JAGIELLONIAN UNIVERSITY
MEDICAL COLLEGE

Human Physiology

Educational subject description sheet

Basic information

Department Faculty of Medicine	**Didactic cycle** 2016/17
Field of study Medical Program	**Realization year** 2016/17
Study level long-cycle master's degree program	**Lecture languages** English
Study form full-time	**Block** obligatory for passing in the course of studies
Education profile general academic	**Mandatory** obligatory
Disciplines Medical science	**Examination** examination
Subject related to scientific research Yes	**Standard group** B. Scientific basics of medicine

Subject coordinator	Agata Ptak-Belowska
Lecturer	Agata Ptak-Belowska, Gracjana Krzysiek-Mączka, Tomasz Brzozowski

Period	**Examination**	**Number of ECTS points**
Semester 1	- **Activities and hours** lecture: 65, laboratory: 25	0.0

Period	**Examination**	**Number of ECTS points**
Semester 2	examination **Activities and hours** lecture: 65, laboratory: 30	13.0

Goals

C1	The major goal of the Physiology course is to provide the clear and up-to-date knowledge on the functions and regulations of the human body for medical students. In particular, our major interest is dedicated to present the medical physiology to medical students in concise, uncomplicated and understandable fashion with focus to the following topics: - Basic principles of body fluids and water-electrolyte balance of the human body - Concepts of: solubility, osmotic pressure, isotonic conditions, colloidal solutions and Gibbs-Donnan balance - Transcellular and intracellular cell communications and the cell signaling - Physiology of skeletal and smooth muscle and the functions of circulating blood - Background necessary to understand the impulse conduction and stimulation in peripheral and central nervous system, higher functions and basic functions of centers in the brain and other centers of central nervous system in order to understand the homeostatic control of body organs and brain special senses - Relevant physical laws explaining the blood flow and gaseous molecules flow along with factors affecting endothelial resistance in circulatory blood vessels and the term of air resistance in airways of respiratory tract - Functions and regulatory mechanisms of all organs and systems of human body including muscular system, cardiovascular and respiratory systems, gastrointestinal tract, endocrine and urinary systems, skin surface system physiology, their interactions and dependence - Metabolic profile of major organs and systems - Acid-base balance, the mechanism of buffer functions and their significance for the future medical practice - Digestive tract enzymes, the mechanism of gastric acid formation and secretion, pancreatic functions, bile synthesis, release and circulation, the course and mechanism of digestion and absorption process of food products and gastrointestinal disorders - The process of food intake and the consequences of bad nutrition leading to nutritional disorders such as cachexia, obesity and unbalanced diet - Hormones and their regulation, release and mechanism of action and hormonal disturbances and disorders - The course and regulation of reproductive functions in female and male - Basic principles and quantitative parameters describing efficiency of particular human organs and systems

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	development, structure and functions of the human body in normal and pathological conditions	O.W1	written examination, theoretical colloquiums, classroom observation, oral answer, multiple choice test, written credit
W2	water and electrolyte management in biological systems	B.W1	written examination, theoretical colloquiums, classroom observation, oral answer, multiple choice test, written credit
W3	acid-base balance and buffer mechanism, and their importance in systemic homeostasis	B.W2	written examination, theoretical colloquiums, classroom observation, oral answer, multiple choice test, written credit
W4	methods of intercellular communication, as well as between the cell and the extracellular matrix, and signal pathways in the cell, and examples of disorders in these processes leading to the development of cancer and other diseases	B.W17	written examination, theoretical colloquiums, classroom observation, oral answer, multiple choice test, written credit
W5	basics of induction and transmission in the nervous system and higher nervous actions as well as physiology of striated and smooth muscles and blood functions	B.W20	written examination, theoretical colloquiums, classroom observation, oral answer, essay, multiple choice test, written credit

W6	activity and mechanisms of regulation of all organs and systems of the human body, including the cardiovascular system, respiratory system, digestive system, urinary tract and skin layers, and the interrelations existing between them	B.W21	written examination, theoretical colloquiums, classroom observation, oral answer, multiple choice test, written credit
W7	the mechanism of the body's aging	B.W23	written examination, theoretical colloquiums, classroom observation, oral answer, multiple choice test, written credit
W8	basic quantitative parameters describing the capacity of particular systems and organs, including the range of norms and demographic factors influencing the value of these parameters	B.W24	written examination, theoretical colloquiums, classroom observation, oral answer, multiple choice test, written credit
W9	the relationship between factors disturbing the balance of biological processes and physiological and pathophysiological changes	B.W25	written examination, theoretical colloquiums, classroom observation, oral answer, multiple choice test, written credit
Skills – Student can:			
U1	identify medical problems and prioritize medical management	O.U1	written examination, theoretical colloquiums, classroom observation, oral answer, written credit
U2	plan own learning activities and constantly learn in order to update own knowledge	O.U5	written examination, theoretical colloquiums, classroom observation, oral answer, written credit
U3	perform simple functional tests assessing the human body as a stable regulation system (stress tests, exercise tests) and interpret numerical data on basic physiological variables	B.U7	written examination, theoretical colloquiums, classroom observation, oral answer, written credit
U4	use databases, including online databases, and search for the necessary information using the available tools	B.U10	theoretical colloquiums, classroom observation, written credit
U5	indicate the relationship between factors disturbing the balance of biological processes and physiological and pathophysiological changes	B.U14	written examination, theoretical colloquiums, classroom observation, oral answer, written credit
U6	identify sources of electrical signals in the body	B.U15	written examination, theoretical colloquiums, classroom observation, oral answer, written credit
U7	use on-line photo, audio and video libraries	B.U21	classroom observation
U8	use various types of computer simulators and e-learning tools for educational purposes, with particular emphasis on virtual patients	B.U26	classroom observation, oral answer, written credit

U9	provide expert knowledge through simple IT techniques of knowledge representation such as a block diagram or a rule database	B.U28	classroom observation, oral answer, written credit
Social competences – Student is ready to:			
K1	use objective sources of information	O.K7	written examination, theoretical colloquiums
K2	formulate conclusions from own measurements or observations	O.K8	written examination, theoretical colloquiums

Calculation of ECTS points

Semester 1

Activity form	**Activity hours***
lecture	65
laboratory	23
preparation for classes	4
preparation for colloquium	10
preparation for classes	5
preparation for test	10
preparation of multimedia presentation	6
kształcenie samodzielne	25
preparation of a report	4
preparation of a paper	5

Student workload	**Hours** 157
Workload involving teacher	**Hours** 90
Practical workload	**Hours** 23

* hour means 45 minutes

Semester 2

Activity form	**Activity hours***
lecture	65

laboratory	22
preparation for colloquium	10
preparation for classes	5
preparation for test	10
preparation of multimedia presentation	6
kształcenie samodzielne	30
preparation of a report	8
preparation of a paper	10
preparation for examination	25

Student workload	**Hours** 191
Workload involving teacher	**Hours** 95
Practical workload	**Hours** 22

* hour means 45 minutes

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	1. General Physiology: internal cell environment, homeostasis and cell function control, the plasma membrane, membrane transport and the resting membrane potential, the action potential, synaptic transmission, neuromuscular junction, synaptic events, maintenance of nerve function, skeletal muscle, smooth muscle, muscle tension, skeletal and smooth muscle contractions and their regulation, molecular mechanism of muscle contraction muscle fatigue, the principles of autonomic nervous system.	W1, W4, W5, W6, U3, U6, U8, K1	laboratory, lecture
2.	2. Neurophysiology: neural organization of nervous system, sensory receptors, nerves and sensory axis, motoneurons of spinal cord and brainstem, sensory and motor neurons of the upper and lower neurons of spinal cord, brain cortex, basal nuclei, cerebellum, speech and its associated brain centers, neural control of emotional behavior, the regulation of sleep, alert (awareness), process of learning and memory, body temperature regulation and brain centers responsible for sense, vision and hearing, vestibular system, sense of smell and taste. Current methods of neurological disorders diagnostics.	W1, W4, W5, W7, U1, U4, U5, U6, K1	laboratory, lecture

3.	3. Blood: Functions of the blood and its components, plasma composition and morphotic elements of the blood, hematopoiesis, blood groups, blood clotting, immune system, fibrinolysis, lymph circulation.	W1, W4, W6, W8, U2, U3, U5, U9, K1, K2	laboratory, lecture
4.	4. Cardiovascular physiology: An overview of the cardiovascular system, principles of hemodynamics, the electrical activity of the heart, electrocardiogram, mechanical activity of the heart and cardiac pump, cardiac cycle, regulation of venous return and cardiac output, blood pressure and its regulation, special circulations, capillary flow and filtration-reabsorption processes, control mechanisms in circulatory functions, local and systemic control of blood circulation, cardiovascular reflexes, current methods of determination of cardiovascular functions.	W1, W6, W8, W9, U1, U5, U8, K1, K2	laboratory, lecture
5.	5. Respiratory Physiology: the structure and function of respiratory tract and airways, the ventilation and the mechanics of breathing, lung spirometry in medicine, gases transfer and transport, oxygen-carbon dioxide exchange in the lungs, pulmonary circulation, the control of ventilation, functional methods of determination of respiratory tract, the respiratory and circulatory adaptation to exercise.	W1, W2, W3, U2, U3, U5	laboratory, lecture
6.	6. Renal Physiology: structure and functions of kidney, the regulation of fluid and electrolyte balance, renal blood flow and glomerular filtration rate, the role of kidney in homeostasis, reabsorption processes in proximal tubule, loop of Henle, distal tubule and collecting ducts, Urine osmolarity, volume and composition regulations in the kidney and the consequences of kidney disorders, renal regulations of potassium, calcium and magnesium levels by kidney, the role of kidney in maintenance of acid-base balance.	W2, W3, W8, U1, U5, K2	laboratory, lecture
7.	7. Gastrointestinal Physiology: food intake control and regulation, the neurogastroenterology and motility, the gastrointestinal secretion, digestion and absorption, physiology of gastrointestinal hormones, intestinal transport mechanisms of water, electrolytes and food digestion products, brain-gut axis, major gastrointestinal disorders and methods of investigation of gastrointestinal tract.	W6, W7, W9, U4, U7, U9, K1, K2	laboratory, lecture
8.	8. Endocrine Physiology: endocrine function mechanisms, the hypothalamic and pituitary gland physiology, the synthesis and regulation of the function of thyroid and adrenal glands, pancreatic endocrine function, the hormonal regulation of body metabolism, the endocrine regulation of calcium, phosphate and bone homeostasis, the hormonal regulation of body growth, female and male reproductive system, control of endocrine function of reproductive tract, physiology of menstrual cycle, fertilization, pregnancy and lactation, an overview of diagnostics in the function of endocrine glands and the consequences of the functional disorders of endocrine system.	W1, W6, W9, U5, U8, K1	laboratory, lecture

Course advanced

Semester 1

Teaching methods:

case study, brainstorm, computer classes, laboratories (labs), classes in simulated conditions, demonstration, discussion, e-learning, educational film, problem solving method, presentation, group work, lecture, practical classes, practical classes in simulated conditions

Activities	Examination methods	Credit conditions
lecture	multiple choice test	Attendance is obligatory and will be monitored.
laboratory	multiple choice test	Multiple choice midterm exams, multiple choice test as final exam. No absences are allowed.

Semester 2

Teaching methods:

laboratories (labs), classes in simulated conditions, demonstration, discussion, lecture, educational film, problem solving method, presentation, group work, lecture, practical classes in simulated conditions

Activities	Examination methods	Credit conditions
lecture	written examination, classroom observation	Attendance is obligatory and will be monitored.
laboratory	written examination, theoretical colloquiums, classroom observation, oral answer, essay, written credit	Attendance is obligatory. In case of long term, excused absence contact with course coordinator is required

Additional info

The Students knowledge acquisition will be checked by 5 midterm exams from particular Physiology parts. These midterm exams will be consisting of multiple choice questions each within the time of 50 - 60min allowed to solve these questions. The Final Physiology exam is consisting of multiple choice questions from all 5 subsequent parts of Physiology course will last about 2 hours. The Final exam pass mark will be assigned to Students after calculation of Gaussian distribution of their scores.

Literature

Obligatory

1. 1. Ganong's Review of Medical Physiology, Kim E. Barrett, Susan M. Barman, Heddwen L. Brooks, Jason X.-J. Yuan
2. 2. Physiology,Linda S. Costanzo
3. 3. Guyton and Hall Textbook of Medical Physiology, John E. Hall

Optional

1. 1. Human Physiology, Stuart Ira Fox

Standard effects

Code	Content
B.U7	perform simple functional tests assessing the human body as a stable regulation system (stress tests, exercise tests) and interpret numerical data on basic physiological variables
B.U10	use databases, including online databases, and search for the necessary information using the available tools
B.U14	indicate the relationship between factors disturbing the balance of biological processes and physiological and pathophysiological changes
B.U15	identify sources of electrical signals in the body
B.U21	use on-line photo, audio and video libraries
B.U26	use various types of computer simulators and lecture tools for educational purposes, with particular emphasis on virtual patients
B.U28	provide expert knowledge through simple IT techniques of knowledge representation such as a block diagram or a rule database
B.W1	water and electrolyte management in biological systems
B.W2	acid-base balance and buffer mechanism, and their importance in systemic homeostasis
B.W17	methods of intercellular communication, as well as between the cell and the extracellular matrix, and signal pathways in the cell, and examples of disorders in these processes leading to the development of cancer and other diseases
B.W20	basics of induction and transmission in the nervous system and higher nervous actions as well as physiology of striated and smooth muscles and blood functions
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B.W24	basic quantitative parameters describing the capacity of particular systems and organs, including the range of norms and demographic factors influencing the value of these parameters
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O.K7	use objective sources of information
O.K8	formulate conclusions from own measurements or observations
O.U1	identify medical problems and prioritize medical management
O.U5	plan own learning activities and constantly learn in order to update own knowledge
O.W1	development, structure and functions of the human body in normal and pathological conditions