



Pomorski Uniwersytet Medyczny w Szczecinie

SYLLABUS of the MODULE (SUBJECT) General information

Module name: Human physiology	
Module type	Obligatory
Faculty PMU	Medicine and Dentistry (WLS)
Major	Medicine and Dentistry (KLD)
Specialty	Not applicable
Level of study	Long-cycle studies
Form of study	full-time/part-time
Year, semester of studies e.g. Year 1, semester (I and II)	Year II, semester III and IV
ECTS credits (incl. semester breakdown)	7-(3+4)
Type/s of training	Lectures-5h/ practical classes(70h) III semester: W-10 (lectures), Ćw. -35 (practical classes) IV semester: W-10 (lectures) Ćw. -35 (pract. classes)
Form of assessment	- final examination: test: I examination/re-sit examination descriptive: re-sit examination
Head of the Department/ Clinic, Unit	Prof. dr hab. n.med. Andrzej Pawlik
Persons conducting classes with indication of a tutor or person responsible for the module	Person responsible for the module: dr n. med. Walat Stanisława – senior lecturer Persons conducting classes: prof. dr . hab. n. med. Słuczankowska- Głębowska Sylwia – profesor PUM prof. dr . hab. n. med. Tarnowski Maciej – profesor PUM, dr n. med. Sroczyński Tomasz – adiunkt, dr n. med. Zgutka Katarzyna – adiunkt dr n. med. Staniszevska Marzena – adiunkt, dr n. med. Banach Bolesław – adiunkt, students of Doctoral Study
Department's/Clinic's/Unit's website	https://www.pum.edu.pl/wydzialy/wydzial-lekarski/katedra-zaklad-fizjologii
Language	Polish/English

Detailed information

Module/subject objectives		<p>Training objectives - the student should:</p> <p>1. know the principles of functioning of organs, systems, the organism as an integrated system in the state of health and be able to explain the mechanisms and ways to regulate physiological functions.</p> <p>2. be able to define the state of health, describe the determinants of homeostasis and its basic parameters, explain the mechanisms regulating and compensating its temporary disturbances.</p> <p>3. know the reference values of basic physicochemical parameters of the internal environment and morphological indicators and physiological variables.</p> <p>4. be able to distinguish between health and dysfunctions and disorders; have the knowledge to understand pathophysiological processes and clinical symptoms which enables rational clinical reasoning and facilitates the understanding of the mechanisms of action of some drugs.</p> <p>5. be able to relate knowledge of physiological processes to practical laboratory tasks and clinical trials in order to facilitate the implementation of the clinical trial and the development of investigator/researcher relationships in the clinical context.</p> <p>6. be familiar with the methods of examination and diagnostic tests used to assess physiological functions, e.g. circulatory, respiratory, renal, visual, auditory, balance, nervous system.</p>
Prerequisite / essential requirements	Knowledge	<p>Knowledge of the structure of tissues and organs of the human organism. Basic knowledge of cell functions, functions of intracellular structures, ways of interactions between cells.</p> <p>Knowledge of basic concepts and biochemical reactions inside and outside cells and the course/ significance of metabolic pathways. Knowledge of concepts, processes and physical phenomena that enable an understanding of the nature and regulatory mechanisms of organ and system functioning (e.g. circulation, respiration, vision, hearing... Etc.)</p>
	Skills	<p>Operation of an optical microscope.</p> <p>Knowledge of the principles and basic skills of working with biological material in laboratory conditions Knowledge of the basic principles of preparing for the physical examination of patients</p>
	Competences	<p>ability to work in a team and to accept current ethical standards in the didactic process and in medicine. ability to work in a team and accurately carry out tasks according to a strictly established procedure.</p> <p>ability to work in a team and to carry out tasks precisely according to a strictly established procedure.</p> <p>Responsibility for entrusted equipment and property.</p>

Description of learning outcomes for the module (subject)			
No. of learning outcome	Student, who has passed the (subject)	Symbol (referring to) Assumed Learning Outcomes	Means of verification of learning outcomes*
W01	Knows physiological nomenclature and terminology.	K_B.W19 K_B.W20 K_B.W21 K_B.W22 K_B.W23	W, K, O
W02	Defines homeostasis, lists physicochemical parameters and determinants of homeostasis.	K_B.W01 K_B.W02 K_B.W19 K_B.W20 K_B.W21 K_B.W22 K_B.W23	W, K, O
W03	Describes ways of communication between cells, signal transduction models, functions of organs, systems, organism as integrated system in health.	K_B.W19 K_B.W20 K_B.W23	W, K, O, S
W04	Describes the role of the nervous system, including the autonomic and endocrine systems in the regulation of the functions of organs and systems at rest and in response to disturbances from the external environment.	K_B.W19 K_B.W20 K_B.W21 K_B.W22 K_B.W23	W, K, PS, O, P
W05	Knows the function of blood morphotic elements and forms and principles of regulation of respiratory gas transport in blood. He/she can perform some basic haematological diagnostic tests.	K_B.W19 K_B.W21 K_B.W23	W, K, O, P, PS, SL
W06	Describes basic mechanisms of regulation of acid-base balance and participation of kidneys and respiratory system in buffering of hydrogen ions.	K_B.W19 K_B.W21 K_B.W23	W, K
W07	He knows the principles of metabolism and balanced nutrition and criteria for assessment of body weight and proportions.	K_B.W19 K_B.W22 .	W, K, O, S
W08	Knows the reference numerical values basic physicochemical and morphological and physiological variables.	K_B.W19 K_B.W23 .	W, K, O, S
W09	Describes the involvement of the central nervous system in the development of sensory, motor and higher nervous functions in response to changes in the internal and external environment; knows speech centres and the process of its formation.	K_B.W19 K_B.W20 K_B.W23	W, K, O, S, SP

W10	He knows the basis of functioning of the cardiovascular system as determining the perfusion of organs and shaping the conditions of their functioning.	K_B.W19 K_B.W20 K_B.W23	W, K
U01	is able to describe and interpret the course and meaning of physiological processes at rest and during stress and interference, precisely define the state of health.	K_B.W19 K_B.W20 K_B.W21 K_B.W22 K_B.W23	W, K, S, O
U02	Distinguishes between health condition and homeostasis disturbances; diagnoses quality and size of disorders. Demonstrates, on the basis of an analysis of a specific situation, that disruption of homeostasis leads to illness or even death	K_B.U04	W, K, O
U03	Differentiates the role of individual organs in maintaining homeostasis and adaptation to changing external environmental conditions; indicates environmental factors that are determinants of health and predicts adaptation mechanisms aiming at compensation of disturbances.	K_B.U04	W, K, O, S
U04	Can interpret numerical values of basic homeostatic parameters, morphological and physiological variables.	K_B.U04	W, K, O, S
U05	mastered some elements of the clinical physical examination and additional examinations (cardiovascular, respiratory, urinary, sensory organs and CNS, exercise tests, blood and urine laboratory tests).	K_B.W19 K_B.W20 K_B.W21 K_B.W22 K_B.W23	W, K, O, S
U06	uses accurately and precisely physiological terminology.	K_B.U04	W, K
K01	Accepts the need for ethical standards.	K_K02	O
K02	Understands the sense of responsibility for entrusted property.	K_K07	O
K03	Understands the importance of the relationship between the examiner and the examined; reliably performs practical tasks assessing physiological functions.	K_K08	O
K04	demonstrates the habit of self-education, uses the sources of knowledge of physiology and related sciences and available databases and publications, critically interpreting the results of reports.	K_K01	W, K, O, PS
K05	Cooperates with team members.	K_K03	O
			ET (final examination 50 questions)

Table presenting LEARNING OUTCOMES in relation to the form of classes								
No .	Symbol (referring to) Assumed Learning Outcomes	Form of didactic classes						
		Lecture	Seminar	Practical classes	Clinical classes	other s ...
1	K_B.W1	X		X				
2	K_B.W2	X		X				
3	K_B.W19	X		X				
4	K_B.W20	X		X				
5	K_B.W21			X				
6	K_B.W22			X				
7	K_B.W23	X		X				
8	K_B.U04	X		X				
9	K_K01	X		X				
10	K_K02			X				
11	K_K03			X				
12	K_K04			X				
13	K_K06			X				
14	K_K07			X				
15	K_K08			X				
16	K_K09			X				

No. of learning content	Description of learning content	Number of hours	Referring to learning outcomes for the module
	LECTURES	20 h	
TK01	1. Insulating and integrative role of the cell membrane; membrane transport; membrane and intracellular receptors; importance of G proteins and membrane enzymes in signal transduction. Extracellular and intracellular ligands; models of signal transduction.	2 h	W01, 02, 03, 04, 05, 06, 09, 10
TK02	2. Mechanisms and ways of regulation of organism activity and conditions of homeostasis maintenance on the example of regulation of isohydremia, isoosmia and natremia (the role of ADH, Aldosterone, RAA system)	2 h	W01, 02, 03, 04, 06, 08
TK03	3. Autonomic system: receptors, mediators, tissue and organ effects of stimulation. Interdependencies between autonomic and autonomic and endocrine systems, with particular emphasis on the role of catecholamines. Role in homeostasis.	2 h	W01, 03, 04, 09, 10
TK04	4. Central nervous system: localization of functions in brainstem and cortex. Sensory and associative fields of the cerebral cortex; higher nervous activity. Motor regulation: localization of motor centres; participation of pyramidal and extrapyramidal system in the formation of free motor skills and motor automatisms. Motor "learning", movement patterns, precision and fluidity of	4 h	W01, 03, 04, 09

	movements.		
TK 05	5. Specific properties of the cardiac muscle. Role of the stimulus-conduction system and contractile myocytes. Ca ⁺⁺ distribution and its importance for cardiac function. Regulation of cardiac minute volume. Regulation of ino tropism, myocardial contractility and its assessment. Regulation of arterial pressure. Cardiovascular centre in the brainstem, components, chemical and neural regulation of neuronal activity. Local and systemic factors shaping organ perfusion.	4 h	W01, 02, 03, 04, 10
TK06	6. Physiology of the respiratory system; Respiratory resistance. Regulation of respiration; brainstem respiratory complex, chemical and neural regulation of neuronal activity, importance of reflexes from respiratory system receptors and arterial chemoreceptors.	2 h	W01, 02, 03, 04, 06, 08, 09 U01, 05, 06 K02, 03.05
TK07	7. Physiology of the kidney. Perfusion of the kidney. Control of TBW, regulation of diuresis. Mechanisms of nephron water absorption and urine thickening.	2 h	W01, 02, 03, 04, 06, 08
TK08	8. Thermoregulation. Mechanism of thermostat. Participation of hormones and somatic and autonomic nervous system in the regulation internal temperature of the body. Mechanisms of thermolysis and thermogenesis in response to external and internal temperature changes.	2 h	W01, 02, 03, 04, 07, 08, 09, 10
	PRACTICAL CLASSES - SEMESTER III	35h	
	Section I		
TK09	1.Homeostasis - as a condition of health; assessment criteria, homeostatic parameters; regulatory mechanisms, participation of nervous and hormonal system in maintaining homeostasis. Regulation of hormone secretion, mechanisms and directions of their action. Participation of hormones in the regulation of organ function, metabolic processes and tissue growth and differentiation. Endocrine activity of the hypothalamus and pituitary. Importance of the hypothalamic-pituitary-gonadal axis	6 h	W01, 02, 03, 04, 05, 06, 07, 08, 09, 10 U01, 02.03, 05, 06 K02, 03.05
TK10	2. Basics of nervous system functioning - neuron as excitable cell, regulation of neuronal excitability and function. Activity of nerve synapse. Participation of sympathetic and parasympathetic nervous system in regulation of organ and tissue function.	3 h	W01, 02, 03
TK11	3. Composition and functions of blood. Activity of the red blood cell system: principles of respiratory gas transportation in blood, regulation of Hb affinity to oxygen. Functions of particular leukocyte subpopulations, participation in mechanisms of specific and non-specific immunity. Methods of assessment, Laboratory indices, reference values. Haemostasis: procoagulants and anticoagulants, coagulation cascade, role of thrombocytes; fibrinolysis. Diagnostics of the haemostatic system.	9 h	W01, 02, 03, 05, 08

TK12	4. Blood groups, essence of division. Characteristics of ABO and Rh systems. Meaning of serological incompatibility, serological conflict.. Principles of membrane antigen determination of ABO and Rh systems.	2 h	W01, 05, 06
	Section II		
TK13	1. Physiology of sensory organs; examination of the functions of sensory analysers. Sense of hearing and balance, study of functions. Sense of sight: retinal function, mechanism of accommodation, conditions of acute perception. Visual pathway, visual centres. The importance of visual field examination, ways of assessing visual acuity and colour perception	6 h	W01,03, 08, 09 U05,06, K03,05

TK14	2. Central nervous system - function of the spinal cord: sensory functions, sensory centres, afferent pathways and their projection fields. Pain and its modulation. Neurological examination of extrinsic and proprioceptive sensation.	3 h	W01, 09 U05, 06 K02, 03.05
TK15	3. Central nervous system: motor functions of the spinal cord spinal cord and brainstem. Motor centres, efferent pathways of pyramidal and extrapyramidal system. Involvement of cerebellum in motor control. Examples of symptoms of damage to motor centres of different levels of the CNS. Selected elements of neurological examination: examination of muscle tension and spinal reflexes, assessment of cerebellar function.	6 h	W01, 09 U01, 05,06, K02, 03.05
	SEMESTER IV	35 h	
	Section III		
TK16	1. Skeletal muscle physiology: mechanism of contraction, regulation of excitation, contraction force, examination of dependence of contraction force on volume of excitation, load and frequency of excitation force, examination of dependence of contraction force on volume of contractions. Smooth muscles: electrophysiological properties, division, characteristics of systolic function.	3 h	W01, 03 U01, 06 K03,05
TK17	2. Phases of the cardiac cycle, mechanism of generation and characteristics of heart tones. Physical examination of the heart: tapping, auscultation, palpation. Electrophysiology of myocytes of the cardiac stimulus and contractile system. ECG recording, basics of recording and interpretation of a normal ECG.	6 h	W01, 02, 03, 04, 10 U01, 02, 03, 04, 05 K03, 04, 08
TK18	3. Arterial pressure: haemodynamic determinants, shaping factors and regulating mechanisms, significance. Standards of measurement and assessment of blood pressure (systolic, diastolic, MAP); reference values. Mechanisms stabilising MAP in response to acting disturbances. Response of the cardiovascular system to changes in position and physical effort, adaptation mechanisms, assessment of their efficiency; methodology and evaluation of orthostatic and stress tests	6 h	W01, 02, 03, 04, 10 U01, 02, 03, 04, 05 K01, 03, 04, 05
TK19	4. Venous system: properties, peripheral venous and central pressure, methods of examination and assessment. Phlebogram. Microcirculation.	3 h	W10 U02, 05 K03, 05
	Section IV		

TK20	1. Physiology of the respiratory system: mechanism and regulation of ventilation, diffusion limitations, transport of respiratory gases. Regulation of bronchial width. Reflexes from the receptors of respiratory system. Basics of physical examination of the respiratory system (palpation and auscultation of the lungs) . Basics of spirometry examination, spirometric assessment of respiratory resistance.	6 h	W01,02.03, 05.06, 09 U01,02.06, K01,05
TK21	2. Renal function, indices for assessing renal parenchymal function, assessment of glomerular and tubular function of the nephron, qualitative and quantitative tests. Properties of blood and final urine (biochemical and physical features, sediment) in relation to nephron function.	3 h	W01,02,03,04, 06, U01,02,06
TK22	3. Appetite, regulation of appetite. Secretory function and motor activity of the gastrointestinal tract. Role of gastrointestinal hormones. Participation of hormones and nervous system in the regulation of metabolism. Ways of evaluating basic metabolism and total metabolism, assessment of body mass and proportions.	6 h	W02,03,07, U01,02,03,06
TK23	4. Endocrine functions of the pancreas: action and importance of insulin and glucagon. Thyroid hormones T3 and T4: tissue and organ action, importance	2 h	W01, 03, 07 U02,03,06

Obligatory literature:

1. Stanisław J. Konturek (red.). **Fizjologia człowieka**. Elsevier Urban & Partner, Wrocław 2007.
2. William F. Ganong: **Fizjologia**. Wydawnictwo Lekarskie PZWL, 2007.

Literatura uzupełniająca

1. Dee U. Silverthorn. "**Human Physiology**". Pearson, Benjamin Cummings
2. J.T Hansen, B.M. Koeppen, ilustracje F.H.Netter. "**Atlas fizjologii człowieka Nettera**". Urban&Partner; wyd.I pl pod redakcją S.J.Konturka.
3. D.L. Felten, R. Józefowicz, ilustracje F.H. Netter. "**Atlas neuroanatomii i neurofizjologii Nettera**". Urban&Partner; wyd.pl pod red. A. Szczudlika
4. B.M.Koeppen, B.A. Stanton. "Berne & Levy Physiology". Mosby Elservier

Student's workload (balance of ECTS credits)

Form of student's activity (in-class participation; activeness, produce a report, etc.)	Student's workload [h]		
	Tutor	Student	Average
Contact hours with the tutor	90 h		
Time spent on preparation to seminars/practical classes	40 h		
Time spent on reading recommended literature	40 h		
Time spent on writing report on Laboratory/practical classes/making project/paper etc.	-		
Time spent on preparing to colloquium/short test	40 h		
Time spent on preparing to exam	40 h		
Other			
Student's workload in total	250 h		
ECTS credits for the module/subject	7		

Notes
<p>* Selected examples of methods of assessment:</p> <p>EP – written examination</p> <p>EU – oral examination</p> <p>ET – test examination</p> <p>EPR – practical examination– K-colloquium</p> <p>R – report</p> <p>S – practical skills assessment RZĆ – practical classes report, incl. discussion on results O – student’s active participation and attitude assessment SL – lab report</p> <p>SL – laboratory report SP – case study</p> <p>PS - assessment of student’s ability to work independently W – entry test PM – multimedial presentation</p>