimensional of space sense).
16. Examination of clinical syndromes (types) of sensitivity disorders (peripheral, segmental, conductive, spinal, cerebral, cortical).
17. Examination of pain points and areas (Erb's points, Vale's points, paravertebral, Head's areas).
18. Examination of symptoms of tension of the radices, schiatic and femoral nerves (Neri, Lasègue, Dezherin, Turin, Wasserman, Matskevych).
19. Examination of olfactory analyzer functions.
20. Examination of visual analyzer functions (acuity, field of vision, color perception).
21. Examination of oculomotor nerves dysfunctions (ptosis, strabismus, anisocoria, convergence) and sympathetic innervation of the eye (Bernard- Horner's syndrome).
22. Examination of the trigeminal nerve (sensitivity on the face, pain points, trigger zones, superciliary corneal, mandibular reflexes).
23. Examination of the facial nerve (functions of facial muscles, taste sensitivity).
24. Examination of the vestibular-cochlear nerve. Detection of auditory disorders (hyper-hypoacusia, Rinne's and Weber's tests).
25. Examination of vestibular disorders (nystagmus, coordination of movements), vestibular ataxia.
26. Examination of bulbar and pseudobulbar disorders (pharyngeal reflexes, from soft palate, articulation, reflexes of oral automatism).
27. Examination of aphasia (motor, sensory, amnestic).
28. Examination of apraxia (motor, ideational, constructive).
29. Examination of agnosia (visual, auditory, asterogenesis, anosognosia).

30. Examination of the autonomic nervous system. Investigation of autonomic tone, autonomic reactivity (dermographism, Dagnini-Aschner's reflex test, ortho-clinostatic).
31. Examination of meningeal symptoms (Kernig's symptom, Brudzinski's symptoms, occipital muscle rigidity).
32. The lumbar puncture technique.
33. The evaluation of craniograms (signs of CSF, size of the Turkish saddle).
34. The evaluation of spondylograms of the cervical and lumbar spine.
35. The evaluation of encephalograms (characteristic of the main rhythms, focal changes of the EEG, paroxysmal epileptic activity).
36. The evaluation of rheoencephalograms (tone and blood flow, venous outflow).
37. The evaluation of electromyography and electrodiagnosis data.
38. The evaluation of echoencephaloscopy data (displacement of midline structures, signs of hydrocephalus).

Teaching methods

1. Verbal (lecture, explanation, story, conversation, instruction).
2. Visual (observation, illustration, demonstration).
3. Practical (practice to develop skills).
4. Independent work of students of higher education on understanding and assimilation of new material.
5. Thematic discussions.
6. Brainstorming.
7. Round table.
8. Analysis of specific situations (case method).
9. Simulation tasks.
10. Problem statement.
11. Presentations.
12. Trainings.
13. Business games.

Assessment forms and methods

The form of the final study control is the semester final attestation (SFA).

The form of final control of academic performance.

The current academic performance of applicants is assessed on a traditional 4-point scale.

At the same time, standardized generalized criteria for assessing the knowledge of higher education applicants in PDMU are used (Table 1).

Table 1

Standardized generalized criteria for assessing the knowledge of higher education students in PDMU

For 4-point Scale	Assessment in ECTS	Evaluation criteria
5 (excellent)	A	The student shows special creative abilities, is able to acquire knowledge independently, without the help of the teacher

		finds and processes the necessary information, is able to use the acquired knowledge and skills for decision-making in unusual situations, convincingly argues answers, independently reveals own talents and inclinations, possesses not less than 90 % knowledge of the topic both during the survey and all types of control.
4 (good)	B	The student is fluent in the studied amount of material, applies it in practice, freely solves exercises and problems in standardized situations, independently corrects errors, the number of which is insignificant, has at least 85% knowledge of the topic as during the survey, and all types of control .
	C	The student is able to compare, summarize, systematize information under the guidance of a scientific and pedagogical worker, in general, independently apply it in practice, control their own activities; to correct mistakes, among which there are significant ones, to choose arguments to confirm opinions, has at least 75% of knowledge on the topic both during the survey and all types of control.
3 (satisfactory)	D	The student reproduces a significant part of theoretical material, shows knowledge and understanding of the basic provisions with the help of a researcher can analyze educational material, correct errors, among which there are a significant number of significant, has at least 65% knowledge of the topic, and during the survey, and all types of control.
	E	The student has the educational material at a level higher than the initial, a significant part of it reproduces at the reproductive level. has at least 60% knowledge of the topic both during the survey and all types of control.
2 (unsatisfactory)	FX	The student has the material at the level of individual fragments that make up a small part of the material, has less than 60% knowledge of the topic both during the survey and all types of control.
	F	The student has the material at the level of elementary recognition and reproduction of individual facts, elements, has less than 60% knowledge of the topic as during the survey, and all types of control.

After completing the study of all topics of the module, the conversion of the assessment is carried out on the traditional 4-point scale in multi-point (maximum 120 points) - conversion of the total assessment of current performance per module - is carried out only after the last current lesson, before the final module control.

The conversion is performed according to the following algorithm:

- calculates the average score of the applicant on the traditional 4-point scale, obtained during the current classes belonging to this module (to the nearest hundredth point);

- to obtain a convertible multi-point total score of the current performance per module, the average score obtained on the traditional 4-point scale should be

multiplied by a factor of 24, or Table 2. Exceptions are cases where the average score on the traditional 4-point scale is 2 points. In this case, the applicant receives 0 points on a multi-point scale;

- the average score of the current success rate is calculated on the total number of classes in the module, and not on the actual attended by the applicant

Table 2

Unified table of correspondence of scores for current performance, scores for FMC, exam, and traditional four-point score.

Average score for current performance (A)	Points for current success in the module (A * 24)	Points for FMC from the module (A * 16)	Points for the module and / or exam (A * 24 + A * 16)	Category ECTS	By 4-point scale
2	48	32	80	**F FX**	**2 (unsatisfactory**
2,1	50	34	84		
2,15	52	34	86		
2,2	53	35	88		
2,25	54	36	90		
2,3	55	37	92		
2,35	56	38	94		
2,4	58	38	96		
2,45	59	39	98		
2,5	60	40	100		
2,55	61	41	102		
2,6	62	42	104		
2,65	64	42	106		
2,7	65	43	108		
2,75	66	44	110		
2,8	67	45	112		
2,85	68	46	114		
2,9	70	46	116		
2,95	71	47	118		
3	72	50	122	**E**	**3 (satisfactory)**
3,05	73	50	123		
3,1	74	50	124		
3,15	76	50	126		
3,2	77	51	128		
3,25	78	52	130	**D**	
3,3	79	53	132		
3,35	80	54	134		
3,4	82	54	136		
3,45	83	55	138		
3,5	84	56	140	**C**	**4 (good)**
3,55	85	57	142		
3,6	86	58	144		
3,65	88	58	146		
3,7	89	59	148		

3,75	90	60	150		
3,8	91	61	152		
3,85	92	62	154		
3,9	94	62	156		
3,95	95	63	158		
4	96	64	160	**B**	
4,05	97	65	162		
4,1	98	66	164		
4,15	100	66	166		
4,2	101	67	168		
4,25	102	68	170		
4,3	103	69	172		
4,35	104	70	174		
4,4	106	70	176		
4,45	107	71	178		
4,5	108	72	180	**A**	**5 (excellent)**
4,55	109	73	182		
4,6	110	74	184		
4,65	112	74	186		
4,7	113	75	188		
4,75	114	76	190		
4,8	115	77	192		
4,85	116	78	194		
4,9	118	78	196		
4,95	119	79	198		
5	120	80	200		

The final module control from 1 module "General Neurology" is carried out upon completion of the study of all topics of the module at the last control lesson from the module.

Applicants for higher education who have completed all types of work provided for in the curriculum and scored at least the minimum number of points during the study of the module (score 3.0 - 72 points) are admitted to the final control.

Applicants for higher education who during the study of the module, which is the final control, had an average score of current performance from 4.50 to 5.0 are exempt from FMC and automatically (by agreement) receive a final grade according to the table, with the presence of the applicant on FMC is mandatory. In case of disagreement with the assessment, this category of higher education students pass the PMC according to the general rules.

The form of the last final lesson for admission to the SFA includes control of theoretical (solving test tasks "Step-2") and practical training (the ability to study and interpret neurological status, analyze data from paraclinical research methods and prescribe treatment).

The form of final module control 1 is standardized. Examination cards for FMC include a test of practical skills (4 questions of 5 points), problem solving (5 tasks of 6 points) and an oral answer (3 questions of 10 points).

The FMC score is evaluated in points and is not converted into a traditional 4-point score. The maximum number of FMC points is 80 points. The minimum number of FMC points at which the control is considered to be made is 50 points. The maximum number of points for the module is 200 points (up to 120 points for the current performance).

After passing the final module control, the total number of points per module is calculated:

a) the sum of points of current performance;

b) scores of the final modular control.

The teacher scores the obtained points for the module in the "Statement of final module control" (and the individual curriculum of the student), in accordance with the provisions on the organization of the educational process in UMSA and submitted to the dean's office.

Applicants for higher education who have not passed the FMC have the right to work off the module twice according to the work off schedule.

Semester final attestation.

Students are admitted to the exam who have not missed classroom classes, scored a minimum score of at least 72 (which corresponds to an average score of 3.0 for current performance), completed all FMC in the discipline (except the last) and met all the requirements of the discipline, which are provided by the working curriculum in the discipline (protection of medical history, positive assessments of meaningful modules, admission to the FMC in the form of test control, etc.), fulfilled financial obligations under the agreements (for study, dormitory, etc.) , which was marked in the individual curriculum for admission to the session by the dean (deputy dean) of the faculty.

The examination ticket consists of 2 theoretical questions (on topical and special neurology) and a clinical problem. The student receives 5 marks: for 1 question, for 2 questions and 3 marks at the decision of a clinical problem (establishment of the topical diagnosis, the clinical diagnosis, treatment in the form of the prescription).

The exam is taken by examiners who are approved by order of the rector.

Applicants for higher education who during the study of the module from which the exam is conducted, had an average score of the current grade from 4.50 to 5.0 are exempt from the SPA and automatically (by agreement) receive a final grade according to the table, with the student's presence at the SFA is required. In case of disagreement with the assessment, the specified category of higher education students passes the SPA according to the general rules.

The result of the SFA is evaluated according to a unified table of correspondence of scores for current performance, scores for PMK, exam, and the traditional four-point score. The maximum number of points for the SPA is 200 points.

The grade for the exam corresponds to the scale:

Grade "5" - 80-72 points;

Grade "4" - 71-56 points;

Grade "3" - 55-50 points;

Grade "2" - less than 50 points.

The grade for the discipline is set by the department on the traditional (national) 4-point scale on the basis of the average number of points for all modules provided by the program of the discipline.

Table 3

Conversion of the average number of points for all modules provided by the program in the discipline, in the traditional score on a 4-point scale

The average number of points for all modules of the discipline	Traditional score on a 4-point scale
122 – 139,99	3
140 – 179,99	4
180 – 200	5

The final grade in the discipline is given only to students who have passed all modules in the discipline.

Methodological support

1. Plans of lectures, practical classes and independent work of students.
2. Methodical planning of lectures.
3. Methodical instructions for independent work of students during the preparation for the practical training and and in class.
4. Methodical materials that ensure the independent work of students.
5. Multimedia presentations.
6. Packages of clinical tasks, resultset of paraclinical investigations.
7. Test and control tasks for practical classes.
8. Questions and tasks to control the acquirement of sections.
9. A list of questions for the exam, a task to check practical skills during the exam.
10. Demonstration materials, instructions for the use of technical teaching aids (equipment for mastering theoretical material, educational films, videos).

Recommended reading

Basic

1. **Neurology**: [textbook for students of higher education establishments - medical universities, institutes and academies] / ed. I.A.Hryhorova, L.I.Sokolova; A.Hryhorova, L.I.Sokolova, R.D.Herasymchuk et al. - K.: Medicine Publishing, 2017. - 623 p.
2. **Neurology**: textbook for students of higher medical institutions of IV level of accreditation / ed. L.Sokolova; L.Sokolova, O. Myalovitska, V.Krylova et al. ; Ministry of health of Ukraine. - Vinnytsia : Nova Knyha, 2012. - 275 p.
3. **Neurology: Clinical Cases**: a practical guide for students of higher medical education institutions of the 4th level of accreditation / ed.: L.Sokolova, L.Panteleienko ; L.Sokolova, L.Panteleienko, T.Dovbonos et al. ; Ministry of Health of Ukraine, O.O.Bogomolets National Medical University. - K.: Medicine Publishing, 2016. - 93 p.
4. **Clinical Neurology**/ ed. V.A.Gryb ; V.A.Gryb, O.O.Doroshenko, S.I.Genyk et al.; Ivano-Frankivsk national medical university. - K.: Medknyha, 2017. - 287 p.

Supplementary

1. Oxford Handbook of Neurology (Oxford Medical Handbooks) 2nd Edition. Hadi Manji, Sean Connolly, Neil Kitchen, Christian Lambert, Amrish Mehta.Oxford University Press; 2nd edition 2014, 656 p
2. European Handbook of Neurological Management, 2nd Edition, Volume 1 Editors: Nils Erik Gilhus, Michael R. Barnes, Michael Brainin. 2010 Wiley-Blackwell 584 P
3. Principles and Practice of Emergency Neurology Handbook for Emergency Physicians EDITORS:Sid M. Shah, Kevin M. Kelly, 2003
4. Neurology A Clinical Handbook. Charles H. Clarke Wiley; 1st edition, 2022, 760 p
5. **Neurology** A Queen Square Textbook Editors: Charles H. Clarke, Martin Rossor, Robin Howard, Simon Shorvon , Wiley, 2018, 1097 p
6. Handbook of Neurology Minoru Oishi (*Nihon University*), https://doi.org/10.1142/3384 1997 408 P
7. Handbook of Neurosurgery, Neurology, and Spinal Medicine for Nurses and Advanced Practice Health Professionals.Edited By Michael Wang, Andrea Strayer, Odette Harris, Cathy Rosenberg, Praveen Mummaneni 2018 Routledge 576 P
8. Oxford American Handbook of Neurology/ Edited by Sid Gilman William J. Herdman Hadi Manji Sean Connolly Neil Dorward Neil Kitchen Amrish Mehta Adrian Wills. Oxford University Press, Inc. 2010
9. Manual of Neurological Signs John G. Morris, Padraic J. Grattan-Smith 2015 Oxford University Press
10. Martin Samuels, Allan H. Ropper MD. Samuels's Manual of Neurologic Therapeutics 9th Edition. LWW, 2017, 744 P
11. EMA. Guideline on clinical investigation of medicinal products for the treatment of Multiple Sclerosis. European Medicines Agency, 2015.

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