



Pomorski Uniwersytet Medyczny w Szczecinie

SYLLABUS of the MODULE (SUBJECT)

General information

Module title: HUMAN PHYSIOLOGY	
Module type	Obligatory
Faculty PMU	Medicine and Dentistry (WLS)
Major	Medicine and Dentistry (KLD)
Specialty	Not applicable
Level of study	long-cycle
Mode of study	full-time/part-time
Year of studies, semester 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, Cw-35 IV sem.: W-10, Cw-35
Form of assessment	- final examination: test: I examination term/I re-sit examination term descriptive re-sit examination term
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. Słuczanska-Głabowska Sylwia – profesor PUM prof. dr . hab. n. med. Tarnowski Maciej – profesor PUM, dr n. med. Sroczyński Tomasz – tutor, dr n. med. Zgutka Katarzyna – tutor dr n. med. Staniszevska Marzena – tutor, dr n. med. Banach Bolesław – tutor, students of doctoral studies
Department's/Clinic's/Unit's website	https://www.pum.edu.pl/wydzialy/wydzial-lekarski/katedra-zaklad-fizjologii
Language	Polish/English

Detailed information

Module type	<p>Didactic objectives - student should:</p> <ol style="list-style-type: none"> 1. know the principles of functioning of organs, systems, organism as an integrated system in the state of health and be able to explain the mechanisms and ways of regulation of physiological functions. 2. be able to define a state of health, describe conditions of homeostasis and its basic parameters, explain mechanisms regulating and compensating its temporary disturbances. 3. be familiar with the reference values of basic physicochemical parameters of the internal environment and morphological indicators and physiological variables. 4. be able to differentiate health from dysfunction and disease disorders; have the knowledge enabling the understanding of pathophysiological processes and clinical manifestations, which enables rational clinical reasoning and facilitates the understanding of the mechanisms of action of some drugs. 5. be able to relate knowledge of physiological processes to practical laboratory tasks and trials of a clinical nature, which will facilitate implementation in the clinical examination and the formation of examiner/examined relationships in the clinical setting. 6. be familiar with the methods of examination and diagnostic tests underlying the assessment of physiological functions, e.g. circulatory, respiratory, renal, visual, auditory, balance, nervous system. 	
Prerequisite /essential requirements	Knowledge	<p>Knowledge of the structure of tissues and organs of the human body. Basic knowledge of cellular functions, functions of intracellular structures, modes of interactions between cells.</p> <p>Knowledge of basic concepts and biochemical reactions within and outside cells and the course/ significance of metabolic pathways.</p> <p>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>Habit and ability to systematic self-education.</p> <p>Ability to work in a team and accept binding ethical standards in the didactic process and in medicine.</p> <p>Ability to work in a team and the precise implementation of tasks according to a strictly established procedure.</p> <p>Responsibility for entrusted equipment and property.</p>

Description of the learning outcomes for the subject /module			
No. of learning outcome	Student, who has passed the module (subject) knows /is able to /can:	SYMBOL (Referring to assumed learning outcome)	Means of verification of learning outcomes*
W01	Familiar with 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 an integrated system in health condition.	K_B.W19 K_B.W20 K_B.W23	W, K, O, S
W04	Describes the involvement of the nervous system, including the autonomic and endocrine systems in the regulation of the functions of organs and systems under resting conditions and in response to interference 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 the forms and principles of regulation of respiratory gas transport in blood. Can perform some basic haematological diagnostic tests.	K_B.W19 K_B.W21 K_B.W23	W, K, O, P, PS, SL
W06	Describes the basic mechanisms of regulation of acid-base balance and the involvement of the kidney and respiratory system in buffering hydrogen ions.	K_B.W19 K_B.W21 K_B.W23	W, K
W07	Knows the principles of metabolism and balanced nutrition and the criteria for assessing body weight and proportion.	K_B.W19 K_B.W22	W, K, O, S
W08	Knows the reference numerical values of basic physicochemical and morphological parameters and physiological variables.	K_B.W19 K_B.W23	W, K, O, S
W09	Describes the participation of the central nervous system in the formation of sensory, motor and higher nervous functions in response to changes in the internal and external environment; knows the speech centres and the process of its formation.	K_B.W19 K_B.W20 K_B.W23	W, K, O, S, SP

W10	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	Can: describe and interpret the course and meaning of physiological processes at rest as well as during stress and acting disturbances, 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 and homeostasis disorders; diagnoses quality and level of disorders. Demonstrates on the basis of analysis of a specific situation that homeostasis disturbance 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 conditions of external environment; indicates environmental factors constituting 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	Has mastered some elements of clinical physical examination and additional examinations (cardiovascular, respiratory, urinary, sensory organs and CNS, exercise tests, laboratory tests of blood and urine).	K_B.W19 K_B.W20 K_B.W21 K_B.W22 K_B.W23	W, K, O, S
U06	Accurately and precisely uses physiological terminology and nomenclature.	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 investigator and the examined; reliably completes practical tasks assessing physiological functions.	K_K08	O
K04	Shows 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 exam 50 questions)

Table presenting LEARNING OUTCOMES in relation to the form of classes									
item	SYMBOL (referring assumed learning outcome)	Form of didactic classes							
		Lecture	Seminar	Practical classes	Clinical classes	other ...
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	References to learning outcomes for the module
	LECTURES	20 hrs	
TK01	1. Isolating and integrative significance 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 body functions and conditions of homeostasis maintenance using the example of regulation of isohydremia, isoosmia and natremia (role of ADH, Aldosterone, RAA system)	2 hrs	W01, 02, 03, 04, 06, 08
TK03	3. Autonomic system: receptors, mediators, tissue and organ effects of stimulation. Interdependence between the autonomic and endocrine systems, with particular reference to the role of catecholamines. Role in homeostasis.	2 hrs	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.	4 hrs	W01, 03, 04, 09

	Motor "learning", movement patterns, precision and fluidity of movements.		
TK 05	5. Specific properties of the myocardium. Role of 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 hrs	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 receptors and arterial chemoreceptors.	2 hrs	W01, 02, 03, 04, 06, 08 U01, 05, 06 K02, 03.05
TK07	7. Physiology of kidneys. Perfusion of the kidney. Control of TBW, regulation of diuresis. Mechanisms of nephron water absorption and urine thickening.	2 hrs	W01, 02, 03, 04, 06, 08
TK08	8. Thermoregulation. Mechanism of the thermostat. Participation of hormones and somatic and autonomic nervous system in regulation of internal body temperature. Mechanisms of thermolysis and thermogenesis in response to external and internal temperature changes	2 hrs	W01, 02, 03, 04, 07, 08, 09, 10
	PRACTICAL CLASSES - SEMESTER III	35h	
	SECTION I		
TK09	Homeostasis - as a condition of health; assessment criteria, homeostatic parameters; regulatory mechanisms, participation of the nervous and endocrine systems 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 hypothalamus and pituitary. Importance of hypothalamic-pituitary-organ axis	6 hrs	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 excitability and function of neurons. Activity of nerve synapse. Participation of the sympathetic and parasympathetic nervous system in the regulation of organ and tissue function	3 hrs	W01, 02, 03
TK11	3. Composition and functions of blood. Function of the red blood cell system: principles of respiratory gas transport in blood, regulation of Hb affinity for oxygen. Functions of particular leukocyte subpopulations, participation in mechanisms of specific and non-specific immunity.. Methods of assessment, laboratory indicators, reference values. Haemostasis: procoagulants and anticoagulants, coagulation cascade, role of thrombocytes; fibrinolysis. Diagnostics of the haemostatic system.	9 hrs	W01, 02, 03, 05, 08
TK12	4. Blood groups, nature of division. Characteristics of the ABO and Rh systems. The meaning of serological incompatibility, serological conflict. Principles of determination of membrane antigens of the ABO and Rh systems	2 hrs	W01, 05, 06
	Section II		
TK13	1. Physiology of the sensory organs; examination of the	6 hrs	W01,03, 08, 09

	functions of sensory analysers. Sense of hearing and balance, study of function. Sense of sight: retinal function, mechanism of accommodation, conditions of acute perception. Visual pathway, visual centres. Importance of visual field testing, ways to assess visual acuity and colour perception.		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 exteroceptive and proprioceptive sensation.	3 hrs	W01, 09 U05, 06 K02, 03.05
TK15	3. Central nervous system: Motor functions of the 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 the motor centers of different levels of the CNS. Selected elements of neurological examination: examination of muscle tone and spinal reflexes, assessment of cerebellar function.	6 hrs	W01, 09 U01, 05,06, K02, 03.05
	SEMESTER IV	35 hrs	
	Section III		
TK16	1. Skeletal muscle physiology: mechanism of contraction, regulation of contraction force, study of the dependence of contraction force on excitation level, load and frequency of excitation: Smooth muscle: electrophysiological properties, division, characteristics of contractile activity.	3 hrs	W01, 03 U01, 06 K03,05
TK17	2. Phases of the cardiac cycle, mechanism of origin and characteristics of heart tones. Physical examination of the heart: percussion, auscultation, palpation. Electrophysiology of myocytes of the cardiac pacemaker and contractile system. ECG recording, basics of recording and interpretation of a normal ECG.	6 hrs	W01, 02, 03, 04, 10 U01, 02, 03, 04, 05 K03, 04, 08
TK18	3. Blood pressure: haemodynamic determinants, shaping factors and regulating mechanisms, significance. Standards of measurement and assessment of arterial pressure (systolic, diastolic, MAP); reference values. Mechanisms that stabilise MAP in response to acting disturbances. Response of the cardiovascular system to change of position and exercise, adaptive mechanisms, assessment of their efficiency; methodology and assessment of orthostatic test and exercise tests	6 hrs	W01, 02, 03, 04, 10 U01, 02, 03, 04, 05 K01, 03, 04, 05
TK19	4. Venous system: properties, peripheral and central venous pressure, methods of examination and assessment. Phlebogram. Microcirculation.	3 hrs	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. Receptor reflexes of the respiratory system. Basics of physical examination of the respiratory system (tapping and auscultation of the lungs). Basics of spirometric examination, spirometric evaluation of respiratory resistance.	6 hrs	W01,02,03,05,0 6, U01,02.06, K01,02,03,05
TK21	2. Renal functions, indices for assessing renal parenchymal function, assessment of glomerular and tubular function of the nephron, qualitative and quantitative studies. Properties of blood and final urine (biochemical and physical	3 hrs	W01,02,03,04, 06, U01,02,06

	characteristics, sediment) in relation to nephron function.		
TK22	3. Apestat, regulation of appetite. Secretory and motor activity of the gastrointestinal tract. Role of gastrointestinal hormones. Involvement of hormones and nervous system in regulation of metabolism. Ways of evaluating basic and total metabolism, evaluation of body mass and proportions.	6 hrs	W02,03.07, U01,02,03,06
TK23	4. Endocrine functions of the pancreas: action and significance of insulin and glucagon. Thyroid hormones T3 and T4: tissue and organ action, importance.	2 hrs	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.
Supplementary literature:
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 Elsevier

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

* Selected examples of methods of assessment:

EP – written examination

EU - oral examination

ET – test examination

EPR – practical examination

K – colloquium

R – report

S – practical skills assessment

RZC – practical classes report, incl. discussion on results

O - student's active participation and attitude assessment

SL - lab report

SP – case study

PS - assessment of student's ability to work independently

W – entry test

PM – multimedial presentation