NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

DEPARTMENT OF EPIZOOTOLOGY, MICROBIOLOGY AND VIROLOGY

"**CONFIRM**"
Dean of the Faculty of
Veterinary Medicine
_____Tsvilihovskiy M.I.

On «_____»_____ 2020

REVIEWED and APPROVED
at the meeting of Department of Epizootology, Microbiology and Virology
The Protocol, № 4 від «02» 06 2020
Acting as Head of Department
_____ Melnyk V.V.

WORKING PROGRAM OF EDUCATIONAL DISCIPLINE

«VETERINARY MICROBIOLOGY»

Training direction 211 – «Veterinary Medicine»
Faculty of Veterinary Medicine
Developers: **G.V. Kozlovska,** Assoc. Professor, Candidate of Veterinary Sciences

Kyiv – 2020

1. Description of the discipline «VETERINARY MICROBIOLOGY»

Field of knowledge, direction of training, specialty, education and qualification level		
Area of knowledge	1101 Veterinary	
Direction of training	211 – «Veterinary Medicine»	
Specialty		
Education level	Master	
Characteristics of discipline		
Kind	Regulatory	
Total hours	180	
Number of ECTS credits	6	
Number of thematic modules	4	
Course project (work) (if it is in the working educational plan)	-	
Form of control	an examination	
Indicators discipline for full-time and extramural study		
	full-time study	extramural study
Year of training	2	
Semester	3	
Lectures	30 hours	
Practical classes, seminars	30 hours	
Laboratory classes	30 hours	
Self-work	90 hours	
Self-work under supervising tutor		
Number of weekly hours for full-time study: classroom self-work of student –	3 hours / 3 hours	

2. The purpose and tasks of the discipline

The **purpose** of "Veterinary Microbiology" teach students to explore the morphology, physiology, genetics of microorganisms, their role in the cycle of matter in nature, in animal pathology, human and plants.

Tasks of the course:

- the study of the morphology, physiology, genetics and ecology of microorganisms;
- the study of relationships between microorganisms themselves and other organisms;
- identifying microbial pathogens nature - animal pathogens;
- the study of the immune system, specific means of diagnosis and prevention of infectious diseases of bacterial nature.

After study of the discipline, the student must know:

- about morphological, physiological, biochemical and genetic properties of microorganisms;
- pathogens of bacterial animal diseases;
- stages and methods of laboratory diagnosis of bacterial diseases of animals.

After study of the discipline, the student must be able to:

- make the technique of preparing smears for microscopy;
- isolate of «pure culture» of microorganism;
- own techniques of bacteriological studies;
- determine the type (kind) of bacteria
- identify bacterial pathogens of animal diseases;
- analyze the results of bacteriological studies.

3. The program and structure of study discipline:

CONTENT OF MODULE 1. MORPHOLOGY AND TAXONOMY OF MICROORGANISMS

Theme of Lecture lesson 1. Introductory lecture. Subject and problems of microbiology. Historical milestones of microbiology development. Connection with other scientific disciplines.

Theme of Lecture lesson 2. Morphology and taxonomy of microorganisms. Classification Principles of bacteria by Berg. Morphology of bacteria, submicroscopic structure of bacteria.

Theme of Lecture lesson 3. Morphology of microscopic fungi and base of their taxonomy. The structure of filamentous body microscopic fungi. Morphology Ficomitsetes and Mikomitsetes. Methods of fungi propagation. Activators of fungal infections and mycotoxicoses.

CONTENT OF MODULE 2. PHYSIOLOGY AND GENETICS OF MICROORGANISMS

Theme of Lecture lesson 4. **Physiology of microorganisms.** Chemical composition of microorganisms, reproduction and respiration mechanism. The role of microbial enzymes.

Theme Lectures 5. Genetics of microorganisms.

Theme of Lecture lesson 6. Ecology of microorganisms. Microflora of air, water, soil, animal body. The role of microorganisms in nature. Physical, chemical and biological factors that influence to microorganisms.

Theme of Lecture lesson 7. Study of the infection. Definition of "infection", "infectious process," «infectious disease». Difference between infectious and contagious diseases. Pathogenicity and virulence. Types of infections, stages of infection. Saprophytic and pathogenic microbes. Values of microorganism and the environment in the infectious process. Features of pathogenic microbes.

CONTENT OF MODULE 3. BACTERIAL CAUSATIVE AGENTS OF ANIMALS: BACILLI, CLOSTRIDIA, COCCI, ENTEROBACTERIA, BRUCELLA, MYCOBACTERIA.

Theme of Lecture lesson 8. The causative agent of anthrax. Determination of disease. Biological characteristics of the pathogen. Laboratory diagnosis of disease. Immunity, specific prophylaxis and treatment of anthrax. **Pathogenic cocci.** General characteristics of stafilo-, strepto-, diplococci and their role in animal disease. Laboratory diagnosis of coccal infections and their prevention.

Theme of Lecture lesson 9. Causative agent of anaerobic infections. Biological properties of pathogens, anaerobic infections of sheep, malignant edema, tetanus, botulism, nekrobakteriosis. Laboratory diagnostics, prophylaxis.

Theme of Lecture lesson 10. Pathogenic enterobacteria. Pathogenic Escherichia. Salmonellosis in animals. Laboratory diagnostics and specific prophylaxis.

Theme of Lecture lesson 11. Brucella and tularemia pathogen. Determination of brucellosis. Infectious characteristic of pathogens, laboratory diagnostics. Immunity Features. Bacteriological, serological and allergic diagnosis of brucellosis. Possibilities of specific prevention of infections.

CONTENT OF MODULE 4. BACTERIAL PATHOGENS OF ANIMALS: LISTERIA, PASTERELLA, YERSYNIA, LEPTOSPIRA, MYCOPLASMA, CHLAMIDIA, RICKETTSIA.

Theme of Lecture lesson 12. The causative agent of tuberculosis. Characteristic of Mycobacterium tuberculosis, their types, the possibilities of differentiation. Bacteriological and serological diagnosis of diseases.

Theme of Lecture lesson 13. The causative agent of swine. Pasterellosis. Listeriosis. Definition of disease characteristic of pathogens, laboratory diagnosis, differentiation agents, means of specific prophylaxis and therapy. Pasterelly. Determination of infectious diseases "pasteurellosis". Biological characteristics of pasterel, laboratory diagnosis of pasteryllosis.

Theme of Lecture lesson 14. Pathogenic leptospira. A brief definition of the disease, characteristics of pathogenic leptospira, especially the diagnosis and prevention.

Theme of Lecture lesson 15. Pathogenic mycoplasmas. The difference between mycoplasmas and other bacteria. The role of mycoplasmas in veterinary pathology. Mycoplasma cultivation, their identification, laboratory diagnosis of mycoplasmosis, the possibility of prevention. **Chlamydia and Rickettsia.** Characteristics of pathogens as obligate parasites. Role of arthropods in rickettsiosis transmission. Features of cultivation, laboratory diagnosis of infection, prophylaxis and therapy.

The structure of the discipline

Titles of thematic module and themes	Hours					
	Full-time					
	Total	including				
		L	P	Lab	Ind	Self
1	2	3	4	5	6	7
Thematic Module 1. Morphology and taxonomy of microorganisms.						
Theme 1. Introductory lecture. Subject and problems of microbiology.		2	4			8
Theme 2. Morphology and taxonomy of microorganisms.		2	6			8
Theme 3. Morphology of microscopic fungi and base of their taxonomy.		2	4			12
Total for the thematic module 1.	**49**	**7**	**14**			**28**
Thematic Module 2. Physiology and genetics of microorganisms.						
Theme 4. Physiology of microorganisms.		2	4			8
Theme 5. Genetics of microorganisms.		2	4			8
Theme 6. Ecology of microorganisms.		2	4			8
Theme 7. Study of the infection.		2	4			8
Total for the thematic module 2.	**56**	**8**	**16**			**32**
Thematic Module 3. Bacterial causative agents of animals: bacilli, clostridia, cocci, enterobacteria, brucella, mycobacteria.						
Theme 8. The causative agent of anthrax. Pathogenic cocci.		2		4		4
Theme 9. Causative agent of anaerobic infections		2		4		4
Theme 10. Pathogenic enterobacteria		2		4		4
Theme 11. Brucella and tularemia pathogen		2		2		2
Total for the thematic module 3.	**36**	**8**		**14**		**14**

Thematic Module 4. Bacterial pathogens of animals: listeria, pasteurella, yersinia, leptospira, mycoplasma, chlamydia, rickettsia.						
Theme 12. The causative agent of tuberculosis.		2		4		4
Theme 13. The causative agent of swine. Pasterellosis. Listeriosis.		2		4		4
Theme 14. Pathogenic leptospira.		1		4		4
Theme 15. Pathogenic mycoplasmas. Chlamydia and Rickettsia.		2		4		4
Total for the thematic module 4.	**39**	**7**		**16**		**16**
Total hours	**180**	**30**		**60**		**90**

4. Themes of seminars

There are not planned

#	Name of theme	Hours
1		
2		
...		

5. Themes of practical classes

#	Name of theme	Hours
1	Rules and safety at work in the microbiological laboratory. Light microscope.	2
2	The main forms of bacteria	2
3	Preparation, fixation and staining of smears simple method	2
4	Special staining techniques of bacteria	4
5	The study of bacteria in the living state	2
6	Morphology of microscopic fungi and their methods research.	2
7	Methods of sterilization. Equipment in Microbiology laboratory.	2
8	Nutrient media for culturing microorganisms.	2
9	Technology seeding bacteria on nutrient media. Bold pure cultures of microorganisms.	4
10	Cultural properties of microorganisms. Selection of pure cultures.	4
11	Biochemical properties of microorganisms.	4
Total hours		**30**

6. Themes of laboratory studies

#	Name of theme	Hours
12	Effect on bacteria physico-chemical and biological factors. Methods for studying microbial antagonism.	4
13	Sanitary and microbiological objects of the environment.	2
14	The microflora of milk feeds.	2
15	The causative agent of anthrax. Pathogenic coccus.	2
16	The causative agent of tuberculosis.	4
17	Pathogenic clostridia.	2
18	The causative agent of erysipelas. Listeria.	2
19	The causative agent of pasteurellosis.	2
20	The causative agent of brucellosis.	2
21	The causative agent of colibacillosis.	2
22	Pathogen salmonella	2
23	The causative agent of leptospirosis	4
Total hours		**30**

7. Test questions

1.A spore for bacilli can be located:	
1	Terminal
2	Subterminal
3	Chaotic
4	Central

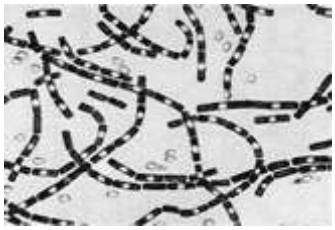
2. Nucleoid in prokariotes has:	
1	Own shell
2	Form of the reserved loop
3	S-similar form
4	Capsule

3. A form of bacteria is on the picture:	
1. Cocci	
2. Vibrio	
3.Spirochete	
4. Bacilli	

4. For the selection of clear culture of bacteria use a method:	
1	Of breeding in ten times
2	Of diffusion in the gelose
3	Of Drigalskiy
4	Of Shukevich

5. Who the first did suggest to grow the bacteria on artificial nourishing environments?	
1	Koch
2	Paster
3	Mechnikov
4	Vinogradskiy

6. In bacteria it is not:	
1	Nucleoid
2	Periplasmic space
3	Mitochondria
4	Golgi apparatus

7. Bacilli bacteria with spores it:	
1. Bacillius	
2. Streptobacilli	
3.Sarcina	

8. Cultural properties of bacteria study on:	
1	The test tube
2	The culture of cell
3	Liquid nourishing environments
4	Dense nourishing environments

9. The functions of interferon:	
1	immunomodulatory
2	phagocytic
3	ensuring adsorption of the virus in cell
4	antivirus
5	reducing body resistance to viral infections

10. Tinctirial properties of bacteria is:	
1	the ability to dye aniline dyes
2	the ability to form a dispute
3	the ability to form a capsule
4	the ability to grow on nutrient media

11. Factors of pathogenicity of bacteria:	
1	Formation of capsule
2	Exotoxines
3	Enzymes
4	Heat-resistance

12. In Gram-positive bacteria it is not:	
1	Murein
2	Extracellular membrane
3	Nucleoid
4	Mesosome

13. The size of bacterial cell is measured in next units:	
1	nm
2	A^0
3	mkm
4	mm

14. For what purpose do the bacteria synthesize exoenzymes?
In the form for answers write a faithful answer

15. What kind of bacteria are able to synthesize all need them organic compounds from CO2 as the unique source of Carbon?	
1	autotrophs
2	heterotrophs
3	hemotrophs
4	saprophytes

16. Factor of extrachromosomal heredity for bacteria it:	
1	nucleoid
2	nucleus
3	plasmid
4	nucleolus

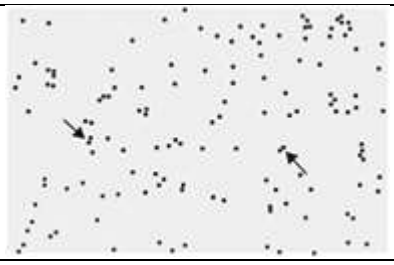
17. Which is typical for bacteriophages?	
1	Bacteriophages are high-specific, causea lysis only certain types of microorganisms
2	One phage can do lysis a few types of bacteria
3	By transduction they bring in a bacterial genomenew genes
4	Bacteriophages and bacterial cells live in symbiosis

18. The figure shows the method:	
1. definition antagonistic properties of bacteria	
2. determine the sensitivity of bacteria to antibiotics	
3. determine the sensitivity of bacteria to oxygen	

19. Yeast breed most often ...
(in the form for answers write a faithful answer)

20. Methods of health assessment of air:	
1	Titration
2	Sedimentation
3	Aspiration
4	Method of membrane filters

21. What can cause death thermophiles?	
1	The presence of oxygen
2	Medium temperature + 4 °C
3	Medium temperature + 30 °C
4	Medium temperature +70 °C

22. What type of location do cocci in the picture?	
1. Streptococci	
2. Coccus	
3. Diplococci	
4. Sarcina	

23. Adaptation of microbes to new conditions of existence under the influence of physical, chemical, biological and anthropogenic factors are:	
1	association
2	dissociation
3	adaptation
4	mutation

24. The exchange of genetic material (DNA segments) between the cells of bacteria of different options within the same species are:	
1	association
2	dissociation
3	genetic mutation
4	genetic recombination

25. Arrange according to the shape of bacteria	
A. Cocci	1. Staphylococci
	2. Vibrio
	3. Micrococcus
B. Spiral	4. Spirochete

26. What index is determined by assessing the sanitary water and expresses the number of E. coli in 1 liter of water?
(in the form of answer write the correct answer in one word)

27. What are spirillus?	
1	Bacteria belonging to the spiral forms, the body which has several large curls
2	Curved sticks that are often reminiscent of comma
3	Bacteria that have a large number of small curls around the axial filament
4	Rod-shaped bacteria length 1.7 m

28. Difficult virions consist of:	
1	nucleic acid
2	nucleocapsid
3	nucleoid
4	capsid and nucleic acid
5	nucleocapsid, supercapsid and etc.

29. What does name of mutually beneficial coexistence of two organisms?
(in the form of answer write the correct answer in one word)

30. A device for culturing microorganisms:	
1. autoclave	
2. thermostat	
3. sterilizer	

31. What are microorganisms can develop as in the access of oxygen and without it?	
1	Obligate aerobes
2	Facultative anaerobes
3	Obligate anaerobes
4	Microaerophile

32. What are bacteria called monotryhy?	
1	Bacteria that can move with a single flagellum
2	Bacteria which flagella are located all over the body surface
3	Not-moving bacteria
4	Bacteria which is a bundle of flagella at one of the poles of the bacterial cell

33. Put the names under the pictures:	
A.Vibrio	
B. Diplococci	
C.Staphylococci	
D. Bacilli	
F. Streptococci	
E. Spirochete	

34. Sporogonic in bacteria it:	
1	Method of reproduction
2	Protective adapt to adverse living conditions
3	Pathogenic factor
4	Mandatory component of the bacterial cell

35. For microscopy of live bacteria are used:	
1	The drug "hanging drop"
2	The dark field microscopy
3	The fluorescence microscopy
4	The method of Dryhalskiy

36. API system designed to determine in bacteria:	
1. The morphology	
2. The cultural properties	
3. The biochemical properties	

37. Explain place under the name of bacteria:	
A. Vibrio	1. Bacteria that have multiple (2 - 3) large curls
B. Spirilli	2. Bacteria with one incomplete curl of spiral as a comma
C. Spirochete	3. The spiral shape of the bacteria, which has a central axial thread
Д. Leptospiri	4. Bacteria that have many small curls

38. What characterizes the circle indicator - an index of water?	
1	Number of E. coli found in 1 liter of water
2	Number of colonies of any microorganisms grown on MPA
3	The smallest water volume in ml which found at least one E. coli
4	The presence of anaerobic microorganisms in water

39. What are bacteria which flagella are located around the perimeter of the cell?	
1	Monotryhy
2	Perytryhy
3	Lofotryhy
4	Amfitryhy

40. The transfer of certain properties of one microbe (donor) to another (recipient) by transferring DNA is:	
1	Replication
2	Transduction
3	Transformation
4	Conjugation

41. Which way viruses can be recovered from the body of the affected animal?	
1	With milk
2	With urine
3	On discharge from the eyes, nose, mouth, genitals
4	On damaged skin and mucous membranes
5	All these

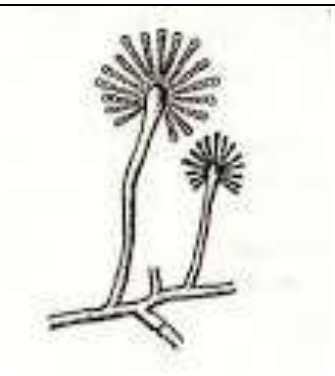
42. Which mushroom is shown in the picture?	
1. Mucor	
2. Aspergillus	
3. Penicillus	
4. Yeast	

43. What research methods used to determine the sensitivity of microorganisms to antibiotics?	
1	Agar diffusion method (method of dicks)
2	Method of serial dilutions in liquid culture medium
3	Seeding for permanent residence (MPJ)
4	The biological sample on laboratory animals

44. Methods of staining spores of bacteria:	
1	Gram method
2	Mihin method
3	Romanovskiy-Himz method
4	Kozlovsky method

45. The process of transferring the genetic material of bacteria of cell donor to recipient cells involving bacteriophage is:
(in the form for answers write a faithful answer)

46. For the cultivation of anaerobic organisms are used:	
1	Wilson-Blair
2	Endo
3	anaerostat
4	autoclave

47. Which mushroom is shown in the picture?	
1. Mucor	
2. Aspergillus	
3. Penicillus	
4. Yeast	

48. Arrange these structural components of bacterial cell according to group affiliation	
A. The main structural components	1. Cell wall
	2. Cytoplasm, nucleoid
	3. Cytoplasmic membrane and its derivatives
B. Temporary structural components	4. Capsule
	5. Spore
	6. Flagellates, villi

49. Microorganisms that are not clearly differentiated nucleus and contains its counterpart - Nucleoid.	
1	eukaryotes
2	prokaryotes
3	saprophytes
4	pathogens

50. What is the difference from the typical mycoplasma bacteria?	
1	Do not have microvilli
2	Do not have a cell wall
3	There have been considerable polymorphism
4	Stable retain features characteristic of the L-forms

National University of Life and Environmental Sciences of Ukraine			
EQL Master **Direction of training 1101** **Specialty Veterinary Medicine**	Department of Epizootology, Microbiology, Virology products 2020-2021 ed.year	**EXAM TEST № _1_** of discipline Veterinary Microbiology	**Confirm** Acting as Heads _____ (signature) _____2020
Examination questions *(The maximum score is 10 points for every question)*			
1. The morphology and ultrastructure of prokaryotic microorganisms. The ultrastructure of the microbial cells. Ultrastructure and chemical composition of the shell of different groups of bacteria. The structure of the capsule in the bacteria, their functions.			
2. Laboratory diagnostics of anthrax. Material for research. The causative agent, its morphology, cultural and biochemical properties. Differentiation of the pathogen from antrakoid-like bacteria. Bioassay.			
Tests of various types *(The maximum score is 10 points for answers to tests)*			

1. Spore in bacillus may be located:	
1	Terminally
2	subterminally
3	Chaotic
4	In Center

2. Nucleus of prokaryotes has:	
1	own shell
2	closed loop form
3	Spore
4	Capsule

3. What form of bacteria are on the figure:	
1. cocci	
2. vibrio	
3. spirochetes	
4. sticks	

4. To isolate a «pure culture» of bacteria we use…. method:	
1	decimal dilutions

2	agar diffusion
3	By Drygalskyi
4	By Shukevich

5. Who first suggested the bacteria to grow in culture media?	
1	Koch
2	Pasteur
3	Mechnikov
4	Vinogradsky

6. The causative agent of anthrax is…
(in the form of answers enter the correct answer in Latin)

7. Listeria have the form of:	
1	cocci-like
2	very small sticks up to 1 micron
3	0.5-2 microns in length sticks
4	filamentary

8. What culture medium we use For selection of staphylococci?	
1	Culture medium with NaCl 8-10%
2	MPB
3	MPA
4	Endo medium

9. The factors of pathogenicity of streptococcus:	
1	produce hemotoksyn, coagulase
2	produce enterotoxin
3	Some of them have a capsule
4	Пригнічують фагоцитоз за рахунок агресинів

10. Morphological features of Echerichia coli:	
1	stick of about 3 mcm length, with rounded edges.
2	stick of about 30 mcm length, with rounded edges.
3	some serotypes have a capsule
4	spore form

8. Methods of teaching

Below **teaching methods** used on core classroom training sessions of discipline " Veterinary Microbiolgy" and during independent work of students:

- verbal (***narrative, explanation***): the story is a method of study involving narrative, a descriptive form of disclosing educational material (involving imagination of student); explanation is the verbal learning method (whereby the teacher reveals the essence of a phenomenon, the law of the process), based on logical thinking with prior experience of students;
- visual (***demonstration, illustration***): ***demonstration*** is a method of teaching which involves showing objects and processes actually in dynamics; ***illustration*** is a method of teaching in which objects and processes are revealed through their symbolic images (photographs, drawings, charts, graphs etc.)
- practical (***laboratory method, practical work, exercise, observation***): ***laboratory method*** involves the organization of training activities through the use of special equipment and specific technologies for acquiring new knowledge or test scientific hypotheses at the level of research; ***practical work*** aims to use the knowledge gained in the resolution of practical tasks (for example, performing some kind of experiment or its fragment in biochemical research of scientists); ***exercise*** is a method of teaching, the essence of which is to deliberate, repetition by students some actions or operations to the formation of skills (for example, ability to use machinery and equipment of biochemical laboratory); ***observation*** as a method of training involves perception of certain objects, phenomena and processes in natural and laboratory environment without interfering with these phenomena and processes.

9. Forms of control

For application control is divided into the current, periodic and summative assessment.

Current control is used for testing individual students, usually in their daily learning activities. The teacher systematically observes students' academic work, checks the level of mastery of the program material, the formation of practical skills and abilities, their strength, but also presents the corresponding estimates for oral answers, tests, practical laboratory experiments (protocol implementation which are presented in a workbook on the subject "Veterinary Microbiology"), provided by the discipline.

Current control is educational in nature, as is aimed at stimulating students' desire to systematically work independently of educational material, to raise their level of knowledge and to improve the teaching skills of teachers.

Periodic monitoring (ranking with thematic modules) is a systematic, planned and focused. It consists in determining the level and extent of mastery of knowledge, skills and abilities late as thematic modules, and a time interval: week, month, quarter, etc. This control is carried out in the course of routine activities (exercises), and designated backup time.

Summative assessment (test, exam) aims to determine the level of fulfillment of the tasks set out in the curriculum, training plan and other documents that govern the educational process. It covers both theoretical and practical training for students, spend it, usually at the end of the first semester (test) and second (exam) as well as during special events check.

10. Distribution of points that get students.

Evaluation of the student is in accordance with the provisions of "On the examinations and tests NUBiP in Ukraine" dated 02/20/2015. The protocol №6 from the table. 1.

National estimation	**ECTS Evaluation**	**ECTS Definition of evaluation**	**Rating student, points**
"Excellent"	**A**	**Excellent** - excellent performance with few errors	**90 – 100**
"Good"	**B**	**VERY GOOD** - above average with some mistakes	**82 – 89**
	C	**GOOD** - generally correct work with a number of gross mistakes	**74 – 81**
"Satisfactory"	**D**	**Satisfactory** - not bad but many drawbacks	**64 – 73**
	E	**ENOUGH** - performance meets the minimum criteria	**60 – 63**
"Unsatisfactory"	**FX**	**Unsatisfactory** - must work before get credit (positive evaluation)	**35 – 59**
	F	**Poor** - thorough and elaborate	**01 – 34**

Rating from attestation is determined on a 100 ball scale and includes rating from a test, that calculation Rtest. = 30.0 points, which settles accounts after a formula:

$$R_{at.} = 0.3 \cdot R_{test}.$$

For determination of the real rating from discipline it is necessary to make the marks collected during an educational semester:

R = 70 + 30 = 100 points.

11. Methodical maintenance

1. Патогенні клостридії /Козловська Г.В./ К.: НАУ, 2008. - 42 с.
2. Збудник кишкового ієрсиніозу. Методи лабораторної діагностики /Козловська Г.В./ К.: ФОП Нагорна, 2011. - 35 с.
3. Біфідобактерії та молочнокислі мікроорганізми. Методи виявлення та ідентифікації /Козловська Г.В./ К.:ФОП «Нагорна І.Л.».- 2010.- 43 с.
4. Лабораторна діагностика сибірки /Мельник М.В./- методичні вказівки, Київ, 2001

12. Recommended Literature

Basic

1. Ветеринарна мікробіологія. / Скибіцький В.Г., Власенко В.В., Козловська Г.В., Ібатулліна Ф.Ж., Ташута С.Г., Мельник М.В. / К.: ТОВ «Дорадо-Друк», 2012. – 367 с.
2. Бортнічук В.А., Скибіцький В.Г., Ібатулліна Ф.Ж. Ветеринарна мікробіологія /Практикум для вузів/. К., І993. – 178 с.

Supplemental

1. Мікробіологія м’яса та м’ясопродуктів (практикум) /В.В.Власенко, В.Г.Скибіцький, І.Г.Власенко, Ф.Ж.Ібатулліна, Г.В.Козловська, М.В.Мельник/, Вінниця, «Едельвейс і К», 2008, 132 с.
2. Мікробіологія молока та молочних продуктів// Скибіцький В.Г., Власенко В.В., Власенко І.Г. та ін..// Вінниця: Едельвейс і К., 2008. – 412 с.

13. Information Resources

1. http://www.microbiologyonline.org.uk/media/transfer/doc/sgm_basic_practical_microbiology_2.pdf
2. http://www.imv.kiev.ua/index.php/ru/publications/magazin/archiv-magazin
3. http://jcm.asm.org/
4. http://www.microbiologyinpictures.com/index.html
5. http://www.microbiologyinpictures.com/microbiology%20images%20links.html