

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
SUMY NATIONAL AGRARIAN UNIVERSITY**

**Department_ Anatomy, normal and pathological animal physiology
Faculty of_ Veterinary Medicine _**

MODULESYLLABUS

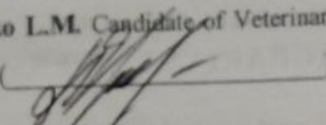
PATHOLOGICAL PHYSIOLOGY

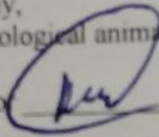
(compulsory)

Implemented in the “SP. 05 Pathological Physiology” Academic Program

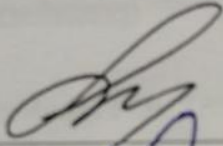
Area of specialization 211 “Veterinary Medicine”

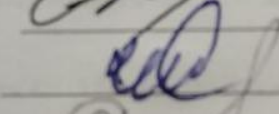
at the second (master's) level of higher education

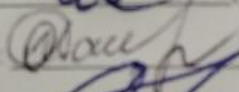
Author: **Kovalenko L.M.** Candidate of Veterinary Sciences (comparable to the academic degree of Doctor of Philosophy, Ph.D.) ()

Module syllabus agreed at the <u>anatomy, normal and pathological animal physiology</u> Department meeting	Minutes No <u>15</u> dated <u>June 23/2021</u>
	Head of anatomy, normal and pathological animal physiology Department d.vet.s., Professor  (Kambur M.D.)

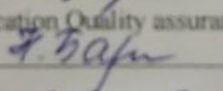
Approved by:

Guarantor of the Academic program  (L.G. Ulco)

Dean of the Faculty  (O.L. Nechiporenko)

Syllabus review (attached) is provided by  (O.E. Kasjanenko)

 (A.N. Kalashnik)

Representative of the Department of Education Quality assurance, licensing and accreditation  (N. Baranik)

Registered in electronic data base 30.06 2021

Syllabus review data:

The academic year in which changes are made	The Academic program attachment number with changes description	Changes revised and approved		
		Minutes No and date of the department meeting	Head of Department	Guarantor of the Academic program

MODULE OVERVIEW

1.	Title	PATHOLOGICAL PHYSIOLOGY			
2.	Faculty/Department	Veterinary Medicine/ anatomy, normal and pathological animal physiology			
3.	Type (compulsory or optional)	compulsory			
4.	Program(s) to which module is attached (to be filled in for compulsory types)	SP. 05 Pathological Physiology” Academic Program Area of specialization 211 “Veterinary Medicine”			
5.	Module can be suggested for (to be filled in for optional types)	-			
6.	Level of the National Qualifications Framework	5th semester, 15 weeks			
7.	Semester and duration of module	2			
8.	ECTS credits number				
9.	Total workload and time allotment	Directed study			Self-directed study
		Lectures	Practicals	Labs	
		5th semester	4		4
10.	Language of instruction	Ukrainian			
11.	Module leader	Lydia Mikhailovna Kovalenko, Candidate of Veterinary Sciences (comparable to the academic degree of Doctor of Philosophy, Ph.D.).			
12.	Module leader contact information	KovalenkoLm4@gmail.com https://vet.snau.edu.ua/en/			
13.	Module description	The educational component is related to the general objectives of OP and covers aspects of the formation of a modern specialist veterinarian in-depth theoretical knowledge on the study of general and patterns of pathological process of individual organs and systems, the pathological state of the organism; practical skills in laboratory research methods.			
14.	Module aim	-training of highly qualified specialists who are able to solve complex issues in the conditions of production related to the formation of deep theoretical knowledge on the study of general and temporal patterns of the pathological process, the pathological state of the organism; practical skills in the methods of laboratory tests in the examination of sick animals.			
15.	Module Dependencies (prerequisites, co-requisites, incompatible modules)	1. The educational component is based on OK 7 Anatomy with Latin veterinary terminology, OK 11. Cytology, histology, embryology. The educational component is aimed at studying the issues: the role of pathological physiology, its place in the system of higher veterinary education, the relationship with other disciplines. Modern methods used in the experiment. Principles of disease classification. Relationship and role of etiological and pathogenetic factors in pathogenesis. Typical microcirculation disorders. Capillary - trophic insufficiency. Importance of inflammation for the body. Changes in thermoregulation. Features of the basic metabolism in laboratory animals in case of fever and tissue changes. General characteristics of disorders of the blood system. General characteristics of respiratory disorders. Dysfunction of nervous			

		and endocrine regulation. 2. The educational component is the basis for OK 21 Clinical Diagnosis of Animal Diseases, OK 23 Pathological Anatomy and Dissection and is the basis for developing the ability of veterinary specialists to apply the acquired knowledge, skills, abilities to teach certain practical techniques and develop skills in production conditions.
16.	The policy of academic integrity	No manifestations of academic dishonesty are allowed during the study of OK. Plagiarism check algorithm systems are tools for counteracting violations of academic integrity. In case of violations, the response is in accordance with the regulations on the academic integrity of the participants of the educational process in Sumy NAU. If a violation of academic integrity is detected, the completed task is not credited and is sent for re-execution.
17	Link in Moodle	https://snau.edu.ua/viddil-zabezpechennya-yakosti-osviti/zabezpechennya-yakosti-osviti/akademichna-dobrochesnist/ .

2. CORRELATION BETWEEN MODULE LEARNING OUTCOMES (MLOs) AND PROGRAM LEARNING OUTCOMES (PLOs)

MLOs: On successful completion of the module the learner will be able to:	PLOs				How assessed
	PLOs 1	PLOs 3	PLOs 4	PLOs 15	
MLOs1. Ability to use competently the terminology of veterinary medicine in the training and performance of professional tasks related to the development of pathological processes occurring in animals, changes in peripheral blood circulation under the influence of heat and cold, high and low atmospheric. Use information from domestic and foreign sources to develop diagnostic and business strategies.	+				Thematic survey Execution of tasks in laboratory-practical classes
MLOs 2. Ability to use during		+			Thematic survey Execution of tasks in

<p>training and performance of professional types of work on the manufacture of blood smears to determine its morphological composition under a world microscope, with typical violations of thermal regulation of the body. To determine the essence of physicochemical and biological processes that occur in the body of animals in normal and pathological conditions. To characterize changes of the formed elements of blood in smears at pathophysiological changes of an organism; distinguish the norm from pathology; distinguish between changes in leukocyte and erythrocyte formulas in the study of animal blood. Establish a link between the clinical manifestations of the disease and the results of laboratory tests.</p>					<p>laboratory-practical classes</p>
<p>MLOs 3. Ability to use various methods and techniques of learning to work</p>	<p>+</p>				<p>Thematic survey Execution of tasks in laboratory-practical classes</p>

with devices for physico - chemical blood tests; systematize diseases depending on the place of origin. To determine the essence of physicochemical and biological processes that occur in the body of animals in normal and pathological conditions.						
MLOs 4. Ability to operate with concepts, concepts, teachings and theories of cardiac disorders. Know the rules of storage of various pharmaceuticals and biologicals, ways of their enteral or parenteral use, understand the mechanism of their action, interaction and complex action on the body of animals. Use information from domestic and foreign sources to develop diagnostic and business strategies.	+			+		Thematic survey Execution of tasks in laboratory-practical classes
MLOs 5. Ability to use during training and performance of professional tasks basic knowledge of the general theory of indigestion, to determine the type		+	+			Thematic survey Execution of tasks in laboratory-practical classes

of digestion by the titer of gastric acidity, to establish changes in the body by clinical signs. To determine the essence of physicochemical and biological processes that occur in the body of animals in normal and pathological conditions.						
MLOs 6. Ability to use basic knowledge of the general theory of the system of reproduction and lactation during training and performance of professional tasks. Know and correctly use the terminology of veterinary medicine.	+					Thematic survey Execution of tasks in laboratory-practical classes
MLOs 7. Ability to use during training and performance of professional types of work the basics of knowledge of veterinary medicine, to provide pre-medical care to animals during the occurrence of pathological processes in the body in violation of the endocrine and nervous systems. Collect anamnestic data during registration and examination of animals, make	+		+			Multiple choice test (or written work)

decisions on the choice of effective methods of diagnosis and prevention of animal diseases.						
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3. MODULE INDICATIVE CONTENT

Autumn semester

Topics	Distribution of hours			Self-directed study	Learning resources
	Directed study				
	Lectures	Practicals	Labs		
Topic 1. Pathophysiology of the blood system. General characteristics of disorders of the blood system. Hypervolemia, hypovolemia. Leukocytosis and leukopenia. Platelet pathology. General characteristics of circulatory disorders. Circulatory failure. Heart failure. Myocardopathy. Myocarditis, myocardial infarction. Blood transfusion shock. Leukemia. Vascular insufficiency.	2			6	[3, 7, 8]
Topic 2. Pathophysiology of the respiratory system. Dysfunction of the upper respiratory tract. Respiratory disorders during lung pathology: bronchitis, pneumonia, hyperemia, edema, emphysema. Pleurisy. Pneumothorax. Types of hypoxia.			2	6	[1, 2,4,5]
Topic 3. Pathophysiology of the digestive system. The main forms of manifestation of digestive pathology. Pathological physiology of digestion in a single-chamber stomach. Indigestion in the pancreas of ruminants. Tympanum. Digestive pathology in the intestines. Autointoxication. Pathogenesis of dyspepsia.	2			10	[1, 3, 8, 9]
Topic 4. Pathophysiology of the liver. Causes and consequences of liver dysfunction. Etiology and pathogenesis of hepatitis and liver cirrhosis. Impaired liver barrier function.			2	6	[3, 5, 6,8]

Topic 5. Pathophysiology of the kidneys. General characteristics of disorders of urination and urination.				6	[4, 7, 8]
Topic 6. Pathophysiology of the reproductive and lactation system. Violation of neuro-humoral mechanisms of regulation of the reproductive system in animals. Dysfunction of reproductive organs in males. Dysfunction of reproductive organs in females.				6	[2, 6, 9]
Topic 7. Pathophysiology of the endocrine system. General characteristics of endocrine disorders. Pituitary dysfunction. Hypofunction of the thyroid gland. Dysfunction of the parathyroid glands. Adrenal dysfunction. Disorders of water metabolism. Dysfunction of nerve cells and conduction of nerve fibers. Dysfunction of inhibitory synapses. Pathological parabiosis and dominant. Dysfunction of the autonomic nervous system. Hypothalamic damage.				6	[1, 3, 5, 8, 10]
Topic 8. Pathophysiology of the nervous system. Disorders of sympathetic innervation. Autonomic neuroses. Disorders of higher nervous activity. Stress and general adaptation syndrome. Paresis and paralysis. Hyperkinesis. Asthenia. Astasia. Sensitivity disorders, hypoesthesia, hyperesthesia, anesthesia, paresthesia. Pain.				6	[1, 2, 4, 7, 9]
Total for the fall semester	4		4	52	

4. TEACHING AND LEARNING METHODS

MLOs	Teaching methods (directed study)	Hours	Learning methods (self-directed study)	Hours
<p>MLOs 1. To model the analysis of the pathophysiology of the blood system. Modeling of determination of changes of leukocyte formula and leukocyte profile animal blood. Research of physicochemical properties of blood. Simulation of cardiac dysfunction in the experiment. Compression of the aorta and pulmonary artery.</p>	<p>Methods of teaching by source of knowledge: Verbal: story, explanation, conversation (heuristic and reproductive), lecture, instruction. Visual: demonstration, illustration, observation. Active methods: (use of technical means of training and problem situations, classes on production, group researches in the conditions of "Educational production complex-vivarium", use of educational and control tests) Interactive teaching methods: (use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations), dialogue training, student cooperation (cooperation))</p>		<p>Methods of teaching by source of knowledge: Verbal: work with a book (reading, translation, writing, taking notes, making tables, graphs, reference notes), Visual: observation. Teaching methods by the nature of the logic of cognition (analytical, synthesis methods, inductive method, deductive method). Active methods (brainstorming, binary classes, group research). Interactive learning technologies (use of multimedia technologies, dialogue learning, cooperation of students (cooperation). Self-study, analysis, preparation of multimedia reports on materials: Pathophysiology of the blood system. Blood transfusion shock. Leukemia. , its pathogenesis. Violation of physicochemical properties of blood vessel walls. Violation of blood pressure regulation. Hypertension and hypertension. Hypotension. Shock, collapse. Fainting.</p>	6
<p>MLOs 2. Develop and implement methods to determine the pathophysiology of the respiratory system. Virtual demonstration of an experiment on the study of oxygen starvation. Periodic respiration in frogs</p>	<p>Methods of teaching by source of knowledge: Verbal: story, explanation, conversation (heuristic and reproductive), lecture, instruction. Visual: demonstration, illustration, observation. Active methods: (use of technical means of training and problem situations, classes on production, group researches in the conditions of "Educational production</p>	2	<p>Methods of teaching by source of knowledge: Verbal: work with a book (reading, translation, writing, taking notes, making tables, graphs, reference notes), Visual: observation. Teaching methods by the nature of the logic of cognition (analytical, synthesis methods, inductive method, deductive method). Active methods</p>	6

<p>under the action of sodium nitrate.</p>	<p>complex-vivarium", use of educational and control tests) Interactive teaching methods: (use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations), dialogue training, student cooperation (cooperation)</p>		<p>(brainstorming, binary classes, group research). Interactive learning technologies (use of multimedia technologies, dialogue learning, cooperation of students (cooperation). Self-study, analysis, preparation of multimedia reports on materials: Pathological physiology of the respiratory system. Respiratory disorders due to impaired lung perfusion. Types of hypoxia and consequences tissues during hypoxia (cyanosis, changes in metabolism) Influence of hypoxia on the function of the nervous and cardiovascular systems, kidneys.</p>
<p>MLOs 3. To model the pathophysiology of the digestive system. Selection and study of the contents in case of indigestion in the pancreas of ruminants. Determination of digestion of proteins, starch, fiber in the contents of the scar. Study of gastric juice in animals with different types of gastric secretory dysfunction</p>	<p>Methods of teaching by source of knowledge: Verbal: story, explanation, conversation (heuristic and reproductive), lecture, instruction. Visual: demonstration, illustration, observation. Active methods: (use of technical means of training and problem situations, classes on production, group researches in the conditions of "Educational production complex-vivarium", use of educational and control tests) Interactive teaching methods: (use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations), dialogue training, student cooperation (cooperation)</p>	<p>Methods of teaching by source of knowledge: Verbal: work with a book (reading, translation, writing, taking notes, making tables, graphs, reference notes), Visual: observation. Teaching methods by the nature of the logic of cognition (analytical, synthesis methods, inductive method, deductive method). Active methods (brainstorming, binary classes, group research). Interactive learning technologies (use of multimedia technologies, dialogue learning, cooperation of students (cooperation). Self-study, analysis, preparation of multimedia reports on materials: Pathophysiology of digestive system. Pathophysiology of digestive system in a single-chamber stomach.</p>	<p>10</p>

<p>MLOs 4. Develop and conduct demonstration methods to determine liver pathology. Virtual demonstration of the effects of circulatory disorders in the liver</p>	<p>Methods of teaching by source of knowledge: Verbal: story, explanation, conversation (heuristic and reproductive), lecture, instruction. Visual: demonstration, illustration, observation. Active methods: (use of technical means of training and problem situations, classes on production, group researches in interfaculty>NNL of electron microscopy, use of educational and control tests) Interactive teaching methods: (use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations), dialogue training, student cooperation (cooperation)</p>	<p>2</p>	<p>Methods of teaching by source of knowledge: Verbal: work with a book (reading, translation, writing, taking notes, making tables, graphs, reference notes), Visual: observation. Teaching methods by the nature of the logic of cognition (analytical, synthesis methods, inductive method, deductive method). Active methods (brainstorming, binary classes, group research). Interactive learning technologies (use of multimedia technologies, dialogue learning, student cooperation) Self-study, analysis, preparation of multimedia reports on materials: Pathological physiology of the liver. bile.</p>	<p>6</p>
<p>MLOs 5. Carry out modeling of kidney pathology. Virtual demonstration of the effect of circulatory disorders in the kidneys on urination Determination of the concentration capacity of the kidneys for creatinine during experimental nephritis.</p>	<p>Methods of teaching by source of knowledge: Verbal: story, explanation, conversation (heuristic and reproductive), lecture, instruction. Visual: demonstration, illustration, observation. Active methods: (use of technical means of training and problem situations, classes on production, group researches in the conditions of "Educational production complex-vivarium", use of educational and control tests) Interactive teaching methods: (use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations), dialogue training, student cooperation (cooperation)</p>		<p>Methods of teaching by source of knowledge: Verbal: work with a book (reading, translation, writing, taking notes, making tables, graphs, reference notes), Visual: observation. Teaching methods by the nature of the logic of cognition (analytical, synthesis methods, inductive method, deductive method). Active methods (brainstorming, binary classes, group research). Interactive learning technologies (use of multimedia technologies, dialogue learning, cooperation of students (cooperation). Self-study, analysis, preparation of multimedia reports on materials: Pathophysiology of kidneys. Disorders of excretion of nitrogenous compounds. Pathogenesis</p>	<p>6</p>

			of renal edema	
<p>MLOs 6. Carry out modeling of pathophysiological processes in the systems of reproduction and lactation. Laboratory methods of floridine glucosuria. Urine examination.</p>	<p>Methods of teaching by source of knowledge: Verbal: story, explanation, conversation (heuristic and reproductive), lecture, instruction. Visual: demonstration, illustration, observation. Active methods: (use of technical means of training and problem situations, classes on production, group researches in the conditions of "Educational production complex-vivarium", use of educational and control tests) Interactive teaching methods: (use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations), dialogue training, student cooperation (cooperation)</p>		<p>Methods of teaching by source of knowledge: Verbal: work with a book (reading, translation, writing, taking notes, making tables, graphs, reference notes), Visual: observation. Teaching methods by the nature of the logic of cognition (analytical, synthesis methods, inductive method, deductive method). Active methods (brainstorming, binary classes, group research). Interactive learning technologies (use of multimedia technologies, dialogic learning, cooperation of students (cooperation). Self-study, analysis, preparation of multimedia reports on the materials: Pathophysiology of the reproductive and lactation system. Ovarian hyperfunction. Dysfunction of the gonads.</p>	6
<p>MLOs 7. Develop and conduct demonstration methods of pathophysiology of the endocrine system. Virtual demonstration of water metabolism disorders in animals</p>	<p>Methods of teaching by source of knowledge: Verbal: story, explanation, conversation (heuristic and reproductive), lecture, instruction. Visual: demonstration, illustration, observation. Active methods: (use of technical means of training and problem situations, classes on production, group researches, use of educational and control tests) Interactive teaching methods: (use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations),</p>		<p>Methods of teaching by source of knowledge: Verbal: work with a book (reading, translation, writing, taking notes, making tables, graphs, reference notes), Visual: observation. Teaching methods by the nature of the logic of cognition (analytical, synthesis methods, inductive method, deductive method). Active methods (brainstorming, binary classes, group research). Interactive learning technologies (use of multimedia technologies, dialogue learning, student</p>	6

	dialogue training, student cooperation (cooperation)		cooperation (cooperation). Self-study, analysis, preparation of multimedia reports on the materials: Pathophysiology of the endocrine system. Disorders of intrasecretory (endocrine) function of the pancreas. Insulin deficiency.	
MLOs 8. To model the pathophysiology of the nervous system. Modeling of experiments to determine impaired mobility and sensitivity in case of damage to the nervous system. Virtual demonstration of convulsions. Experiments to determine impaired mobility and sensitivity in case of damage to the nervous system. Experiment with experimental ataxia.	Methods of teaching by source of knowledge: Verbal: story, explanation, conversation (heuristic and reproductive), lecture, instruction. Visual: demonstration, illustration, observation. Active methods: (use of technical means of training and problem situations, classes on production, group researches, use of educational and control tests) Interactive teaching methods: (use of multimedia technologies, spreadsheets, case-study (method of analysis of specific situations), dialogue training, student cooperation (cooperation)		Methods of teaching by source of knowledge: Verbal: work with a book (reading, translation, writing, taking notes, making tables, graphs, reference notes), Visual: observation. Teaching methods by the nature of the logic of cognition (analytical, synthesis methods, inductive method, deductive method). Active methods (brainstorming, binary classes, group research). Interactive learning technologies (use of multimedia technologies, dialogue learning, cooperation of students (cooperation). Self-study, analysis, preparation of multimedia reports on materials: Pathophysiology of the nervous system. Stress and general adaptation syndrome. Disorders of motor function of the nervous system. Paresis and paresis. Asthenia Astasia Sensitivity disorders (hypoesthesia, hyperesthesia, anesthesia, paresthesia) Pain, its pathogenesis and protective value Experimental neuroses.	6
In just 5 semesters		4		52

5. ASSESSMENT

5.1. Diagnostic assessment

5.2. Summative assessment

5.2.1. Intended learning outcomes methods:

No	Summative assessment methods	Grades	Deadline
Autumn semester			
1.	Current control: Thematic survey Execution of tasks in laboratory-practical classes	40 points / 40% 15 points / 15%	4... 13 weeks
2.	Periodic control	15 points / 15%	8 weeks
3.	Multiple choice test (or written work)	30 points / 15%	Week 16, on schedule

5.2.2. Grading criteria

Summative assessment method	Unsatisfactory	Satisfactory	Good	Excellent
Current control:	<i><24 points</i>	<i>25-40 points</i>	<i>41-54 points</i>	<i>55 points</i>
	Task requirements not met.	Most of the requirements are met, but some components are missing or insufficiently disclosed, there is no analysis of other approaches to the issue. Partially reproduced knowledge on the basis of directly presented material within the program.	Most of the requirements are met, but some components are missing. Reproduced knowledge of directly presented material within the program with some evidence of a broader study.	All the requirements of the task are fulfilled, creativity and thoughtfulness are demonstrated, the own solution of the problem is offered. Reproduced knowledge obtained outside the directly presented material within the program.
Thematic survey	<i><3 points</i>	<i>4-10 points</i>	<i>11-14 points</i>	<i>15 points</i>
	Task requirements not met.	Most of the requirements are met, but some components are missing or insufficiently disclosed, there is no analysis of other approaches to the issue. Partially reproduced knowledge on the	Most of the requirements are met, but some components are missing. Reproduced knowledge of directly presented material within the program with some evidence of a	All the requirements of the task are fulfilled, creativity and thoughtfulness are demonstrated, the own solution of the problem is offered. Reproduced knowledge obtained outside

		basis of directly presented material within the program.	broader study.	the directly presented material within the program.
Execution of tasks in laboratory-practical classes	<i><11 points</i>	<i>12-25 points</i>	<i>26-29 points</i>	<i>30 points</i>
	Task requirements not met.	Most of the requirements are met, but some components are missing or insufficiently disclosed, there is no analysis of other approaches to the issue. Partially reproduced knowledge on the basis of directly presented material within the program.	Most of the requirements are met, but some components are missing. Reproduced knowledge of directly presented material within the program with some evidence of a broader study.	All the requirements of the task are fulfilled, creativity and thoughtfulness are demonstrated, the own solution of the problem is offered. Reproduced knowledge obtained outside the directly presented material within the program.

5.3. Formative assessment

Formative exercises are designed to enable students to develop particular aspects of their learning, prior to summative assessments. Formative exercises are designed to help students use feedback and self-reflection to manage and develop their learning so that they can see how to improve their work.

No	Formative Assessment elements	Date
Autumn semester		
1.	Oral feedback after studying topics 1-3, 4-7	3 weeks
2.	Written feedback tem1-3	Within 1 week after assembly
3.	Testing after studying topics 4-7	7 weeks
4.	Intermediate control	According to the schedule
5.	Oral feedback after studying topics 8-12	12 weeks
6.	Written feedback on topics 8-12	Within 1 week after assembly
7.	Testing after studying topics 13-14	14 weeks
8.	Current control (testing, generalization of points) 15 weeks	15 weeks
9.	Exam - multiple choice test (or written work) 16 weeks, on schedule	Week 16, on schedule

Self-assessment can be used both an element of formative and summative assessment.

6. LEARNING RESOURCES

6.1. Key resources

1. Essentials of Pathophysiology Concepts of Altered Health States 4th Edition - <https://www.pinterest.com/pin/321303754648019663/>
2. Pathophysiology of Disease 7th Edition - <https://www.pinterest.com/pin/321303754648019658/>
3. PATHOPHYSIOLOGY - <https://www.lfhk.cuni.cz/Faculty/Organization-structure/Workplace-homepages/Department-of-Pathological-Physiology/Study-information/Questions/Pathophysiology-complet.aspx/>
4. Pathophysiology of Disease 7th Edition PDF - <https://medicalbooksfreedownload.com/pathophysiology-disease-7th-edition-pdf/>

6.2. Additional resources

5. Pathophysiology of Disease - http://faculty.sgsc.edu/cperkins/biol%203910/Hammer_Ch10.pdf
6. Pathophysiology - <http://lmpbg.org/new/downloads/pathophysiology.pdf>
7. Pathophysiology - https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/nursing_students/ln_pathophysiology.pdf
8. Pathophysiology Of Disease An Introduction To Clinical Medicine, 7th Ed [PDF][tahir 99] VRG- <https://archive.org/details/PathophysiologyOfDiseaseAnIntroductionToClinicalMedicine7thEdPDFtahir99VRG>
9. Veterinary Pathophysiology - <https://ru.scribd.com/doc/246194376/Veterinary-Pathophysiology-pdf>
10. Veterinary Pathophysiology - <https://sites.google.com/site/ffdhdhfdhdhddsaaassds/pdf-veterinary-pathophysiology-full-books-ebook>

6.4. Computer Applications and soft

«MOODL»; «ZOOM»; «Viber»; «Facebook».