

Module title:	Animal physiology (1)	ECTS	6
Polish translation:	Fizjologia zwierząt (1)		
Course:	Veterinary Medicine		

Module language: English		Stage: JM-FVM	
Form of studies: <input checked="" type="checkbox"/> intramural <input type="checkbox"/> extramural	Type of module: <input checked="" type="checkbox"/> basic <input type="checkbox"/> directional	<input checked="" type="checkbox"/> mandatory <input type="checkbox"/> elective	Semester: iii <input checked="" type="checkbox"/> winter semester <input type="checkbox"/> summer semester
Academic year: 2023/2024		Catalogue number:	FVM-V-JMSS-03W-B39_23

Module coordinator:	Dr hab. Tomasz Sadkowski
Teachers responsible for the module:	Academic teachers of the Institute of Veterinary Medicine; Department of Physiological Sciences; PhD students in accordance to the internal legal acts; visiting professors; other specialists in the field of study
Objectives of the module:	<p>During the animal physiology course in the winter semester, a student of the Faculty of Veterinary Medicine acquires basic and advanced knowledge of the physiological issues presented below. The acquired knowledge will allow to understand the functioning of individual organs / systems as well as the body as a whole. It will also be the basis for further education of students allowing identification of disorders in the proper physiological functioning of the body and its tissues / organs (among others: pathophysiology, internal diseases, etc.).</p> <p><u>Lecture topics:</u></p> <p>Nerve cell electrophysiology - among others: membrane properties, ion channels, genesis of resting potential, action potential; action potential conduction, synaptic transmission: transmitters, co-transmitters, neuromodulators; formation of excitatory and inhibitory postsynaptic potential (4 hours); Sensation and perception - among others: receptors - division and functioning, specific and non-specific sensory systems, thalamus and cortical representation of sensation, bioelectric brain activity, EEG (2 hours); Body movements and posture - among others : spinal cord functions, reflexes, reflex testing methods; cortical representation of movement, pyramidal and extrapyramidal system, cerebellar functions, intentional movements (2 hours); Physiological background of behaviour - among others: hypothalamic motivation centers, limbic system functions, cortical association areas, learning and remembering, sleep (2 hours); Molecular aspects of skeletal muscle contraction - including: bioelectric properties, electromechanical coupling, molecular mechanism of contraction (2 hours); Autonomic nervous system - among others: central, sympathetic, parasympathetic, transmitters, receptors, cell signal transmission systems (2 hours); Fundamentals of endocrinology - among others: hormones, cytokines, growth factors, receptors, molecular mechanism of action (2 hours); Hypothalamic-pituitary axis - among others: hypothalamic hormones, pituitary hormones, mutual relations and secretion regulation, the role of the pineal gland (2 hours); Characteristics of the functions of some peripheral endocrine glands and tissue hormones. Eicosanoids, cytokines and growth factors (2 hours); Electrophysiology of the heart - among others: basics of automatism, bioelectrical properties of cardiac working cells, extracellular leads, ECG, regulation of heart function (2 hours); Regulation of blood flow in the vessels - among others: a) local - humoral, autoregulation, influence of substances secreted by the endothelium, interaction of metabolites, b) central - sympathetic nervous system, parasympathetic nervous system, hormonal effects, reflex mechanisms (2 hours); Breathing physiology - among others: gas exchange in the lungs, breathing regulation (2 hours); Breathing physiology - among others: gas transport through the blood, specificity of breathing in birds (2 hours); Function of immune system (2 hours).</p> <p><u>Laboratory classes topics:</u></p> <p>Bioelectric properties of the cell; resting and action potential, ion pump. Mechanisms of cell transport and membrane permeability (3 hours); Conduction in the nervous system - nerve fibers, synapses. Resting and action potential of the nerve, determining chronaxy, types and gradation of stimuli, summing up stimuli (6 hours). Patch Clamping - examination of ion flow through individual channels in the cell membrane (3 hours); Spinal cord reflex activity. Somatic reflex arch and its types, regulation of muscle tone. Neurophysiology of nerve impulses (3 hours); Skeletal muscle physiology - electromechanical coupling in skeletal muscle, molecular mechanism of skeletal muscle contraction (4 hours); Mechanical properties of skeletal muscle, summation of two contractions, complete and incomplete tetanic contractions (5 hours); Physiology of the cardiovascular system, myocardium, its structure and the resulting electromechanical properties (4 hours); Nervous and hormonal regulation of heart function (4 hours); High and low pressure system characteristics. The functions and importance of these systems in ensuring blood circulation (4 hours);</p>

	<p>Veterinary electrocardiography, blood pressure measurement; pulse before and after exercise, pulseoximetry, ECG (3 hours); Sense organs function (seminar 3 hours); Special features of blood circulation in selected organs (3 hours seminar).</p> <p>The content of lecture education supplements the content of the exercise education. The topics of lectures and exercises, as well as their form and number of hours may change depending on the current external conditions determined by the published legal acts.</p>			
Teaching forms, number of hours:	<p>a) Lectures; hours 30 b) Laboratory classes; hours 36 c) Seminars; hours 9 d) Clinical laboratories; hours ...; e) Field exercises; hours ...;</p>			
Teaching methods:	<p><b>Lectures:</b> multimedia presentations by IMW employees responsible for conducting lectures discussing selected issues of animal physiology (see above - description of lectures) with reference to practical and clinical aspects. <b>Laboratory exercises:</b> introduction to the exercises - original multimedia presentations prepared by the lecturers; analysis of selected issues in animal physiology (see above - classes description) by students using computer simulations (e.g. PhysioEx and Virtual Physiology), practical exercises based on the PowerLab system and other dedicated to physiology classes. Students perform the practical part of the exercise individually or in 2-3-person subgroups, then the exercises are discussed with the teacher. <b>Seminars:</b> students individually or in groups of 2 work out issues in animal physiology agreed with the group teacher and present them in the form of a public presentation. Then the presentation is discussed in the group forum, moderated by the teacher. <b>Consultations for students</b> - 1h / week. Detailed organization of consultations will be defined by the coordinator of the course at the beginning of semester. Detailed schedule will be defined by the coordinator of the course at the beginning of semester.</p>			
Formal prerequisites and initial requirements:	Required credits for the subjects: histology and embryology, chemistry, animal anatomy, biophysics, biochemistry (1)			
Learning effects	Course outcomes:	Learning outcomes relative to the course outcomes	Impact on the course outcomes*	
Knowledge:	1	Student knows the functioning of individual cellular structures / systems / organs such as: the nervous system, CNS, ANS, skeletal muscles, cardiac muscle, cardiovascular system, sense organs, respiratory system.	A.W.1 A.W.2, A.W.8 A.W.4, A.W.9, A.W.10	1 3 2
	2	Student knows the physiological fundamentals / mechanisms of sensation and perception, movement and maintenance of body posture, physiological fundamentals of behaviour, endocrinology (hypothalamic-pituitary axis, peripheral endocrine glands and tissue hormones), regulation of blood flow in vessels, gas exchange.	A.W.2	3
	3	Student knows the functional connections between the organs / tissues.	A.W.2, A.W.4	2
	4	Student knows the methods of examining parameters determining the physiological state of the body such as: the nervous system (chronaxie, rheobase, conduction speed); skeletal muscle mechanics; physiological parameters of the cardiovascular system (stroke volume, minute volume, etc., blood pressure); respiratory system (air volumes).	B.W.4, B.W.6	2
	5	Student knows the mechanisms integrating the functioning of the whole organism and maintaining the body's homeostasis (CNS, AUN, transmitters, co-transmitters, neuromodulators in the nervous system, hormones, Eicosanoids, cytokines, growth factors, circulatory system).	A.W.4, A.W.9 A.W.5, A.W.11	2 1
	6	Student knows the disturbances in the functioning of the organs as examples of malfunctioning of the body.	A.W.11	1
	7	Student knows the concepts of intellectual property protection.	A.W.23	1
Skills:	1	Student can explain the physiological mechanisms / molecular mechanisms of cellular structures / organs / systems such as: the nervous system, CNS, AUN, skeletal muscles, heart muscle, cardiovascular system, sense organs, respiratory system.	A.U.8	1
	2	Student can explain the physiological fundamentals / mechanisms of sensation and perception, movement and maintenance of body posture, physiological fundamentals of behaviour, endocrinology (hypothalamic-pituitary axis,	A.U.8 A.U.7	1 2

		peripheral endocrine glands and tissue hormones), regulation of blood flow in vessels, gas exchange.		
	3	Student can indicate how the discussed tissues / organs / systems can affect each other and what are the consequences for the functioning of the body.	A.U.8	1
	4	Student can indicate the parameters describing the physiological state of the organs / systems in question - can define the physiological (health) state of the body.	B.U.12 A.U.4, A.U.7	1 2
	5	Student can plan and carry out a simple experiment allowing the analysis of physiological parameters.	A.U.13, A.U.14, A.U.15, A.U.23	1
	6	Student can perform a knee reflex test, examine the pulse, blood pressure, blood saturation and perform an ECG.	B.U.3, B.U.6	1
	7	Student can analyse information from publicly available databases, including scientific ones.	C.U.2, C.U.3	1
Competences:	1	Student is ready to assess and interpret the functioning of the body / systems / organs / cells in the context of the activities of the nervous system, CNS, CNS, skeletal muscle, cardiac muscle, cardiovascular system, sense organs, respiratory system, endocrine system, their interaction and ensuring homeostasis of the body.	KS.1, KS.4, KS.5, KS.6, KS.7	2
	2	Student is ready to assess the physiological parameters determining the animal's health in veterinary diagnostics and treatment of diseases.	KS.1, KS4	2
	3	Student is ready to perform basic physiological (scientific) experiments and to draw correct conclusions from the observations made.	KS.5	2
	4	Student is critical of his knowledge and constantly updates it in accordance with the latest state of general knowledge, uses scientific sources to expand his knowledge.	KS.4, KS.8, KS.7, KS.9	2
	5	Student is ready to cooperate - consult other people and share the knowledge with others.	KS.3, KS.4, KS.7, KS.9	1
	6	Student is ready to apply his knowledge and skills in further stages of education.	KS.1, KS.4, KS.5, KS.6, KS.7, KS.8, KS.9,	2
Objectives of the module required to obtain learning effects:	Knowledge of the lecture, class and seminar topics indicated in the objectives of the module, as well as knowledge available in the compulsory and supplementary literature (topics corresponding to those of the objectives of the module). Passing both tests and giving a presentation during the seminar.			
Assessment methods:	Laboratory class credit, Tests, Seminar			
Detail description of assessment methods;  Formal documentation of learning outcome:	<p><b>Laboratory class credit:</b> The student is required to perform the exercises in accordance with the instructions of the teacher conducting the class, to complete the review sheet with data obtained during experiments and the answers to the indicated questions. At the end of the class, the teacher checks review sheets, asks verification questions, corrects incorrect answers by explaining the physiological mechanisms they concern. The condition of passing the classes is the teacher's approval of the individual review sheet prepared by the student during each laboratory class.</p> <p><b>Tests:</b> Students are required to complete two tests per semester (each contains 8 open questions, a maximum of 5 points per question; 24 points necessary to pass the test – 60%). The retake of the test is in the same form. At all tests, all material from the schedule of lectures, laboratory and seminar preceding the test as well as relevant material from mandatory and supportive literature applies. The student is required to take at least one test attempt.</p> <p><b>Seminar:</b> Each student is required to prepare and deliver a seminar. Seminar topics are proposed by the teachers, selected by students from the proposed pool according to their interests. It is allowed for the student to prepare his / her own seminar topic after having been approved by the teacher. Positive evaluation of the seminar is one of the conditions for passing the semester. The seminar is scored on a scale of 0-10 points (compliance with the topic, explanation of physiological foundations of the</p>			

	<p>issues discussed, manner of presentation, formulation of opinions, conducting discussions, appropriate answers to questions, justification / defense of opinions).</p> <p>No extra assessment methods are anticipated.</p> <p>In case of mandatory suspension of classes at the University (on the current legal regulations) and the need for distance / hybrid teaching, other forms of verification of learning outcomes are allowed in a manner appropriate to the situation. Regardless of the above, the assumed practical learning outcomes assigned to subject/classes will be verified only during contact classes/examination.</p> <p>eHMS entry. Records collected in the course portfolio i.e. individual records of student results, presence lists, database of oral and written questions, written assessments of the students; book with grades</p>
Elements impelling final grade:	<p><b>Completion of the semester:</b>  During the semester, the student may receive a maximum of 90 points from two tests (each max. 40 points; a minimum of 24 points from each test is required) and a seminar (max. 10 points) + additional points for activity (discussion, answers to questions, completion of tasks) - max. 9 points. Student must get a minimum of 60% of points to pass the semester (excluding points for activity).</p> <p>Criterion for issuing the semester grade:  54 - 60 points - satisfactory (3.0)  61 - 67 points - satisfactory plus (3.5)  68 - 74 points - good (4.0)  75 - 81 points - good plus (4.5)  82 - 90 points - very good (5.0)</p>
Teaching base:	IMW lecture halls, laboratory rooms of the Department of Physiological Sciences No. 233, 235 and 236 (building 24)
Mandatory and supportive materials : 1. JG. Cunningham BG Klein, Textbook of Veterinary Physiology, Saunders Elsevier, 2012 2. T. Stabler et al. PEARSON B. CUMMINGS PhysioEx™ 6.0 for Human Physiology – Laboratory Stimulations in Physiology 3. WF. Boron, EL. Boulpaep, Medical Physiology. A Cellular and Molecular Approach, Saunders Elsevier, 2009 4. CD. Moyes, PM. Schulte, Principles of Animal Physiology, Pearson Education, 2007 Relevant scientific publications, including those of the module coordinator.	
<b>ANNOTATIONS</b> Lab coat is required during laboratory classes	

\* 3 – complete and detailed, 2 – moderate, 1 – basic.

Quantitative summary of the module:

Estimated number of work hours per student (contact and self-study) essential to achieve presumed learning outcomes of the module - base for quantifying ECTS:	<b>150 h</b>
Total ECTS points, accumulated by students during contact learning:	<b>3 ECTS</b>