

SUBJECT CARD

Faculty of Medicine and Health Sciences

Field of studies: Medicine

Form of studies: Full-time course

Degree: long-cycle Master's programme

Specializations: No specialization

Academic year: 2022/2023

THE NERVOUS SYSTEM AND SENSORY ORGANS	
SUBJECT NAME	The nervous system and sensory organs
NUMBER OF ECTS POINTS	5
LANGUAGE OF INSTRUCTION	English
TEACHER(S)	dr Marcin Lipski dr Martyna Jastrzębska dr n. med. Izabela Zamojska dr n. med. Maciej Krupiński dr n. med. Natalia Grabska lek. med. Emanuel Kolanko mgr Bożena Wójcik prof. nadzw. dr hab. n. med. Anna Roszkowska prof. nadzw. dr hab. n. med. Piotr Kopiński prof. zw. dr hab. n. med. Jadwiga Mirecka
PERSON RESPONSIBLE	dr Marcin Lipski
NUMBER OF HOURS	
LECTURES	49
CLASSES	36
SEMINARS	4
GENERAL OBJECTIVES	
OBJECTIVE 1	Getting to know the study of the CNS structure and surgery, PNS and ANS. Combining anatomical and histological structure with the function of the CNS, PNS and ANS.
OBJECTIVE 2	Student is acquainted with the structure and activity of the CNS, including the components of the ANS and PNS.
LEARNING OUTCOMES	
MK ₁	Knowledge: Student describes the macro- and microscopic structure of the CNS, knows the anatomical structures of the CNS, and PNS. He is able to discuss the topography and course of the nervous tract. He knows the structures of the ANS and its role.

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MK ₂	Knowledge: Student knows the structure of the CNS, PNS and ANS and understands the function of CNS, relates the microscopic structure to the CNS and activity of the CNS.
MK ₃	Knowledge: Student knows the macro- and microscopic structure of the CNS, ANS and PNS, characterizes parts of the tracts of the CNS and plexuses of the PNS (peripheral nervous system) depending on their function.
MS ₁	Skills: Student can describe the parts of the CNS at microscopic and macroscopic level.
MS ₂	Skills: Student performs simple functional tests. Interpret the results obtained for basic physiological variables.
MC ₁	Social Competences: Student works in a group, cooperates with other students in the preparation of presentations and solving tasks.

INTRODUCTORY REQUIREMENTS

Knowledge at secondary school level.

COURSE PROGRAM

DETAILED DESCRIPTION OF THE TOPIC BLOCKS

LECTURE 1	Anatomy: The division of the brain. Lobes, sulci and gyruses. Distribution of the white and grey matter. Types of the neurons according to their projections. The scheme of the CNS. Neuroglia. (3h)
LECTURE 2	Anatomy: The Meninges and cerebrospinal fluid. Ventricles of the brain. The circumventricular organs. The spinal cord. Topography. External morphology. Location: the spinal cord. Attachements. Shape. Spinal nerves. Internal morphology. Gray matter. White matter. Spinal cord levels. Myotatic reflex (3h)
LECTURE 3	Anatomy: The tracts of the spinal cord. Classification according to the main function. Ascending spinal tracts: Dorsal Column-medial lemniscus pathway. The ventral spinothalamic tract. Lateral spinothalamic tract. Dorsal spinocerebellar tract. Ventral spinocerebellar tract. Cuneocerebellar tract. (3h)
LECTURE 4	Anatomy: The descending tracts of the spinal cord. Lateral corticospinal (pyramidal) tract. Ventral corticospinal tract. Rubrospinal tract. Vestibulospinal tracts. Descending autonomic tracts. Clinical correlation. (3h)
LECTURE 5	Anatomy: The brainstem. Introduction. Medulla oblongata. Topography. External features. Internal features. Cross-section of the medulla oblongata. The Pons: overview. Internal structures. (3h)
LECTURE 6	Anatomy: The Mesencephalon (midbrain). The external features. Structures of the midbrain. The inferior collicular level. The superior collicular level. The posterior commissural level. (2h)

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LECTURE 7	Anatomy: The trigeminal system. The ascending trigeminothalamic tract. The trigeminal sensory nuclei. The trigeminocerebellar fibers. The trigeminal reflexes. (2h)
LECTURE 8	Anatomy: The auditory system. The vestibular system. The cranial nerves. The visual system. The gustatory system. The olfactory system and limbic system. (2h)
LECTURE 9	Anatomy: The cerebellum. The thalamus. The autonomic nervous system. The hypothalamus. (2h)
LECTURE 10	Anatomy: The basal ganglia and striatal motor system. The cerebral cortex. The peripheral nervous system. The reflex arc. The spinal nerves. The cervical plexus. The brachial plexus. The thoracic nerves. The cranial nerves. The lumbar and sacral plexus (2h)
LECTURE 11	Histology: Microscopic structure of the spinal cord, cerebral cortex, and cerebellar cortex. Meninges. Peripheral nervous system: ganglia and nerves. Mechanism of nerve conductance. (2h)
LECTURE 12	Histology: The structure of the eyeball. Sclera and cornea. Anterior and posterior chambers of the eye. The lens and ciliary body. Structures involved in accommodation and adaptation. Production and flow of the aqueous humor. The retina, its layers and photoreceptors. (A) (3h)
LECTURE 13	Histology: Organs of olfaction and taste. Sensory receptors. (2h)
LECTURE 14	Physiology: Organization of the nervous system. Basic information about sensory and motor axes. Functional levels of the nervous system, hierarchy. Concepts of nervous center, nucleus, ganglion, nerve, and tract. Types of synapses and receptors (including iono- and metabotropic receptors). Modulation of synaptic conduction. Autonomic system, its role and mediators. Pre- and postganglionic fibers. (2h)
LECTURE 15	Physiology: Reflex – concept, elements, description of the reflex arc. Spinal cord functions. The rule „everything or nothing”, priming and inhibition of spinal reflexes. Divergence and convergence in spinal cord. Reflexes: stretch, clasp knife and flexor withdrawal. Velocity and ways of impulse conduction. The cerebellum and its role. Maintaining the body balance, regulation of muscle tone, motoric coordination. (2h)
LECTURE 16	Physiology: Role and function of corticospinal tract. The concept of upper and lower motor neuron. Spinal shock. Extrapyramidal system, cortico-basal-thalamic circuits. The function of extrapyramidal system – examples of specific disorder syndromes. Mechanisms regulating muscle tone – summary. The physiology of cerebrospinal fluid formation, its circulation and role. (2h)

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LECTURE 17	<p>Physiology: Feeling and perception. Receptors classification, modalities, information coding, the relation between the stimulus strength and the sensation intensity. Transduction of sensation. Adaptation of receptors. Activity of tactile receptors. Skin receptors, nociceptors and proprioceptors. Photoreceptors, conduction of visual stimuli, physiology of the vision process. Receptor function of taste buds. (3h)</p>
LECTURE 18	<p>Physiology: Sensory pathways of central nervous system: dorsal cords and anterolateral tracts. Somatic and visceral sense. Types of pain, temperature sensation, sensory mechanisms of rebound pain. Organization of sensory cortex. Limbic system, emotion control in CNS. Reward and punishment system. Addictions. (2h)</p>
LECTURE 19	<p>Physiology: Activatory and inhibitory reticular formation, its organization and role. The superior role of the hypothalamus in the autonomic and metabolic functions. Basics of electroencephalographic research. Waves in the EEG record in normal conditions and in epilepsy. Biorhythms, sleep and wakefulness. (2h)</p>
LECTURE 20	<p>Physiology: Cortex functions, learning and memory. Types, storage and retrieval of memory. Conditioned reflexes as a type of associative learning. Priming and inhibition of conditioned reflexes. The speech and its cortical centers. Lateralization of the brain. Specialization of hemispheres. Association centers of the cortex. (2h)</p>
CLASS 1	<p>Anatomy: The external features of the brain. Gyri and sulci and lobes. The main Brodmann's area. (2h)</p>
CLASS 2	<p>Anatomy: The spinal cord. External and internal features. The spinal cord topography. (2h)</p>
CLASS 3	<p>Anatomy: The brainstem. The medulla oblongata – external features. The pons – external features. (2h)</p>
CLASS 4	<p>Anatomy: The mesencephalon – external features. The meninges of the spinal cord and the brain. (2h)</p>
CLASS 5	<p>Anatomy: The blood supply of the CNS. (2h)</p>
CLASS 6	<p>Anatomy: The cranial nerves. The autonomic nervous system ANS. (2h)</p>
CLASS 7	<p>Anatomy: The cerebellum. The descending pathways. (2h)</p>
CLASS 8	<p>Anatomy: The thalamus. The ascending pathways. The reticular system. (2h)</p>
CLASS 9	<p>Anatomy: The peripheral nervous system. The roots of the spinal cord. The spinal nerve. The sympathetic trunk. (2h)</p>
CLASS 10	<p>Anatomy: The cervical plexus. The brachial plexus. The thoracic nerves. The lumbar plexus. The sacral plexus and autonomic. (2h)</p>

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CLASS 11	Histology: Microscopic structure of the spinal cord, cerebral cortex, cerebellar cortex and intervertebral ganglia. (2h)
CLASS 12	Histology: Microscopic structure of the eyeball. Anterior part: sclera and cornea. Anterior and posterior chambers. The corneo-scleral junction. The lens. The ciliary body and ora serrata. Layers of the retina. Ultrastructural characteristics of the rods and cones. Optic nerve. (2h)
CLASS 13	Histology: Olfactory epithelium. Taste buds and taste receptors. Sensory receptors of the skin. Practical test based on recognition of all histological slides demonstrated in this module. (2h)
CLASS 14	Physiology: Functional levels of nervous system, sensory and motor axes - summary. Electrophysiological methods to examine nervous functions. Degeneration and regeneration of neurons, trophic phenomena. The trigger excitation of the muscle, rheobase and chronaxie. Recording of unipolar and bipolar potential - comparison. Concept of absolute and relative refractory period. (3h)
CLASS 15	Physiology: Basics of neurological examination. Examination of stretch, superficial and pathological reflexes. Centers of stretch reflexes in spinal cord. Basics of examination of cranial nerves, including pupillar reflexes, area vision, position and mobility of the eye. Examination of meningeal reflexes. Romberg test. (3h)
CLASS 16	Physiology: Examination of the eye and the ear. Vision: physiology, optic nerve and optic tract, cortical visual centers. Adaptation and accommodation, vision area. Examination of vision acuity and color perception. Pupil reflexes – revision. Sound transmission. Conductive and sensorineural hearing. Tests for hearing with use of tuning fork. (2h)
CLASS 17	Physiology: Symptoms of UMN and LMN lesion. Examination of cerebellum and dorsal cords. Superficial and deep sense. Effects of damage to speech centers. Completion of the physiological part of the module. (2h)
SEMINAR 1	Radiology: Imaging of nervous system; brain. (2h)
SEMINAR 2	Radiology: Imaging of nervous system; spinal cord and sense organs. (2h)

DIDACTIC METHODS (APPLIED)

Lectures
Laboratory classes
Seminars
Discussion session
Dissection classes

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STUDENTS WORKLOAD

CONTACT HOURS WITH THE ACADEMIC TEACHER	Following the study plan (i.e. lectures, classes, seminars, as well as discussions sessions): 87 hours
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	Preparation for classes: 30hours Preparation for the exam: 35 hours
TOTAL NUMBER OF HOURS FOR THE COURSE	152 hours

CONDITIONS FOR COURSE COMPLETION

	Regulations: attendance in all classes taking place in the microscopic laboratory is mandatory. Any absence must be compensated with the other class. Student are obliged to come to classes theoretically prepared and to pass the final test regarding identification of slides pertaining to this module.
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METHODS OF ASSEMENT

IN TERMS OF KNOWLEDGE	Human body structures: cells, tissues, organs and systems; Human body structure in topographic and functional approach; The role of the nervous system in the functioning of individual organs.
IN TERMS OF SKILLS	Interpret anatomical relations illustrated by basic diagnostic methods in radiology; Plan own learning activities and constantly learn in order to update own knowledge; Inspire the learning process of others; Communicate and share knowledge with colleagues in a team.
IN TERMS OF SOCIAL COMPETENCE	To establish and maintain deep and respectful contact with patients and to show understanding for differences in world views and cultures; Perceive and recognize own limitations, self-assess educational deficits and needs; Use objective sources of information; Undertake actions towards the patient on the basis of ethical norms and principles, with an awareness of the social determinants and limitations of the disease.

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SUMMATIVE (I & II terms)

Integrated exam (A/R + P/H)

EXAM (I term):

one choice question test:

100 test questions, 4 possible answers to choose *including*

- 50 questions about nervous system/senses MORHOLOGY [anatomy (A) and radiology (R)]
- 50 questions about nervous system/senses FUNCTION [Physiology (P) and histology (H)]

Criteria to pass:

correct answer to 55% test questions *including*

- correct answer to 50% of anatomy/radiology test questions
- correct answer to 50% of physiology/histology test questions

RETAKE EXAM (II term): MCQ

- 50 questions about nervous system/senses MORHOLOGY [anatomy (A) and radiology (R)]
- 50 questions about nervous system/senses FUNCTION [Physiology (P) and histology (H)]

GRADING SCALE

3,0 (Satisfactory)	55-60% correct answers of total score
3,5 (Satisfactory plus)	61-68% correct answers
4,0 (Good)	69-75% correct answers
4,5 (Good plus)	76-80% correct answers
5,0 (Very Good)	81% -100% correct answers

BASIC LITERATURE

[1] Douglas J. Gould PhD , BRS Neuroanatomy 2019 Wolters Kluwer;

[2] Costanzo Linda S., **Physiology**, Oxford, 2018, Elsevier Ltd.

SUPPLEMENTARY LITERATURE

[1] **Memorix Anatomy**, Radovan Hudak, David Kochlik, Ondrej Volny, Edra Urban & Partner, 2017, 607 str.;

[2] Heddwen Brooks, Scott Boitano, Susan Barman: **Ganong`S Review Of Medical Physiology**, Ed. McGraw-Hill 2016;

[3] Guyton and Hall — **Textbook of Medical Physiology**, Elsevier Science 2015.