Ministry of Agriculture of the Russian Federation
Federal State Budgetary Educational Institution of Higher Education
"St. Petersburg State University of Veterinary Medicine"

APPROVED BY
Vice-Rector for Educational
Work and Youth Policy
_____ A.A.Sukhinin
April 10, 2026

Department of Clinical Diagnostics

WORK PROGRAM

for the discipline

"INSTRUMENTAL DIAGNOSTIC METHODS"

THE LEVEL OF HIGHER EDUCATION
SPECIALTY
Specialty 36.05.01 Veterinary Medicine
Profile: «General clinical veterinary medicine»
Full-time education

Education starts in 2026

Reviewed and adopted
at the meeting of the department
on April 09, 2026
Protocol No. 10
Head of the Department of Clinical Diagnostics
_____ Prof. Kovalev S.P.

Saint Petersburg
2026

1. THE PURPOSE AND OBJECTIVES OF THE DISCIPLINE, ITS PLACE IN THE EDUCATIONAL PROCESS

The purpose of the discipline: the study of modern methods of instrumental diagnostics to study the state of animal health.

The task of the discipline is to determine the state of health and, as early as possible, to comprehensively study the disorders that occur in the body, which makes it possible to diagnose the disease, determine its etiology and pathogenesis. Using general clinical research methods and laboratory diagnostics within the framework of propaedeutics, to work out optimal methods for studying the biochemical, biophysical and cytological composition of body fluids, indicators of animal health in normal and pathological conditions, to establish the diagnostic role of individual tests and their combinations; to identify the features of individual indicators. To master the methodology of conducting medical examinations of productive animals as a set of planned measures aimed at timely detection of animal diseases, disease prevention, with the aim of timely treatment of patients and the creation of healthy highly productive herds.

Instrumental diagnostics as a subject is an integral part of clinical diagnostics, which involves students mastering medical diagnostic techniques, semiotics and medical logic, as well as methods of diagnosis. It is of great importance for students to master instrumental methods of research on farm animals, gain experience in identifying symptoms and syndromes, and the ability to analyze the situation in order to make a diagnosis.

2. THE LIST OF PLANNED RESULTS OF MASTERING THE DISCIPLINE (MODULE), CORRELATED WITH THE PLANNED RESULTS OF MASTERING THE EDUCATIONAL PROGRAM

As a result of mastering the discipline, the student prepares for the following types of activities, in accordance with the educational standard of the Federal State Educational Standard on 05/36.01 "Veterinary Medicine".

The field of professional activity:

13 Agriculture

Types of tasks of professional activity:

- Medical;
- Expert control;
- Scientific and educational.

The student's competencies formed as a result of mastering the discipline

The study of the discipline should form the following competencies:

a) professional competencies (PC):

PC-1 Collection of anamnesis of animal life and disease to identify the causes of diseases, conducting a general clinical study of animals in order to establish a preliminary diagnosis and determine further research program.

ID-1PC1 Should be able to collect and analyze information about the origin and purpose of animals, the method and conditions of keeping, feeding (anamnesis of animal life), including from sensor devices, mechanisms, sensors, tags, etc.

ID-2PC-1 Should be able to collect and analyze information about the occurrence and manifestation of diseases in animals, previously transmitted diseases, epizootological conditions (anamnesis of animal disease), including from sensor devices, mechanisms, sensors, tags, etc.

ID-3 PC-1 Be able to fix animals to ensure safety during a clinical trial.

ID-4 PC-1 Be able to perform a clinical study of animals using common methods: examination, palpation, percussion, auscultation and thermometry.

ID-5 PC-1 Should be able to establish a preliminary diagnosis based on anamnesis analysis and clinical research using general methods.

ID-8 PC-1 Know the forms and rules for filling out the journal for the registration of sick animals and the animal's medical history, including in electronic form in accordance with the requirements of veterinary reporting.

ID-9 PC-1 To know the methods of fixation of animals during their clinical examination.

ID-10 PC-1 To know the technique of conducting clinical animal research using general methods in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals.

PC-2 Development of an animal research program and conducting a clinical study of animals using special (instrumental) and laboratory methods, including to clarify the diagnosis.

ID-1 PC-2 Should be able to perform animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography.

ID-2 PC-2 Be able to interpret and analyze data from special (instrumental) animal research methods to verify the diagnosis.

ID-7 PC-2 To know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules for the diagnosis, prevention and treatment of animals.

ID-8 PC-2 To know the Rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal studies, including X-ray examinations.

ID-9 PC-2 To know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with methodological guidelines, instructions, rules for the diagnosis, prevention and treatment of animals.

3. THE PLACE OF DISCIPLINE IN THE STRUCTURE OF THE MPEP

Discipline B1.V.10. "Instrumental diagnostic methods" is a discipline of the part formed by participants in educational relations of the federal state educational standard of higher education in the specialty 36.05.01 "Veterinary Medicine" (specialty level).

It is mastered in the 5th semester of full-time education.

Instrumental diagnostic methods, as a subject, is one of the main sections closely related to general diagnostics, which helps to master semiotics and medical logic, methods of diagnosis. The course is aimed at developing skills in compiling an algorithm for instrumental diagnostics and tactics of therapeutic and diagnostic measures based on clinical interpretation of data results while ensuring continuity of instrumental examination at different stages of veterinary care for animals. Familiarization with instrumental research methods performed in sick patients. It is of great importance for students to master clinical instrumental methods of research on farm animals, gain experience in identifying symptoms and syndromes, and the ability to analyze the situation in order to make a diagnosis.

4. SCOPE OF THE DISCIPLINE "INSTRUMENTAL DIAGNOSTIC METHODS"

4.1. SCOPE OF THE DISCIPLINE "INSTRUMENTAL DIAGNOSTIC METHODS" FOR FULL-TIME EDUCATION

Type of educational work	Total hours	5 semester
Class work (total)	**32**	**32**
Including:		
Lectures	16	16
Practical lessons (PL), including interactive forms	16	16
Practical training (PT)	4	4
Independent work (total)	**40**	**40**
Type of intermediate certification (test, exam)	test	test
Total labor intensity hours / credit points	72/2	72/2

5. THE CONTENT OF THE DISCIPLINE "INSTRUMENTAL DIAGNOSTIC METHODS"

5.1. The content of the discipline "Instrumental diagnostic methods" for full-time education

№	Name	Emerging competencies	Term	Types of educational work, including independent work of students and labor intensity (in hours)			
				L	PL	PT	IW
1.	The main goals and objectives of instrumental diagnostics. Electrocardiography, phonocardiography, vectorcardiography.	**PC-1 Collection of anamnesis of animal life and disease to identify the causes of diseases, conducting a general clinical study of animals in order to establish a preliminary diagnosis and determine the further research program** ID-1 PC-1 Should be able to collect and analyze information about the origin and purpose of animals, the method and conditions of keeping, feeding (anamnesis of animal life), including from sensor devices, mechanisms, sensors, tags, etc. ID-2 PC-1 Should be able to collect and analyze information about the occurrence and manifestation of diseases in animals, previously transmitted diseases, epizootological conditions (anamnesis of animal disease), including from sensor devices, mechanisms, sensors, tags, etc. ID-5 PC-1 Should be able to establish a preliminary diagnosis based on anamnesis analysis and clinical research using general methods ID-8 PC-1 Know the forms and rules for filling out the journal for the registration of sick animals and the animal's medical history, including in electronic form in accordance with the requirements of veterinary reporting ID-9 PC-1 To know the methods of fixation of animals during their clinical examination. **PC-2 Development of an animal research program and conducting a clinical study of animals using special (instrumental) and laboratory methods, including to clarify the diagnosis** ID-1 PC-2 Should be able to perform animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography. ID-2 PC-2 Be able to interpret and analyze data from special (instrumental) animal research methods to verify the diagnosis. ID-7 PC-2 To know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules for the diagnosis, prevention and treatment of animals. ID-8 PC-2 To know the Rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal studies, including X-ray examinations.	5	2	2	2	8
2.	Diagnosis of arrhythmias.		5	4			6

3.	METHODS OF X-RAY EXAMINATION OF ANIMALS. GENERAL RADIOLOGY. ENSURING RADIATION SAFETY DURING THE X-RAY EXAMINATION OF ANIMALS. RADIOGRAPHY OF THE THORACIC AND ABDOMINAL ORGANS.	ID-9 PC-2 To know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with methodological guidelines, instructions, rules for the diagnosis, prevention and treatment of animals. ID-10 PC-1 Know the technique of conducting a clinical study of animals using general methods in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals. PC-2 Development of an animal research program and conducting a clinical study of animals using special (instrumental) and laboratory methods, including to clarify the diagnosis ID-1 PC-2 Should be able to perform animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography. ID-2 PC-2 Be able to interpret and analyze data from special (instrumental) animal research methods to verify the diagnosis. ID-7 PC-2 To know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals. ID-8 PC-2 To know the Rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal studies, including X-ray examinations. ID-9 PC-2 Know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with the guidelines, instructions, rules for diagnosis, prevention and treatment of animals PK-2 id-1 Be able to conduct animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography.	5	4	4		6
4.	Ultrasound examination. The physical foundations of ultrasound and the principles of ultrasound diagnostics. Ultrasound of the abdominal and pelvic cavities. Ultrasound examination of the chest cavity organs. Ultrasound of the pancreas and thyroid gland.		5	2	2	2	8
5	Endoscopic examination, its principle and basics. Endoscopy of respiratory organs, digestive organs, urinary and reproductive systems, etc.		5	2	2		8
6.	Pneumography, renography, laryngoscopy, thoracocentesis, sputum extraction, catheterization, bladder puncture, cystoscopy		5	2	2		4
	TOTAL FOR THE 5TH SEMESTER			**16**	**12**	**4**	**40**

6. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF THE DISCIPLINE "INSTRUMENTAL DIAGNOSTICS"

6.1. Guidelines for independent work

1. Methodological guidelines for the implementation of course work on the discipline "Clinical diagnostics" for students in the specialty "Veterinary Medicine" / comp.: S. P. Kovalev [et al.]; Ministry of Agriculture of the Russian Federation, SPbGAVM. - St. Petersburg: Publishing House of SPbGAVM, 2015. - 27 p. – URL: https://clck.ru/Vnb8s (accessed 09.04.2026). - Access mode: for authorization. users of the SPbGUVM EB

2. Clinical diagnostics: guidelines for students of the veterinary Faculty of correspondence education / comp.: S. P. Kovalev, V. A. Trushkin; Ministry of Agriculture of the Russian Federation, SPbGAVM. – St. Petersburg: Publishing House of SPbGAVM, 2013. - 26 p.

3. Methodological recommendations on the organization of independent work in the disciplines "Clinical diagnostics", "Hematology", "Laboratory diagnostics", "Instrumental diagnostic methods" for students studying in the specialty "Veterinary Medicine" / comp.: S. P. Kovalev [et al.]; Ministry of Agriculture, SPbGAVM. - St. Petersburg: Falcon Print, 2019. - 26 p. – URL: https://clck.ru/eYPBz (accessed 09.04.2026). - Access mode: for authorization. users of the SPbGUVM EB

6.2. Literature for independent work

1. Kesareva, E. A. Clinical interpretation of biochemical parameters of blood serum of dogs and cats / E. A. Kesareva, V. N. Denisenko. - Moscow: KolosS, 2011. - 29 p.

2. Kovalev, S. P. Clinical assessment of hematological studies in farm animals: guidelines / S. P. Kovalev; Ministry of Agriculture of the Russian Federation, SPbGAVM. – St. Petersburg: Publishing House of SPbGAVM, 2004. - 40 p.

3. Zelenevsky, N. V. Practicum on veterinary anatomy: textbook: in 3 volumes. Vol. 1. Somatic systems / N. V. Zelenevsky . - Saint Petersburg: IST: NICK, 2007. - 304 p.: ill. – URL: https://clck.ru/R6zBq (accessed 09.04.2026). - Access mode: for authorization. users of the SPbGUVM EB.

4. Zelenevsky, N. V. Workshop on veterinary anatomy: textbook for university students. Vol. 2. Splanchnology and angiology / N. V. Zelenevsky. - 3rd ed., reprint. and additional – St. Petersburg, Logos, 2006. - 160 p. - URL: https://clck.ru/R77Kh (accessed 09.04.2026). - Access mode: for authorization. users of the SPbGUVM EB.

5. Zelenevsky, N.V. Practicum on veterinary anatomy: textbook for university students. Vol. 3. Neurology. The senses. Features of the structure of poultry / N. V. Zelenevsky, A. A. Stekolnikov, K. V. Plemyashov; edited by N. V. Zelenevsky. - St. Petersburg: Logos, 2005. - 132 p. – URL: https://clck.ru/ebnFX (accessed 09.04.2026). - Access mode: for authorization. users of the SPbGUVM EB.

7. THE LIST OF BASIC AND ADDITIONAL LITERATURE NECESSARY FOR THE DEVELOPMENT OF THE DISCIPLINE

a) basic literature:

1. Clinical diagnostics with radiologist: textbook / e. S. Voronin, G. V. Snose, M. F. Vasiliev [et al.]; in order. Well. S. Voronina. - Moscow: Kolos, 2006. - 509 PP. Il.- (Textbooks and studies. students of the University).

2. Practice of clinical diagnostics with radiologist: educational tool / E. S. Voronin, S. P. Kovalev, G. V. Snoz [etc.]; under general. red. Well. S. Voronina, G. V. Snosa. - Moscow: infra-M, 2014. - 336 pp.

b) Additional literature:

1. Stekolnikov, A. A. X-ray diagnostics in veterinary medicine: textbook: [approved by the Ministry of Agriculture of the Russian Federation for university students] / A. A. Stekolnikov, S. P. Kovalev, M. A. Narusbaeva. – St. Petersburg: SpetsLit, 2016. - 379 p.

2. Microelementoses of farm animals: a textbook for students of veterinary faculties / S.P. Kovalev, A. P. Kurdeko, Shcherbakov Grigory Gavrilovich [et al.] ; S. P. Kovalev, A. P. Kurdeko, G. G. Shcherbakov [et al.]; edited by S. P. Kovalev; Ministry of Agriculture of the Russian Federation, SPbGAVM. - St. Petersburg: SPbGAVM, 2013. - 132 p. - URL: https://clck.ru/ekrWA (date of application: 09.04.2026). - Access mode: for authorization. users of the SPbGUVM EB.

8. THE LIST OF RESOURCES OF THE INFORMATION AND TELECOMMUNICATION NETWORK "INTERNET" NECESSARY FOR THE DEVELOPMENT OF THE DISCIPLINE

To prepare for practical classes and perform independent work, students can use the following **online resources:**

1. https://meduniver.com – Medical information site.
2. http://vanat.cvm.umn.edu – Animal Anatomy University of Minnesota

Electronic library systems:

1. EBS "SPBGUVM"
2. EBS "Student consultant"
3. Legal reference system "ConsultantPlus"
4. Scientific electronic Library ELIBRARY.RU
5. Russian Scientific Network
6. Electronic books of the publishing house "Prospekt Nauki" http://prospektnauki.ru/ebooks/

9. METHODOLOGICAL GUIDELINES FOR STUDENTS ON THE DEVELOPMENT OF THE DISCIPLINE

Methodological recommendations for students are a set of recommendations and explanations that allow the student to optimally organize the process of studying this discipline.

The content of the methodological recommendations, as a rule, may include:

• Tips on planning and organizing the time needed to study the discipline. Description of the sequence of actions of the student, or the "scenario of studying the discipline".

Morning time is the most fruitful for academic work (from 8-14 o'clock), followed by afternoon time (from 16-19 o'clock) and evening time (from 20-24 o'clock). The most difficult material is recommended to be studied at the beginning of each time interval after rest. After 1.5 hours of work, a break is required (10-15 minutes), after 4 hours of work, the break should be 1 hour. Part of the scientific organization of labor is the mastery of the technique of mental labor. Normally, a student should devote about 10 hours a day to studying (6 hours at university, 4 hours at home).

• Recommendations for working on lecture material.

When preparing for a lecture, the student is recommended:

1) view the recordings of the previous lecture and restore the previously studied material in memory;

2) it is useful to review the upcoming material of a future lecture;

3) if an independent study of individual fragments of the topic of the last lecture is set, then it must be completed without delay;

4) psychologically tune in to the lecture.

This work includes two main stages: lecture notes and subsequent work on lecture material.

Taking notes means making a synopsis, i.e. a brief written statement of the content of something (an oral presentation - a speech, lecture, report, etc. or a written source – a document, article, book, etc.).

The methodology of work when taking notes of oral presentations differs significantly from the methodology of work when taking notes of written sources.

By taking notes of written sources, the student has the opportunity to repeatedly read the desired passage of the text, reflect on it, highlight the main thoughts of the author, briefly formulate them, and then write them down. If necessary, he can also note his attitude to this point of view. Listening to the lecture, the student should postpone most of the complex of the above–mentioned works for another time, trying to use every minute to record the lecture, and not to comprehend it - there is no time left for this. Therefore, when taking notes of a lecture, it is recommended to separate fields on each page for subsequent entries in addition to the summary.

After recording a lecture or making a summary of it, you should not leave work on the lecture material before preparing for the test. It is necessary to do as early as possible the work that accompanies taking notes of written sources and which could not be done during the recording of the lecture - read your notes, deciphering individual abbreviations, analyze the text, establish logical connections between its elements, in some cases show them graphically, highlight the main thoughts, mark issues requiring additional processing, in particular, the teacher's consultations.

When working on the text of the lecture, the student should pay special attention to the problematic issues raised by the teacher during the lecture, as well as to his assignments and recommendations.

For each lecture, practical lesson and laboratory work, the number, topic, list of issues under consideration, volume in hours and links to recommended literature are provided. For classes conducted in interactive forms, their organizational form should be indicated: computer simulation, business or role-playing game, analysis of a specific situation, etc.

• Recommendations for preparing for practical classes.

Practical (seminar) classes are an important part of the professional training of students. The main purpose of conducting practical (seminar) classes is to form students' analytical, creative thinking through the acquisition of practical skills. Practical classes are also conducted in order to deepen and consolidate the knowledge gained in lectures and in the process of independent work on normative documents, educational and scientific literature. When preparing for a practical lesson for students, it is necessary to study or repeat theoretical material on a given topic.

When preparing for a practical lesson, the student is recommended to follow the following algorithm;

1) get acquainted with the plan of the upcoming lesson;

2) study the literature sources that have been recommended and familiarize yourself with the introductory notes to the relevant sections.

Methodological guidelines for practical (seminar) classes in the discipline, along with the work program and schedule of the educational process, refer to methodological documents that determine the level of organization and quality of the educational process.

The content of practical (seminar) classes is recorded in the working curricula of the disciplines in the sections "List of topics of practical (seminar) classes".

The most important component of any form of practical training is assignments. The basis of the assignment is an example that is understood from the standpoint of the theory developed in the lecture. As a rule, the main attention is paid to the formation of specific skills, which determines the content of students' activities - problem solving, laboratory work, clarification of categories and concepts of science, which are a prerequisite for correct thinking and speech.

Practical (seminar) classes perform the following tasks:

- stimulate regular study of recommended literature, as well as attentive attitude to the lecture course;
- consolidate the knowledge gained in the process of lecture training and independent work on literature;
- expand the scope of professionally significant knowledge, skills, and abilities;
- allow you to verify the correctness of previously acquired knowledge;
- instill skills of independent thinking, oral presentation;
- contribute to the free operation of terminology;

- provide the teacher with the opportunity to systematically monitor the level of independent work of students.

Methodological guidelines for practical (seminar) classes in the discipline should be focused on modern business conditions, current regulatory documents, advanced technologies, the latest achievements of science, technology and practice, modern ideas about certain phenomena, the studied reality.

• Recommendations for working with literature.

Working with literature is an important stage of the student's independent work on mastering the subject, contributing not only to the consolidation of knowledge, but also to the expansion of horizons, mental abilities, memory, the ability to think, express and confirm their hypotheses and ideas. In addition, the skills of research work necessary for further professional activity are being developed.

When starting to study the literature on the topic, it is necessary to make notes, extracts, notes. It is mandatory to take notes of the works of theorists, which allow us to comprehend the theoretical basis of the study. For the rest, you can limit yourself to extracts from the studied sources. All extracts and quotations must have the exact "return address" (author, title of the work, year of publication, page, etc.). It is advisable to write an abbreviated title of the question to which the extract or quotation refers. In addition, it is necessary to learn how to immediately compile a file of special literature and publications of sources, both proposed by the teacher and identified independently, as well as refer to bibliographic reference books, chronicles of journal articles, book chronicles, abstract journals. At the same time, publications of sources (articles, book titles, etc.) should be written on separate cards, which must be filled in according to the rules of bibliographic description (surname, initials of the author, title of the work. Place of publication, publisher, year of publication, number of pages, and for journal articles – the name of the journal, year of publication, page numbers). On each card, it is advisable to record the thought of the author of the book or a fact from this book on only one specific issue. If the work, even in the same paragraph or phrase, contains more judgments or facts on another issue, then they should be written out on a separate card. The presentation should be concise, accurate, without subjective assessments. On the back of the card, you can make your own notes about this book or article, its content, structure, on which sources it is written, etc.

• Explanations about working with control and test materials for the course, recommendations for completing homework.

Testing allows you to determine whether the actual behavior of the program corresponds to the expected one by performing a specially selected set of tests. A test is the fulfillment of certain conditions and actions necessary to verify the operation of the function under test or part of it. Each question in the discipline must be answered correctly by choosing one option.

10. EDUCATIONAL WORK

As part of the implementation of the discipline, educational work is carried out to form a modern scientific worldview and a system of basic values, the formation and development of spiritual and moral, civil and patriotic values, a system of aesthetic and ethical knowledge and values, attitudes of tolerant consciousness in society, the formation of students' need for work as the first vital necessity, the highest value and the main way to achieve to achieve success in life, to realize the social significance of your future profession.

11. LIST OF INFORMATION TECHNOLOGIES USED IN THE IMPLEMENTATION OF THE EDUCATIONAL PROCESS

11.1. The use of information technologies is provided in the educational process of the discipline:

- ✓ conducting practical classes using multimedia;
- ✓ interactive technologies (conducting dialogues, collective discussion of various approaches to solving a particular educational and professional task);

- ✓ interaction with students via e - mail;
- ✓ joint work in the Electronic information and educational environment of St. Petersburg State University: https://spbguvm.ru/academy/eios

11.2. Software The list of licensed and freely distributed software, including domestic production.

№	The name of the technical and computer training tools recommended by sections and topics of the program	License
1	MS PowerPoint	67580828
2	LibreOffice	free software
3	OS Alt Education 8	AAO.0022.00
4	AIBS "MARK-SQL"	02102014155
5	MS Windows 10	67580828
6	The ConsultantPlus system	503/КЛ
7	Android OC	free software

12. THE MATERIAL AND TECHNICAL BASE NECESSARY FOR THE IMPLEMENTATION OF THE EDUCATIONAL PROCESS IN THE DISCIPLINE

Name of the discipline (module), practice in accordance with the curriculum	**The name of special rooms and rooms for self-study**	**Equipment of special rooms and rooms for self-study**
Instrumental diagnostic methods	102 (196084, St. Petersburg, Chernigovsky str., 5, Lit. "Zh") A classroom for conducting seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification	Specialized furniture: desks, chairs, stools, blackboard, aluminum trays. Visual aids and educational materials: posters on the sections of the discipline.
	104 (196084, St. Petersburg, Chernigovsky str., 5, Lit. "Zh") A classroom for conducting seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification	Specialized furniture: desks, chairs, stools, blackboard. Visual aids and educational materials: posters on the sections of the discipline.
	106 (196084, St. Petersburg, Chernigovsky str., 5, Lit. "Zh") Educational laboratory of the department	Specialized furniture: stainless steel washing tables, containers. Technical training tools: table scales, drying cabinet, tripods, CFC, microscopes. Visual aids and educational materials: posters on sections of clinical diagnostics.
	(196084, St. Petersburg, Chernigovsky str., house 5, surgical building) Workshop of the department	Technical means of training: animal stalls, means for fixing animals. Visual aids and educational materials: cow, small cattle – sheep, goats).

	206 Large reading room (196084, St. Petersburg, Chernigovsky str., house 5) Room for independent work	Specialized furniture: tables, chairs Technical means of education: computers connected to the Internet and access to an electronic information and educational environment
	214 Small reading room (196084, St. Petersburg, Chernigovsky str., house 5) Room for independent work	Specialized furniture: tables, chairs Technical means of education: computers connected to the Internet and access to an electronic information and educational environment
	324 Information Technology Department (196084, St. Petersburg, Chernigovsky str., 5) Room for storage and preventive maintenance of educational equipment.	Specialized furniture: tables, chairs, special equipment, materials and spare parts for preventive maintenance of technical training facilities.
	Box No. 3 Carpentry workshop (196084, St. Petersburg, Chernigovsky str., house 5) Room for storage and preventive maintenance of educational equipment	Specialized furniture: tables, chairs, special equipment, materials for preventive maintenance of specialized furniture

Developers:

Doctor of Veterinary Sciences,
Professor _____ S.P. Kovalev

Associate Professor of the Department of Clinical Diagnostics,
Candidate of Veterinary Sciences _____ A.A.Nikitina

Annex 1

Ministry of Agriculture of the Russian Federation
Federal State Budgetary Educational Institution of Higher Education
"St. Petersburg State University of Veterinary Medicine"

Department of Clinical Diagnostics

THE FUND OF EVALUATION TOOLS

by discipline
"INSTRUMENTAL DIAGNOSTIC METHODS"
The level of higher education
SPECIALTY
Specialty 36.05.01 Veterinary Medicine
Profile: «General clinical veterinary medicine»
Full-time education

Education starts in 2026

Saint Petersburg
2026

1. PASSPORT OF THE APPRAISAL FUND

Table 1

№	Emerging competencies	Supervised sections (topics) of the discipline	Evaluation tool
1.	**PC-1 Collection of anamnesis of animal life and disease to identify the causes of diseases, conducting a general clinical study of animals in order to establish a preliminary diagnosis and determine the further research program.** ID-1PC-1 Should be able to collect and analyze information about the origin and purpose of animals, the method and conditions of keeping, feeding (anamnesis of animal life), including from sensor devices, mechanisms, sensors, tags, etc. ID-2PC-1 Should be able to collect and analyze information about the occurrence and manifestation of diseases in animals, previously transmitted diseases, epizootological conditions (anamnesis of animal disease), including from sensor devices, mechanisms, sensors, tags, etc. ID-3 PC-1 Be able to fix animals to ensure safety during a clinical trial. ID-4 PC-1 Be able to perform a clinical study of animals using common methods: examination, palpation, percussion, auscultation and thermometry. ID-5 PC-1 Should be able to establish a preliminary diagnosis based on anamnesis analysis and clinical research using general methods. ID-8 PC-1 Know the forms and rules for filling out the journal for the registration of sick animals and the animal's medical history, including in electronic form in accordance with the requirements of veterinary reporting ID-9 PC-1 To know the methods of fixation of animals during their clinical examination. ID-10 PC-1 To know the technique of conducting clinical animal research using general methods in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals. **PC-2 Development of an animal research program and conducting a clinical study of animals using special (instrumental) and laboratory methods, including to clarify the diagnosis.** ID-1 PC-2 Should be able to perform animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography. ID-2PC-2 Be able to interpret and analyze data from special (instrumental) animal research methods to verify the diagnosis. ID-7 PC-2 To know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules for the diagnosis, prevention and treatment of animals. ID-8 PC-2 To know the Rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal studies, including X-ray examinations. ID-9 PC-2 To know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with methodological guidelines, instructions, rules for the diagnosis, prevention and treatment of animals	**Section 1.** The main goals and objectives o instrumental diagnostics Electrocardiography, phonocardiography vectorcardiography.	tests
2.		**Section 2.** Cardiac Arrhythmias	tests
3.		**Section 3.** Methods of X-ray examination of animals. General radiology. Ensuring radiation safety during the X-ray examination of animals. Radiography of the thoracic and abdominal organs.	tests
4.		**Section 4.** Ultrasound examination. The physical foundations of ultrasound and the principles of ultrasound diagnostics. Ultrasound of the abdominal and pelvic cavities. Ultrasound examination of the chest cavity organs. Ultrasound of the pancreas and thyroid gland	tests
5.		**Section 5.** Endoscopic examination, its principle and basics. Endoscopy of respiratory organs, digestive organs, urinary and reproductive systems, etc.	tests
6.		Раздел 6. Пневмография, риноrрафия, ларингоскопия, торакоцентез, получение мокроты, катетеризация, прокол мочевого пузыря, цистоскопия	tests
7		Assessment of knowledge in all sections of the discipline	Credit

An approximate list of evaluation tools

Table 2

№	Name of the evaluation tool	Brief description of the evaluation tool	Presentation of the evaluation tool in the fund
1.	Test	A system of standardized tasks that allows you to automate the procedure for measuring the level of knowledge and skills of a student	The fund of test tasks
2.	Credit	A means of controlling the assimilation of educational material, sections of the discipline.	Questions for the credit

3. INDICATORS AND CRITERIA FOR ASSESSING COMPETENCIES AT VARIOUS STAGES OF THEIR FORMATION, DESCRIPTION OF ASSESSMENT SCALES

Table 3

Planned results of competence development	The level of development				Evaluation tool
	Unsatisfactory	Satisfactory	Good	Excellent	
PC-1 Collection of anamnesis of animal life and disease to identify the causes of diseases, conducting a general clinical study of animals in order to establish a preliminary diagnosis and determine the further research program					
ID-1PC-1 Should be able to collect and analyze information about the origin and purpose of animals, the method and conditions of keeping, feeding (anamnesis of animal life), including from sensor devices, mechanisms, sensors, tags, etc.	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The answer is given correctly, taking into account 1-2 minor errors or 2-3 defects, corrected independently at the request of the teacher.	The answer is given in full; correctly performs error analysis.	Self-study, tests
ID-2PC-1 Should be able to collect and analyze information about the occurrence and manifestation of diseases in animals, previously transmitted diseases, epizootological conditions (anamnesis of animal disease), including from sensor devices, mechanisms, sensors, tags, etc.	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The answer is given correctly, taking into account 1-2 minor errors or 2-3 defects, corrected independently at the request of the teacher.	The answer is given in full; correctly performs error analysis.	Self-study, tests
ID-3 PC-1 Be able to fix animals to ensure safety during a clinical trial	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The answer is given correctly, taking into account 1-2 minor errors or 2-3 defects, corrected independently at the request of the teacher.	The answer is given in full; correctly performs error analysis.	Self-study, tests
ID-4 PC-1 Be able to perform a clinical study of animals using common methods: examination, palpation, percussion, auscultation and thermometry	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The answer is given correctly, taking into account 1-2 minor errors or 2-3 defects, corrected independently at the request of the teacher.	The answer is given in full; correctly performs error analysis.	Self-study, tests
ID-5 PC-1 Should be able to establish a preliminary diagnosis based on anamnesis analysis and clinical research using general methods	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The answer is given correctly, taking into account 1-2 minor errors or 2-3 defects, corrected independently at the request of the teacher.	The answer is given in full; correctly performs error analysis.	Self-study, tests

ID-8 PC-1 Know the forms and rules for filling out the journal for the registration of sick animals and the animal's medical history, including in electronic form in accordance with the requirements of veterinary reporting	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The answer is given correctly, taking into account 1-2 minor errors or 2-3 defects, corrected independently at the request of the teacher.	The answer is given in full; correctly performs error analysis	Self-study, tests
ID-9 PC-1 To know the methods of fixation of animals during their clinical examination	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The answer is given correctly, taking into account 1-2 minor errors or 2-3 defects, corrected independently at the request of the teacher.	The answer is given in full; correctly performs error analysis	Self-study, tests
ID-10 PC-1 To know the technique of conducting clinical animal research using general methods in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The answer is given correctly, taking into account 1-2 minor errors or 2-3 defects, corrected independently at the request of the teacher.	The answer is given in full; correctly performs error analysis	Self-study, tests
PC-2 Development of an animal research program and conducting a clinical study of animals using special (instrumental) and laboratory methods, including to clarify the diagnosis					
ID-1 PC-2 Should be able to perform animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	The level of knowledge in the volume corresponding to the training program, several gross mistakes were made	The level of knowledge in the volume corresponding to the training program, without errors.	Colloquium, tests,
ID-2PC-2 Be able to interpret and analyze data from special (instrumental) animal research methods to verify the diagnosis	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	All basic skills have been demonstrated, all basic tasks have been solved with minor errors, all tasks have been completed in full, but some with flaws	All the basic skills have been demonstrated, all the main tasks have been solved with some minor flaws, and all tasks have been completed in full	Colloquium, tests,
ID-7 PC-2 To know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules for the diagnosis, prevention and treatment of animals	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	Basic skills are demonstrated in solving standard tasks with some shortcomings	Demonstrated skills in solving non-standard tasks without errors and shortcomings	Colloquium, tests,
ID-8 PC-2 To know the Rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal studies, including X-ray examinations	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	Basic skills are demonstrated in solving standard tasks with some shortcomings	Demonstrated skills in solving non-standard tasks without errors and shortcomings	Self-study, tests
ID-9 PC-2 To know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with methodological guidelines, instructions, rules for the diagnosis, prevention and treatment of animals	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	The minimum acceptable level of knowledge, many gross mistakes were made	Basic skills are demonstrated in solving standard tasks with some shortcomings	Demonstrated skills in solving non-standard tasks without errors and shortcomings	Self-study, tests

4. METHODOLOGICAL MATERIALS DEFINING THE PROCEDURES FOR ASSESSING KNOWLEDGE, SKILLS AND ABILITIES AND WORK EXPERIENCE CHARACTERIZING THE STAGES OF COMPETENCE FORMATION

Competence being formed: PC-1 Collection of anamnesis of life and disease of animals to identify the causes of diseases, conducting a general clinical study of animals in order to establish a preliminary diagnosis and determine the further research program.

ID-1PC-1 Should be able to collect and analyze information about the origin and purpose of animals, the method and conditions of keeping, feeding (anamnesis of animal life), including from sensor devices, mechanisms, sensors, tags, etc.

ID-2PC-1 Should be able to collect and analyze information about the occurrence and manifestation of diseases in animals, previously transmitted diseases, epizootological conditions (anamnesis of animal disease), including from sensor devices, mechanisms, sensors, tags, etc.

ID-3 PC-1 Be able to fix animals to ensure safety during a clinical trial.

ID-4 PC-1 Be able to perform a clinical study of animals using common methods: examination, palpation, percussion, auscultation and thermometry

ID-5 PC-1 Should be able to establish a preliminary diagnosis based on anamnesis analysis and clinical research using general methods

ID-8 PC-1 Know the forms and rules for filling out the journal for the registration of sick animals and the animal's medical history, including in electronic form in accordance with the requirements of veterinary reporting

ID-9 PC-1 To know the methods of fixation of animals during their clinical examination

ID-10 PC-1 To know the technique of conducting clinical animal research using general methods in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals

PC-2 Development of an animal research program and conducting a clinical study of animals using special (instrumental) and laboratory methods, including to clarify the diagnosis.

ID-1 PC-2 Should be able to perform animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography

ID-2PC-2 Be able to interpret and analyze data from special (instrumental) animal research methods to verify the diagnosis.

ID-7 PC-2 To know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules for the diagnosis, prevention and treatment of animals

ID-8 PC-2 To know the Rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal studies, including X-ray examinations.

ID-9 PC-2 To know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with methodological guidelines, instructions, rules for the diagnosis, prevention and treatment of animals.

List of questions for the credit

1. The clinical significance of thermography.
2. Linear tomography.
3. Magnetic resonance imaging.
4. Computed tomography.
5. Soft tissue biopsy
6. Biopsy of internal organs
7. Thoracocentesis
8. Abdominocentesis
9. The physical foundations of ultrasound and the principles of ultrasound diagnostics.
10. Echocardiography.
11. Ultrasound of the abdominal and pelvic cavities.
12. Ultrasound of the thoracic cavity.
13. Ultrasound of the pancreas and thyroid gland.
14. Safety precautions when working with animals?
15. Name the methods of fixing horses.
16. Name the methods of fixation of cattle.
17. Name the methods of fixation of small animals and birds.
18. Give a classification of animal research methods.
19. What methods of animal research are special?
20. What is called thermography and what are the methods of thermography of animals?
21. The clinical significance of measuring body surface temperature?
22. why, where and how do they take bone marrow punctate?
23. What is determined in the bone marrow of animals. What is the difference between the results of a bone marrow study and a blood test in healthy animals?
24. Puncture of lymph nodes. Clinical significance.
25. Skin biopsy. Indications, technique, clinical significance.

26. What methods are used to examine the pharynx? Give a description of the condition of the pharynx in healthy animals. What changes of the pharynx can occur in pathology, what characterizes these changes and in which diseases they are noted.

27. What methods are used to examine the esophagus? Give a description of the condition of the esophagus in healthy animals. What changes of the esophagus can occur in pathology, what characterizes these changes and what diseases are observed.

28. What is scar sensing? What are his goals? Describe the technique of sensing the scar in cattle.

29. Where is the goiter in birds? How its probing is carried out.

30. Probing the stomach in horses.

31. What is called stomach probing? What are his goals?

32. Where is rennet located in ruminants? The technique of probing it.

33. Where is the liver located? Special methods of its investigation?

34. Intestinal topography in cattle. The technique of intestinal puncture.

35. Topography of the intestines in horses. The technique of intestinal puncture.

36. What is endoscopy? What are its goals and clinical significance?

37. What internal organs in horses are examined during endoscopy, where they are located, and what they pay attention to. Give a description of the condition of the internal organs that are examined during endoscopy.

38. Which internal organs in cattle are examined during endoscopy, where they are located and what they pay attention to. Give a description of the condition of the internal organs that are examined in healthy animals during endoscopy.

39. What changes of each internal organ examined by endoscopy may occur in pathology and what each of these changes indicates.

40. Liver biopsy. Technic. Indications.

41. Spleen biopsy, technique, indications.

42. Puncture of the paranasal sinuses.

43. Laryngoscopy. Tracheoscopy.

44. Thoracocentesis. Indications for its implementation, the method of implementation.

45. Pericardial puncture, method of execution, indications.

46. Technique of electrocardiography.

47. What pathology can be diagnosed using an ECG?

48. ECG data in case of impaired conduction function.

49. ECG data for impaired contractility function.

50. ECG data in case of violation of the function of automatism.

51. ECG data in case of violation of the frequency of contractions.

52. What is phonocardiography, vectorcardiography.

53. Measurement of arterial and venous pressure. Clinical significance.

54. Ultrasound examination in the diagnosis of pathologies of internal organs.

55. Ultrasonographyc technique.

56. Catheterization of the bladder.

57. Kidney biopsy.

58. Ultrasound of the kidneys and bladder. Clinical significance.

59. Puncture of the spinal canal. Indications for obtaining liquor.

60. Fundamentals of X-ray diagnostics.

61. X-ray examination.

62. Radiography

4.1. INSTRUMENTAL DIAGNOSTIC TESTS:

PC-1 Collection of anamnesis of life and disease of animals to identify the causes of diseases, conducting a general clinical study of animals in order to establish a preliminary diagnosis and determine the further research program.

ID-1PC-1 Should be able to collect and analyze information about the origin and purpose of animals, the method and conditions of keeping, feeding (anamnesis of animal life), including from sensor devices, mechanisms, sensors, tags, etc.

ID-2PC-1 Should be able to collect and analyze information about the occurrence and manifestation of diseases in animals, previously transmitted diseases, epizootological conditions (anamnesis of animal disease), including from sensor devices, mechanisms, sensors, tags, etc.

ID-3 PC-1 Be able to fix animals to ensure safety during a clinical trial.

ID-4 PC-1 Be able to perform a clinical study of animals using common methods: examination, palpation, percussion, auscultation and thermometry

ID-5 PC-1 Should be able to establish a preliminary diagnosis based on anamnesis analysis and clinical research using general methods

ID-8 PC-1 Know the forms and rules for filling out the journal for the registration of sick animals and the animal's medical history, including in electronic form in accordance with the requirements of veterinary reporting

ID-9 PC-1 To know the methods of fixation of animals during their clinical examination

ID-10 PC-1 To know the technique of conducting clinical animal research using general methods in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals

PC-2 Development of an animal research program and conducting a clinical study of animals using special (instrumental) and laboratory methods, including to clarify the diagnosis.

ID-1 PC-2 Should be able to perform animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography

ID-2PC-2 Be able to interpret and analyze data from special (instrumental) animal research methods to verify the diagnosis.

ID-7 PC-2 To know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules for the diagnosis, prevention and treatment of animals

ID-8 PC-2 To know the Rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal studies, including X-ray examinations.

ID-9 PC-2 To know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with methodological guidelines, instructions, rules for the diagnosis, prevention and treatment of animals.

CLOSED-TYPE TASKS

Tasks of a combined type with the choice of one correct answer from the suggested options

ID-1PC-1 Should be able to collect and analyze information about the origin and purpose of animals, the method and conditions of keeping, feeding (anamnesis of animal life), including from devices – sensors, mechanisms, sensors, tags, etc.

Task 1.

Read the text and choose the correct answer

Which of the diagnostic methods is not instrumental?

1. Ultrasonography
2. Electrocardiography
3. Instrumental percussion
4. Endoscopy

Answer 3

Task 2

Read the text and choose the correct answer

Which of the instrumental diagnostic methods is not graphic?

1. Electrocardiography
2. Radiography
3. Phonocardiography
4. Sphygmography,
5. Pneumography

Answer 2

ID-2PC-1 Should be able to collect and analyze information about the occurrence and manifestation of diseases in animals, previous illnesses, epizootological conditions (anamnesis of animal diseases), including from devices – sensors, mechanisms, sensors, tags, etc.

Task 3

Read the text and choose the correct answer

Which of the instrumental methods allows you to visualize the internal structure of organs and tissues?

1. Endoscopy
2. Ultrasonography
3. Vectorcardiography

4. Catheterization
5. Phonocardiography

Answer 2

Tasks of a combined type with the choice of several correct answers from the suggested options

Task 4

Read the text and choose the correct answer

What instrumental diagnostic methods use electromagnetic radiation in the X-ray range?

1. Electrocardiography.
2. Endoscopy
3. Radiography
4. Ultrasonography
5. Computed tomography

Answer 3, 5

Task 5

Read the text and choose the correct answer

What instrumental method allows you to assess the condition of the cardiac conduction system?

1. Echocardiography
2. Electrocardiography
3. Phonocardiography
4. Vectorcardiography
5. Computed tomography

Answer 2, 4

Closed-type compliance assignments

ID-4PC-1 Should be able to perform clinical examination of animals using common methods: examination, palpation, percussion, auscultation and thermometry

Task 6

Read the text and choose the correct answer

Establish a correspondence between the diagnostic method and the scope of its application: for each position in the first column, select the corresponding position from the second column.

Method		field of application	
А	Electrocardiography	1	Visualization of internal structures of organs and tissues.
Б	Ultrasonography	2	Visualization of the surface structures of tubular organs.
В	Endoscopy	3	The study of electrical phenomena in the heart.
Г	Pneumography	4	Studying the mechanical work of the chest.

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-3; Б-1; В-2; Г-4.

Task 7

Read the text and choose the correct answer

Establish a correlation between the equipment and the research method for each position in the first column, select the corresponding position from the second column.

equipment	method

А	Set of electrodes	1	Ultrasonography
Б	Piezocrystalline converter	2	Digital radiography
В	Semiconductor matrix	3	Endoscopy
Г	Flexible Fiber Optic Cable	4	Electrocardiography

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-4; Б-1; В-2; Г-3.

Task 8

Read the text and choose the correct answer

Establish a correspondence between the physical factor and the method of instrumental diagnostics of each position in the first column, select the corresponding position from the second column.

The physical factor		**Diagnostic method**	
А	Reflection of sound waves by fabrics	1	Endoscopy
Б	Absorption of electromagnetic radiation by tissues	2	Electrocardiography
В	Diverting the body's biological currents	3	Ultrasonography
Г	Direct visualization of the surface of tissue structures	4	Radiography

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-3; Б-4; В-2; Г-1.

Task 9

Read the text and choose the correct answer

Establish a correspondence between the color of the electrode and the place of its application during electrocardiography, select the corresponding position from the second column for each position of the first column.

Electrode color		**The place of application of the electrode**	
А	Red	1	Right pelvic limb
Б	Yellow	2	Right thoracic limb
В	Green	3	Left thoracic limb
Г	Black	4	Left pelvic limb

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-2; Б-3; В-4; Г-1.

Task 10.

Read the text and choose the correct answer

Establish a correspondence between the term characterizing the echogenicity of the tissue and its image on the monitor screen.

Term		**The image on the monitor**	
А	Hyperechoic structure	1	The structure (black) is characteristic of formations filled with a liquid that practically does not reflect ultrasonic waves.
Б	The hypoechoic structure	2	the structure (white) – ultrasonic waves are completely reflected from it: gas, bone, connective tissue.
В	Anechoic structure	3	the structure (dark gray) is inherent in tissues with significant hydrophilicity.
Г	The echopositive structure	4	the structure (of medium echogenicity) of the image (gray) is provided by most tissues.

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-2; Б-3; В-1; Г-4.

Closed-type tasks for the sequence

ID-3PC-1 Should be able to fix animals to ensure safety during a clinical trial.

Task 11

Read the text and set the sequence.

Arrange the steps of preparing the dog for the ECG in the correct sequence. Write down the numbers in the correct sequence.

1. Apply an electrically conductive gel
2. Wipe the skin surface with 70% ethanol
3. Position the dog on the right side
4. Apply electrodes to the limbs
5. Attach the patient's cable to the electrodes, observing the color marking
6. Shorten the hair at the places where the electrodes are applied

Answer 6, 2, 1, 4, 3, 5

Task 12

Read the text and set the sequence.

Arrange the order of ECG recording in small animals on a single-channel electrocardiograph in the correct order. Write down the numbers in the correct sequence.

1. Recording of the 1st lead
2. Record 3 leads
3. Recording 2 leads
4. Recording the control milivolt
5. aVF recording
6. aVR recording
7. aVL recording

Answer 4, 1, 3, 2, 6, 7, 5, 4

ID-5PC-1 Should be able to establish a preliminary diagnosis based on anamnesis analysis and clinical research using general methods.

Task 13

Read the text and set the sequence.

Arrange the order of decoding the electrocardiogram of the animal in the correct order. Write down the numbers in the correct sequence.

1. 1 lead
2. 2nd lead
3. 3rd lead
4. aVL
5. aVF
6. aVL

Answer 2, 1, 3, 6, 4, 5.

Task 14

Read the text and set the sequence.

Arrange the order of the dog's X-ray in the correct order. Write down the numbers in the correct sequence.

1. Place the animal on the table in the desired position and fix it.

2. Turn on the X-ray machine
3. Wear personal protective equipment.
4. Select a matrix of the required size.
5. Focus the X-ray machine on the desired area of the body, taking into account the size of the matrix.
6. Take a picture
7. Position the matrix under the desired area of the animal's body
8. Set the required radiation power and exposure on the X-ray machine

Answer 3, 2, 4, 8, 1, 7, 5, 6.

Task 15.

Read the text and set the sequence.

Arrange the order of ultrasonographic examination of the dog in the correct order.

1. Apply acoustic gel to the sensor area.
2. Select a sensor according to the purpose of the study
3. Shave the wool in the sensor area
4. Position and fix the animal in the position necessary for qualitative research
5. Conduct a study of the organs and tissues of interest
6. Turn on the machine and configure the scan settings

Answer 3, 6, 2, 4, 1, 5

Open-type assignments

ID-9PC-1 Should know the methods of fixation of animals during their clinical examination.

Task 16.

Read the text of the assignment and write down a detailed, reasoned answer.

Define the radiographic diagnostic method. Write down a detailed, reasoned Answer.

Answer: The X-ray diagnostic method is based on obtaining a total projection image of the anatomical structures of the body through the passage of X-rays through them.

Task 17.

Read the text of the assignment and write down a detailed, reasoned answer.

What scanning modes are used for ultrasound examination of small pets and what is their field of application? Write down a detailed, reasoned Answer.

Answer: the main scanning modes are: B-mode - used to visualize most organs and tissues; M-mode - used in cardiology to perform morphometry of the myocardium and heart cavities; D-mode - used to determine the direction and speed of blood flow through the vessels.

ID-10PC-1 Know the technique of conducting clinical animal research using general methods in accordance with the guidelines, instructions, rules for diagnosis, prevention and treatment of animals

Task 18.

Read the text of the assignment and write down a detailed, reasoned answer.

What are the principles of electrocardiography? Write down a detailed, reasoned Answer.

Answer: The method is based on the fact that the heart's blood flows have a regular distribution on the surface of the body, and can be diverted, amplified, and recorded as a characteristic curve.

Task 19.

Read the text of the assignment and write down a detailed, reasoned answer.

Which of the instrumental diagnostic methods will be optimal for detecting ureteral obstruction in a dog? Write down a detailed, reasoned Answer.

Answer: the most complete information about the condition of the ureters can be obtained with contrast X-ray or contrast computed tomography.

Task 20.

Read the text of the assignment and write down a detailed, reasoned answer.

What physical processes underlie ultrasonography? Write down a detailed, reasoned Answer.

Answer: Ultrasonography is based on the phenomenon of the forward and reverse piezoelectric effect.

PC-2 Development of an animal research program and conducting clinical animal research using special (instrumental) and laboratory methods, including to clarify the diagnosis

CLOSED-TYPE ASSIGNMENTS

Tasks of a combined type with the choice of one correct Answer from the suggested options

ID-1PC-2 is able to examine animals using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, and echography.

Task 1.

Read the text and choose the correct answer

Electrocardiography is a method of graphically recording electrical phenomena that occur in the heart muscle when it is excited. The ECG plays a leading role in the study of the functional state of the heart. The method is based on the idea that the heart's blood flows have a regular distribution on the surface of the body, and can be diverted, amplified, and recorded in the form of a characteristic curve – an electrocardiogram. Based on the above, choose the correct Answer to the question of the purpose of the electrocardiography method.:

1. To diagnose changes in heart tones
2. To detect heart murmurs
3. For the diagnosis of cardiac arrhythmias
4. For examination of blood vessels

Answer 3.

Task 2.

Read the text and choose the correct answer

What instrumental method can be used to study the structure of internal organs in small domestic animals?

1. ECG
2. Endoscopies
3. Biopsies
4. Ultrasonography

Answer 4

Task 3

Read the text and choose the correct answer

Which of the instrumental methods is used to diagnose heart defects in small pets?

1. Radiography
2. Ultrasonography
3. ECG
4. VCG

Answer 2

Tasks of a combined type with the choice of several correct answers from the suggested options

ID-2PC-2 is able to: interpret and analyze data from special (instrumental) methods of animal research to verify the diagnosis.

Task 4.

Read the text and choose the correct answer

Which of the listed pathologies are not diagnosed using an ECG.

1. Heart disease
2. Sinus node blockage
3. Ventricular fibrillation
4. Cardiofibrosis

Answer 1, 4.

Task 5.

Read the text and choose the correct answer

Which of the listed instrumental methods can be used to diagnose tracheal collapse?

1. Radiography
2. Pneumography
3. Endoscopy
4. Ultrasonography

Answer 1, 3.

Closed-type compliance assignments

ID-7PC-2 Should know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules for the diagnosis, prevention and treatment of animals

Task 6.

Read the text and choose the correct answer

Establish a correspondence between the type of acoustic sensor and the scope of its application: for each position of the first column, select the corresponding position from the second column.

Sensor type		Scope of application	
А	The convection sensor	1	Visualization of superficially located structures and joints
Б	Linear sensor	2	Visualization of structures located deep under the ribs
В	3D sensor	3	Visualization of most organs located in the abdominal cavity
Г	Sector sensor with phased array	4	Obtaining a three-dimensional image of most abdominal organs

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-3; Б-1; В-4; Г-2.

Task 7.

Read the text and choose the correct answer

Establish a correspondence between the teeth on the ECG and their diagnostic value: for each position of the first column, select the corresponding position from the second column.

ECG wave	Diagnostic value

А	P	1	reflects the depolarization of the ventricles
Б	Q	2	reflects the moment of depolarization of the base of the left ventricle
В	R	3	reflects the process of excitation in the atrial myocardium
Г	S	4	reflects the processes of the end of ventricular repolarization
Д	T	5	reflects the excitation of the interventricular septum

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г	Д

Answer А-3; Б-5; В-1; Г-2, Д-4.

Task 8.

Read the text and choose the correct answer

Establish a correspondence between the pathology and the optimal method of its instrumental diagnosis: for each position of the first column, select the corresponding position from the second column.

Pathology		Diagnostic method	
А	Peptic ulcer of the stomach	1	Ultrasonography.
Б	Bronchopneumonia	2	Endoscopy
В	Uroliths in the bladder	3	Contrast radiography
Г	Intestinal obstruction	4	Radiography

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-2; Б-4; В-1; Г-3.

Task 9.

Read the text and choose the correct answer

Establish a correspondence between the terms used in endoscopy and their meaning: for each position of the first column, select the corresponding position from the second column.

Term		Value	
А	Gastroscopy	1	Investigation of the morphological state of the mucous membrane of the bladder and the presence of concretions in it
Б	Bronchoscopy	2	Investigation of the morphological state of the gastric mucosa
В	Cystoscopy	3	Examination of the morphological state of the rectum and large intestine
Г	Colonoscopy	4	Examination of the morphological state of the bronchi

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-2; Б-4; В-1; Г-3.

Task 10.

Phonocardiography is a method of graphical recording of sound phenomena occurring in the heart during its activity. It is an essential addition to cardiac auscultation, as it allows recording vibrations that are not perceptible to the human ear: III and IV tones, low-frequency components of I and II tones, low-frequency noises.

Read the text and choose the correct answer

Establish a correspondence between the heart tone on the phonocardiogram and the causes of its occurrence: for each position of the first column, select the corresponding position from the second column.

Heart tones		Causes of occurrence	
А	1 tone	1	It is formed at the end of the ventricular diastole and is associated with their rapid filling due to atrial contraction.
Б	2 tone	2	It is formed when the myocardium oscillates during the phase of rapid passive filling of the ventricles during diastole.

В	3 tone	3	It is formed when the atriovetricular valves close, the myocardium vibrates, the walls of the aorta and the pulmonary artery
Г	4 tone	4	It is formed when the semilunar valves of the aorta and pulmonary artery are closed, and the walls of the aorta and pulmonary artery vibrate.

Write down the selected numbers under the corresponding letters in the table.

А	Б	В	Г

Answer А-3; Б-4; В-2; Г-1.

Closed-type tasks for establishing the sequence

ID-9PC-2 Know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with the guidelines, instructions, rules for diagnosis, prevention and treatment of animals

Task 11.

Read the text and set the sequence.

Arrange the order in which the dog's phonocardiogram is taken in the correct order. Write down the numbers in the correct sequence.

1. Attach microphones to the animal's body at the specified points.
2. Shave the wool for the convenience of fixing the microphone.
3. Set the phonocardiogram recording parameters on the phonocardiograph.
4. Auscultation establishes the points of best audibility of the heart valves.
5. Select the frequency ranges for phonocardiogram recording
6. Phonocardiogram is recorded.
7. Interpret the received data.

Answer: 4, 2, 1, 5, 3, 6, 7

Task 12.

Read the text and set the sequence.

Arrange the procedure for performing a liver puncture biopsy in the dog in the correct order. Write down the numbers in the correct sequence.

1. Fix the animal in a lateral position.
2. I determine the intercostal space where the puncture needle will be inserted.
3. Assess the condition of the animal and the possibility of a biopsy.
4. A needle with a mandrel is pierced through the skin and muscles.
5. Shave the wool and treat the skin with 70% ethanol.
6. Under ultrasound control, the needle is moved to the desired area of the liver.
7. Attach the syringe to the needle and aspirate the liver tissue.
8. Extract the mandrel.
9. Remove the needle and transfer the aspirated tissue to a slide.

Answer: 3, 2, 5, 1, 4, 6, 8, 7, 9

Task 13.

Read the text and set the sequence.

Sphygmography is a graphical registration of pulse fluctuations of the arterial wall. Arrange the order of the waves on the sphygmogram in the correct order. Write down the numbers in the correct sequence.

1. Incision
2. Cataclysm
3. Anacrota
4. The dicrotic tooth

Answer: 3, 1, 4, 2.

Task 14.

Read the text and set the sequence.

Arrange the steps of preparing the dog for a colonoscopy in the correct order. Write down the numbers in the correct sequence.

1. 12-hour fast diet.
2. Assessment of the possibility of the procedure.
3. Giving the animal a laxative.
4. Fixing the animal in the required position.
5. Giving the animal anesthesia.

Answer: 2, 3, 1, 5, 4.

Task 15.

Read the text and set the sequence

Arrange the technique of probing the dog's stomach with an orogastric probe in the correct order. Write down the numbers in the correct sequence.

1. Prepare the probe and auxiliary equipment.
2. Fix the animal's head.
3. Evaluate the possibility of the procedure.
4. Use the probe to measure the distance from the tip of the nose to the last rib and apply a mark.
5. Open the animal's mouth and insert a plastic mouth expander with a round central hole into the oral cavity.
6. Insert the probe into the oral cavity through the opening of the mouth expander.
7. Fix the mouth expander.
8. Make sure that the probe does not enter the trachea.
9. In accordance with the swallowing movements, push the probe into the pharynx.
10. Carefully move the probe along the esophagus, focusing on the control mark.

Answer: 3, 1, 4, 2, 5, 7, 6, 9, 8, 10.

OPEN-TYPE ASSIGNMENTS

ID-8PC-2 Should know the rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal research, including X-ray examinations.

Task 16.

Read the text of the assignment and write down a detailed, reasoned answer.

What types of catheters are used for bladder catheterization in dogs and cats?

Answer: Nelaton catheters are designed for short-term catheterization when natural urination is impossible or urine drainage is difficult due to injury or pathology: Foley catheters are used for long-term (up to 7 days) catheterization of the bladder when voluntary urination is impossible.

Task 17.

Read the text of the assignment and write down a detailed, reasoned answer.

What parameters of organs and tissues can be adequately assessed by ultrasonography?

Answer: ultrasonography can determine the size, shape, density of organs and tissues, the uniformity (heterogeneity) of the internal structure, the presence of focal changes in them, as well as the accumulation of liquids and gases.

Task 18.

Read the text of the assignment and write down a detailed, reasoned answer.

What are the goals of thoracocentesis in small pets?

Answer: during thoracocentesis, the following goals are pursued: removal of air from the chest during pneumothorax, removal of fluid from the chest cavity for therapeutic purposes and to

determine its physico-chemical properties (transsudate or exudate), as well as for its bacteriological and cytological examination.

Task 19.

Read the text of the assignment and write down a detailed, reasoned answer.

Describe the essence of the forward and reverse piezoelectric effect.

Answer: the direct piezoelectric effect is that under the mechanical action of certain chemical compounds (quartz, barium titanate, cadmium sulphide, etc.) on single crystals, including sound waves, electric charges of opposite sign appear on their surfaces; and when a high-frequency alternating electric charge is applied to these single crystals, they arise mechanical deformations accompanied by the emission of sound waves are the reverse piezoelectric effect.

Task 20.

Read the text of the assignment and write down a detailed, reasoned answer.

Name the types of radiation (X-ray) diagnostic method.

Answer: the types of radiation diagnostics are fluoroscopy, radiography, fluorography, and tomography.

5. METHODOLOGICAL MATERIALS DEFINING THE PROCEDURES FOR ASSESSING KNOWLEDGE, SKILLS AND ABILITIES AND WORK EXPERIENCE CHARACTERIZING THE STAGES OF COMPETENCE FORMATION

Criteria for evaluating students' knowledge during testing:

The test result is evaluated on a percentage rating scale. Each student is offered a set of test tasks consisting of 25 questions:

- Mark "excellent" – 25-22 correct answers.
- Mark "good" – 21-18 correct answers.
- The mark "satisfactory" is 17-13 correct answers.
- Mark "unsatisfactory" – less than 13 correct answers.

Criteria of knowledge during the credit:

- The grade "credited" must correspond to the parameters of any of the positive grades ("excellent", "good", "satisfactory").
- The grade "not credited" must correspond to the parameters of the grade "unsatisfactory".
- Mark "excellent" – all types of educational work provided for in the curriculum have been completed. The student demonstrates the compliance of knowledge, skills, and abilities with the indicators given in the tables, operates with acquired knowledge, skills, and applies them in situations of increased complexity. At the same time, inaccuracies, difficulties in analytical operations, transfer of knowledge and skills to new, non-standard situations may be allowed.
- Mark "good" – all types of educational work provided for in the curriculum have been completed. The student demonstrates the compliance of knowledge, skills, and abilities with the indicators given in the tables, operates with acquired knowledge, skills, and applies them in standard situations. At the same time, minor errors, inaccuracies, difficulties in analytical operations, transfer of knowledge and skills to new, non-standard situations may be made.
- Mark "satisfactory" – one or more types of educational work provided for in the curriculum have not been completed. The student demonstrates incomplete compliance of knowledge, skills, and abilities with the indicators given in the tables, significant errors are made, a partial lack of knowledge, skills, and skills is manifested in a number of indicators, the student experiences significant difficulties in operating with knowledge and skills when transferring them to new situations.
- Mark "unsatisfactory" – the types of educational work provided for in the curriculum have not been completed. demonstrates incomplete compliance of knowledge, skills, and abilities given in the tables of indicators, significant errors are made, a lack of knowledge, skills, and skills is manifested for a large number of indicators, the student experiences significant difficulties in operating knowledge and skills when transferring them to new situations.

6. ACCESSIBILITY AND QUALITY OF EDUCATION FOR PEOPLE WITH DISABILITIES

If necessary, persons with disabilities and persons with disabilities are given additional time to prepare an answer for the test.

When conducting the procedure for evaluating the learning outcomes of persons with disabilities and persons with disabilities, their own technical means can be used.

The procedure for evaluating the learning outcomes of persons with disabilities and persons with disabilities in the discipline provides for the provision of information in forms adapted to the limitations of their health and perception of information:

For people with visual impairments:	– in printed form in enlarged font, – in the form of an electronic document.
For people with hearing impairments:	– in printed form, – in the form of an electronic document.
For people with disorders of the musculoskeletal system	– in printed form, the device: – in the form of an electronic document.

When conducting the procedure for evaluating the learning outcomes of persons with disabilities and persons with disabilities in the discipline, it ensures that the following additional requirements are met, depending on the individual characteristics of the students:

a) instructions on the procedure for conducting the assessment procedure are provided in an accessible form (orally, in writing);

b) an accessible form of assignment of assessment tools (in printed form, in printed form in enlarged font, in the form of an electronic document, assignments are read out by the teacher);

c) an accessible form of providing answers to tasks (written on paper, a set of answers on a computer, orally).

If necessary, for students with disabilities and the disabled, the procedure for evaluating the results of training in the discipline can be carried out in several stages.

The procedure for evaluating the learning outcomes of people with disabilities and persons with disabilities is allowed using distance learning technologies.

Program abstract of the discipline
B1.V.10 Instrumental diagnostic methods
specialty 36.05.01 Veterinary Medicine
Profile: «General clinical veterinary medicine»

The purpose of the discipline: the development of modern methods of instrumental diagnostics to study the state of animal health.

The place of the discipline in the curriculum: Discipline B1.V.10. "Instrumental diagnostic methods" is a discipline of the part formed by participants in educational relations of the federal state educational standard of higher education in the specialty 36.05.01 "Veterinary Medicine" (specialty level).

It is mastered in the 5th semester of full-time education.

Objectives of the discipline: Instrumental diagnostics as a subject is an integral part of clinical diagnostics, which involves students mastering medical diagnostic techniques, semiotics and medical logic, as well as methods of diagnosis. It is of great importance for students to master instrumental methods of research on farm animals, gain experience in identifying symptoms and syndromes, and the ability to analyze the situation in order to make a diagnosis.

As a result of mastering the discipline, the student prepares for the following types of activities, in accordance with the educational standard of the Federal State Educational Standard on 36.05.01 "Veterinary Medicine": medical; expert control; scientific and educational.

The field of professional activity: 13 Agriculture.

The student's competencies formed as a result of mastering the discipline

a) Professional competencies (PC):

PC-1 Collecting anamnesis of animal life and disease to identify the causes of diseases, conducting a general clinical study of animals in order to establish a preliminary diagnosis and determine further research program.

ID-1 PC-1 Should be able to collect and analyze information about the origin and purpose of animals, the method and conditions of keeping, feeding (anamnesis of animal life), including from sensor devices, mechanisms, sensors, tags, etc.

ID-2 PC-1 Should be able to collect and analyze information about the occurrence and manifestation of diseases in animals, previously transmitted diseases, epizootological conditions (anamnesis of animal disease), including from sensor devices, mechanisms, sensors, tags, etc.

ID-3 PC-1 Should be able to fix animals to ensure safety during a clinical trial

ID-4 PC-1 Should be able to perform a clinical study of animals using common methods: examination, palpation, percussion, auscultation and thermometry.

ID-5 PC-1 Should be able to establish a preliminary diagnosis based on anamnesis analysis and clinical research using general methods

ID-8 PC-1 Know the forms and rules for filling out the journal for the registration of sick animals and the animal's medical history, including in electronic form in accordance with the requirements of veterinary reporting.

ID-9 PC-1 Know the methods of fixation of animals during their clinical examination.

ID-10 PC-1 Know the technique of conducting a clinical study of animals using general methods in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals.

PC-2 Development of an animal research program and conducting a clinical study of animals using special (instrumental) and laboratory methods, including to clarify the diagnosis.

ID-1PC-2 Should be able to perform animal research using digital equipment and using special (instrumental) methods, including endoscopy, probing, catheterization, radiography, electrocardiography, echography.

ID-2 PC-2 Be able to interpret and analyze data from special (instrumental) animal research methods to verify the diagnosis.

ID-7 PC-2 To know the indications for the use of digital equipment and special (instrumental) and laboratory methods of animal research in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals.

ID-8 PC-2 Know the rules of safe operation with digital equipment, tools and equipment used in conducting special (instrumental) animal studies, including X-ray examinations.

ID-9 PC-2 To know the technique of conducting animal research using digital equipment and special (instrumental) methods in accordance with the guidelines, instructions, rules of diagnosis, prevention and treatment of animals.

The total labor intensity of the discipline is 72 hours (2 credits)

The final control: test.