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**Federal State Autonomous Educational Institution of Higher Education
PEOPLES' FRIENDSHIP UNIVERSITY OF RUSSIA
NAMED AFTER PATRICE LUMUMBA
RUDN University**

Agrarian-Technological Institute

educational division (faculty/institute/academy) as higher education programme developer

COURSE SYLLABUS

Bacterial diseases

course title

Recommended by the Didactic Council for the Education Field of:

35.04.04 Agronomy

field of studies / speciality code and title

The course instruction is implemented within the professional education programme of higher education:

Integrated Plant Protection

higher education programme profile/specialisation title

1. THE PURPOSE OF MASTERING THE DISCIPLINE

The purpose of mastering the discipline "Bacterial Diseases" is to familiarize with the features of the structure, physiology and genetics of bacteria, the principles of their classification, the symptoms of plant lesions. Mastering methods of isolating pathogens from plant tissue into a pure culture, calculating their harmfulness and the magnitude of economic damage. Evaluation of integrated control techniques used in the fight against phyto bacteriosis

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

Mastering the discipline "Bacterial Diseases" is aimed at the formation of the following competencies (parts of competencies) among students:

*Table 1 - The list of competencies formed by students during the development of the discipline
(the results of mastering the discipline)
OPK-1.2; OPK-4.2; PC-4.5; PC-4.6; PC-7.1; PC-7.2*

Cipher	Competence	Competency Achievement Indicators
OPK-1	Able to solve the problems of development of the field of professional activity and (or) organization on the basis of analysis of the achievements of science and production	OPK-1.2 Uses methods of solving problems in the development of agronomy based on the search and analysis of modern achievements of science and production
OPK-4	Able to conduct research, analyze results and prepare reporting documents	OPK-4.2 Uses information resources, scientific, experimental and instrumental base for research in agronomy
OPK-5	Capable of participating in experimental research in professional activities	OPK-5.1 Participates in experimental research in the field of plant protection under the guidance of a highly qualified specialist
		OPK-5.2 Uses classical and modern research methods in plant protection
PK-1	Ready to participate in agronomic research, statistical processing of experimental results, formulation of conclusions	PK-1.1 Defines, under the guidance of a higherly qualified specialist, research objects and uses modern laboratory, vegetation and field research methods in agronomy

PK-6	Able to consult on innovative technologies in agronomy	PC-6.1. Able to work with information systems and databases on agricultural production management
		PK-6.2. Able to aggregate the need to use plant protection technologies for accelerated development of agricultural enterprises
PK-7	Able to carry out phytosanitary control at the state border in order to protect the territory of the Russian Federation from the penetration of quarantine and other dangerous pathogens and plant pests, weeds	PC-7.1 Recognizes quarantine objects and identifies quarantine pests and pathogens
		PC-7.2 Conducts examination of crops and crop products for the presence of quarantine facilities

3. THE PLACE OF DISCIPLINE IN THE STRUCTURE OF THE OP VO

The discipline "BACTERIAL DISEASES" refers to the mandatory part of block B1 OP VO.

Within the framework of the OP HE, students also master other disciplines and / or practices that contribute to the achievement of the planned results of the development of the discipline "BACTERIAL DISEASES".

Table 2 – List of components of the HE OP that contribute to the achievement of the planned results of the discipline

Cipher	Name of competence	Previous disciplines/modules, practices	Subsequent disciplines/modules, practices
OPK-1	Able to solve typical problems of professional activity on the basis of knowledge of the basic laws of mathematical and natural sciences with the use of information and communication technologies	History and methodology of scientific agronomy Information Technologies Instrumental research methods	Work experience
OPK-4	Able to implement modern technologies and justify their use in professional activities	History and methodology of scientific agronomy	Plant Growing, Crop Production Practice, Production Practice

		Information Technologies Instrumental research methods	
OPK-5	Capable of participating in experimental research in professional activities	Agriculture, History and Methodology of Scientific Agronomy Information Technologies Instrumental research methods	Plant Growing, Plant Growing Practice, Fundamentals of Scientific Research in Agronomy, Production Practice
PK-1	Ready to participate in agronomic research, statistical processing of experimental results, formulation of conclusions	Agriculture, History and Methodology of Scientific Agronomy Information Technologies Instrumental research methods	Crop production, Fundamentals of scientific research in agronomy, Production practice, Pre-diploma practice
PK-7	Able to develop fertilizer application systems taking into account soil properties and biological characteristics of plants	Soil science with the basics of geology	Crop
PK-11	Able to determine the total need for seed and planting material, fertilizers and pesticides	-	Crop
PK-12	Able to control the implementation of the technological process of crop production	Agriculture	Crop

4. THE SCOPE OF DISCIPLINE AND TYPES OF EDUCATIONAL WORK

The total labor intensity of the discipline "Bacterial Diseases" is 3 credit units (108 hours) for full-time education.

Table 4.1 – Types of educational work by periods of mastering the OP HE for full-time education

Type of educational work		Semesters
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		Total, aca. hrs.	5	6
<i>Contact work</i>		60	60	-
including:				
Lectures (LC)		17	17	-
Laboratory works (LR)		17	17	-
Practical/Seminar Classes (FPs)		–	–	–
<i>Independent work of students</i>		48	48	-
<i>Control (exam/test with grade)</i>		26	26	-
Overall labor intensity of the discipline	aca. hrs.	108	108	-
	Zach. Units.	3	3	-

Table 4.2. Types of educational work by periods of mastering the OP HE for **full-time and part-time** education

Type of educational work		TOTAL, aca.hrs.	Semester(s)			
			1	2		
<i>Contact work, ac.ch.</i>		26	26			
Including:						
Lectures (LC)		13	13			
Laboratory works (LR)		13	13			
Practical/Seminar Classes (FPs)						
<i>Independent work of students, ac.ch.</i>		57	57			
<i>Control (exam /test with grade), ac.ch.</i>		25	25			
Overall labor intensity of the discipline	aca.hrs	108	108			
	hrs.ed.	3	3			

Table 4. 3. Types of educational work by periods of mastering the OP HE for **part-time** education

Type of educational work		TOTAL, aca.hrs.	Semester(s)			
			Winters.	Years.		
<i>Contact work, aca.hrs.</i>		30	30			
Including:						
Lectures (LC)		10	10			
Laboratory works (LR)		20	20			
Practical/Seminar Classes (FPs)						
<i>Independent work of students, aca.hrs.</i>		69	69			
<i>Control (exam /test with grade), aca.hrs.</i>		9	9			
Overall labor intensity of the discipline	aca.hrs.	108	108			
	hrs.ed.	3	3			

5. CONTENTS

Table 4 – Content of the discipline (module) by types of educational work

Name of the discipline section	Contents	Type of educational work
Section 1. Subject and tasks of phytobacteriology	Topic 1.1. History of the development and formation of science. Systematics of bacteria by physiological and genetic signs.	LUX

	<p>Topic 1.2. Features of metabolism and genetics of bacteria. Methods of penetration of bacteria into plants and damage to plants, symptoms of damage.</p> <p>Topic 1.3. Interaction between a parasitic bacterium and a host plant. Plant resistance to bacterial pathogens and the factors that determine it.</p> <p>Topic 1.4. The relationship between bacteria and other pests and pathogens of plant diseases.</p> <p>Topic 1.5. The economic importance of phytobacteriosis: the economic consequences of the defeat of crops, a decrease in the quantity and quality of the harvest of cultivated plants.</p>	
Section 2. Morphology, physiology and genetics of bacteria	<p>Topic 2.1. Features of respiration, enzymatic processes in various groups of bacteria.</p> <p>Topic 2.2. Bacterial systematics, based on physiological traits and DNA analysis, characterizes the most pathogenic groups of bacteria: <i>Pseudomonas</i>, <i>Xanthomonas</i>, <i>Erwinia</i>, <i>Agrobacter</i>, and <i>Clavibacter</i>.</p>	LR, LC
Section 3. Biology	<p>Topic 3.1. Interaction with the host plant: symbiotic and parasitic development, survival in plant residues, distribution with seeds and vectors.</p> <p>Topic 3.2. Genes responsible for the pathogenicity of bacteria and horizontal gene transfer in bacteria.</p>	LR, LC
Section 4. Ecology of phytobacteria	<p>Topic 4.1. Influence of climatic factors, physical and chemical soil factors;</p> <p>Topic 4.2. Influence of antagonistic microflora and microfauna: bacteriophages, antibiotic producers and competitors.</p>	LR, LC

Section 5. The main methods of combating bacteriosis	Topic 5.1. Preventive, quarantine, phytosanitary, agrotechnical and exterminatory (biological, physical and chemical methods) measures.	LR, LC
Section 6. Bacteria as objects of research	<p>Topic 6.1. Examination of plants, seeds and planting material for infection with phytobacteria.</p> <p>Topic 6.2. Plant sampling. Methods of isolating bacteria into a pure culture.</p> <p>Topic 6.3. Diagnosis of bacteria based on phenotypic traits and DNA.</p> <p>Topic 6.4. Preservation of bacteria in pure culture</p> <p>Topic 6.5. Plant inoculation techniques to test bacterial pathogenicity and plant resistance.</p>	LR, LC

6. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

Table 5 – Discipline Logistics

Audience type	Equipping the classroom	Specialized educational/laboratory equipment, software and materials for mastering the discipline
Lecture Hall	Auditorium for lecture-type classes, equipped with a set of specialized furniture; whiteboard (screen) and technical means of multimedia presentations.	
Laboratory	An auditorium for laboratory work, individual consultations, current control and intermediate certification, equipped with a set of specialized furniture and equipment.	List of specialized laboratory equipment, installations, stands, etc.
Computer Lab	Computer class for classes, group and individual consultations, current control	List of specialized software installed on computers for

	and intermediate certification, equipped with personal computers (in the amount of _____pieces), a whiteboard (screen) and technical means of multimedia presentations.	mastering the discipline (module)
For independent work of students	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to EIOS.	
Audience type	Equipping the classroom	Specialized educational/laboratory equipment, software and materials for mastering the discipline

7. EDUCATIONAL, METHODOLOGICAL AND INFORMATION SUPPORT OF THE DISCIPLINE

Main literature:

1. Kirai Z., Klement Z., Shoimoshi F., Veresh J. Methods of phytopathology // Per.s eng. – M.: Kolos, 1974. 343 s.
2. Geshele E.E. Basics of phytopathological evaluation in plant breeding. 2nd ed. M.: Kolos, 1978. 204 s.
3. Shpaar D., Kleinhempel G., Muller G., Nauman K. Bacteriozy kul'nykh zavody / Per. with German. - M.: Kolos, 1980.143 p.
4. Dyakov, Y. T., & Elansky, S. N. (2019). Phytopathology.
5. Levitin, M., 2022. Agricultural phytopathology 3rd ed. Textbook for universities. Litres. 1.
6. Lazarev, A. M., E. N. Mysnik, Y. A. Varitsev, I. A. Zaitsev, A. P. Kozhemyakov, F. A. Popov, S. A. Volgarev, and V. K. Chebotar. "Areas and zones of harmfulness of the main bacteriosis of plants on the territory of Russia and neighboring countries." (2017): 136-136.
7. General phytopathology with the basics of microbiology: Method. instructions for studying the discipline and tasks for control and course works of part-time students of agricultural universities on special. 1504 - "Plant Protection" / VSKhIZO: M.: 1987, - 49 p.

Resources of the information and telecommunication network "Internet":

1. RUDN University EBS and third-party EBS, to which university students have access on the basis of concluded contracts:

– Electronic library system RUDN University – EBS RUDN University
<http://lib.rudn.ru/MegaPro/Web>

– EBS "University Library Online" <http://www.biblioclub.ru>

- EBS Jurait <http://www.biblio-online.ru>

– EBS "Student Consultant" www.studentlibrary.ru

- EBS "Lan" <http://e.lanbook.com/>

- EBS "Trinity Bridge"

2. Databases and search engines:

– electronic fund of legal and normative-technical documentation of the <http://docs.cntd.ru/>

– Yandex <https://www.yandex.ru/> search engine

– Google search engine <https://www.google.ru/>

– abstract database SCOPUS <http://www.elsevierscience.ru/products/scopus/>

– <http://quakes.globalincidentmap.com/>,

– <http://www.globalincidentmap.com/>,

- ScienceDirect: <http://www. sciencedirect. com>
- EBSCO: <http://search. ebscohost. com>
- Sage Publications:<http://online. sagepub. com>
- Springer/Kluwer:<http://www. springerlink. com>
- University Information System RUSSIA: <http://www.cir.ru/index.jsp>

Educational and methodical materials for independent work of students in the development of the discipline / module:

1. Lazarev, Alexander Mikhailovich. "List of scientific literature on the study of plant bacteriosis and the biological properties of their pathogens." (2019).
2. Determination of phytopathogenic bacteria that infect cereals, cruciferous and nightshade cultures: Uchebnoe posobie / A. N. Ignatov, K. P. Kornev, E. S. Mazurin, M. S. Egorova. – Moscow : Peoples' Friendship University of Russia, 2015. – 112 p. – ISBN 978-5-209-06672-9. – EDN VXHEJZ.
3. Karimova, E. V., I. N. Alexandrov, and E. Y. Shneider. "Plant bacteriosis pathogens included in the EPOX Signal List." *Plant protection and quarantine* 12 (2012).
4. Ignatov AN, Egorova MS, Khodykina CF. Distribution of bacterial and phytoplasmic plant diseases in Russia. *Plant protection and quarantine*. 2015(5).
5. Gorshkov, Vladimir Yurievich. "Plant bacteriosis: molecular basis for the formation of plant-microbial pathosystems." (2017).

8. ASSESSMENT MATERIALS AND POINT-RATING SYSTEM FOR ASSESSING THE LEVEL OF FORMATION OF COMPETENCIES IN THE DISCIPLINE "Bacterial Diseases"

Specialty: 35.03.04 Agronomy 1 semester

Code of a supervised competency or part of it	Controlled discipline section	Controlled theme of discipline	Name of the appraisal tool				Certification		Points Themes	Points Section
			Current control				Rubezhnaya	Total		
			Performing Home Job	Execution laboratory assistant	Report, presentation	Tests				
OPK-1.1; OPK-1.2; OPK-4.2; OPK-5.1; OPK-5.2; OPK-5.3; PC-2.1; PC-2.2; PC-3.2;	Section 1. Subject and tasks of phytobacteriology	Topic 1.1. History of the development and formation of science. Systematics of bacteria by physiological and genetic signs.	1	4	3	2	10		10	30
		Topic 1.2. Features of metabolism and genetics of bacteria. Methods of penetration of bacteria into plants and damage to plants, symptoms of damage.	1	4	3	2			10	
		Topic 1.3. Interaction between a parasitic bacterium and a host plant. Plant resistance to bacterial pathogens and the factors that determine it.	1						10	
		Topic 1.4. The relationship between bacteria and other pests and pathogens of plant diseases.		4	3	2				
		Topic 1.5. The economic importance of phytobacteriosis: the economic consequences of the defeat of crops, a decrease in the quantity and quality of the harvest of cultivated plants.								
PC-4.2; PC-4.5; PC-4.6; PC-6.2	Section 2. Morphology, physiology and genetics of bacteria	Topic 2.1. Features of respiration, enzymatic processes in various groups of bacteria.	1	4	3	2			10	20
		Topic 2.2. Systematics of bacteria, based on physiological signs and DNA analysis, characteristics of the most pathogenic groups of bacteria	1	4	3	2			10	

Section 3. Biology	Topic 3.1. Interaction with the host plant: symbiotic and parasitic development, survival in plant residues, distribution with seeds and vectors.	1	4	3	2			10	20
	Topic 3.2. Genes responsible for the pathogenicity of bacteria and horizontal gene transfer in bacteria.	1	4	3	2			10	
Section 4. Ecology of phytobacteria	Topic 4.1. Influence of climatic factors, physical and chemical soil factors;	1	4	3	2			10	20
	Topic 4.2. Influence of antagonistic microflora and microfauna: bacteriophages, antibiotic producers and competitors.	1	4	3	2			10	
Section 5. The main methods of combating bacteriosis	Topic 5.1. Preventive, quarantine, phytosanitary, agrotechnical and exterminatory (biological, physical and chemical methods) measures.	1	4	3	2			10	10
Section 6. Bacteria as objects of research	Topic 6.1. Examination of plants, seeds and planting material for infection with phytobacteria. Topic 6.2. Plant sampling. Methods of isolating bacteria into a pure culture. Topic 6.3. Diagnosis of bacteria based on phenotypic traits and DNA. Topic 6.4. Preservation of bacteria in pure culture Topic 6.5. Plant inoculation techniques to test bacterial pathogenicity and plant resistance.	1	4	3	2			10	10
	TOTAL	12	48	36	24	10	10	100	

Criteria for the evaluation of controlled types of work

№ p/n	Estimated parameters	Scores	
		Matches Parameters	Does not match the parameters
1	Doing homework for lab work - executed completely, carefully -partially executed, carelessly	1 0.5	0 0
2	Perform lab work -made by yourself completely, carefully decorated -made independently, carelessly designed -made partially independently -performed with an error in the result of the work	4 3 2 1	0 0 0 0
3	Report, presentation of the section -Clearly lined up, well illustrated -the report and presentation are well designed, but there are inaccuracies -answers all questions -can't answer most questions -conclusions are entirely derived from the work - conclusions are fuzzy	1 0.5 1 0.5 1 0.5	0 0 0 0 0 0

4	Tests -Correctly answered 95-100% of the questions -Correctly answered 80-94% of questions -Correctly answered 50-79% of questions	2 1 0.5	0 0 0
5	Milestone attestation <i>1) Quality of oral answer to questions</i> (a) Completeness of the response -Replied in full -Answered most of the questions -Didn't answer most of the questions b) Consistency of the answer - The answer is built logically - The answer is built illogically <i>2)Test part</i> -Correctly answered 95-100% of the questions -Correctly answered 80-94% of questions -Correctly answered 50-79% of questions	2.5 1.5 0.5 2.5 0.5 5 4 2	0 0 0 0 0 0 0 0
Total:		10	0
6	Final attestation <i>1) Quality of oral answer to questions</i> (a) Completeness of the response -Replied in full -Answered most of the questions	2.5 1.5	0 0

-Didn't answer most of the questions	0.5	0
b) Consistency of the answer		
- The answer is built logically	2.5	0
- The answer is built illogically	0.5	0
<i>2)Test part</i>		
-Correctly answered 95-100% of the questions	5	0
	4	0
-Correctly answered 80-94% of questions	2	0
-Correctly answered 50-79% of questions		
Total:	10	0

Questions for self-assessment and discussions on topics.

Section 1. Subject and tasks of phytobacteriology

Topic 1.1. History of the development and formation of science. Systematics of bacteria by physiological and genetic signs.

What species of bacteria were first identified as causative agents of plant diseases?

Who has made the greatest contribution to the development of phytobacteriology?

Topic 1.2. Features of metabolism and genetics of bacteria. Methods of penetration of bacteria into plants and damage to plants, symptoms of damage.

Features of the prokaryote genome (rod genome, mobile genome), the structure of the ribosomal apparatus, the types of DNA in the bacterial cell, the mobility of the bacterial genome.

Topic 1.3. Interaction between a parasitic bacterium and a host plant. Plant resistance to bacterial pathogens and the factors that determine it.

Types of parasitism in phytopathogenic bacteria, genetic systems of bacteria that determine their virulence, elicitors of the protective reaction of plants. Genetic features of plant resistance, genes of proteins-effectors of secretory systems of bacteria

Topic 1.4. The relationship between bacteria and other pests and pathogens of plant diseases.

Synergism and antagonism of phytopathogens

Topic 1.5. The economic importance of phytobacteriosis: the economic consequences of the defeat of crops, a decrease in the quantity and quality of the harvest of cultivated plants.

What losses do different groups of bacteria cause?

Section 2. Morphology, physiology and genetics of bacteria

Topic 2.1. Features of respiration, enzymatic processes in various groups of bacteria.

Facultative anaerobes and strict aerobes – what are the differences between metabolism and harmfulness?

Topic 2.2. Bacterial systematics, based on physiological traits and DNA analysis, characterizes the most pathogenic groups of bacteria: *Pseudomonas*, *Xanthomonas*, *Erwinia*, *Agrobacter*, and *Clavibacter*.

What methods are used to identify, identify, determine genetic diversity and describe new species of phytopathogenic bacteria?

Section 3. Biology

Topic 3.1. Interaction with the host plant: symbiotic and parasitic development, survival in plant residues, distribution with seeds and vectors.

Factors affecting the survival of bacteria in soil, water, air and plants.

Seminal infection – meaning, methods of detection, methods of control

Topic 3.2. Genes responsible for the pathogenicity of bacteria and horizontal gene transfer in bacteria.

Plasmids are the main factor in the transfer of genes between bacteria. Localization of virulence genes in bacterial plasmids

Bacteriophages - a factor in the transfer of genes between bacteria

Transposons (mobile genetic elements) - a factor in the transfer of genes between bacteria

Section 4. Ecology of phytobacteria

Topic 4.1. Influence of climatic factors, physical and chemical soil factors;

Effect of temperature, precipitation, wind and sunlight on bacterial pathogen transport and plant resistance

Topic 4.2. Influence of antagonistic microflora and microfauna: bacteriophages, antibiotic producers and competitors.

Symbiotic and antagonistic relationships between soil and plant microorganisms.

Section 5. The main methods of combating bacteriosis

Topic 5.1. Preventive, quarantine, phytosanitary, agrotechnical and exterminatory (biological, physical and chemical methods) measures.

Methods for diagnosing infestation of seeds and planting material

Influence of crop rotation on the prevention of bacteriosis

Vectors of bacteriosis and their control

Chemical methods of protection against bacteriosis – the role of copper and antibiotics

Biomethod against bacteriosis

Section 6. Bacteria as objects of research

Topic 6.1. Examination of plants, seeds and planting material for infection with phytobacteria.

Methods for diagnosing infestation of seeds and planting material

Topic 6.2. Plant sampling. Methods of isolating bacteria into a pure culture.

Nutrient media and methods of bacterial excretion

Topic 6.3. Diagnosis of bacteria based on phenotypic traits and DNA.

Immunological methods, biochemical methods, PCR and other methods of DNA and RNA amplification, DNA: DNA hybridization, DNA sequencing, gene and genome analysis

Topic 6.4. Preservation of bacteria in pure culture

Nutrient media for storage, lyophilization, cryopreservation, maintenance of collections of microorganisms

Topic 6.5. Plant inoculation techniques to test bacterial pathogenicity and plant resistance.

Infestation of plants in the laboratory

Plant infestation under controlled conditions

Infestation of plants in the field

Creation and evaluation of the natural infectious background.

Methods for assessing plant response

Exam TICKETS
BY DISCIPLINE: Bacterial diseases
(1 SEMESTER)

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

Exam TICKET No 1

1. The role and tasks of phytobacteriology in modern agriculture.
2. Diagnosis of bacterial plant diseases. Diagnostic methods.
3. Species of bacteria in plants(pathogens, symbionts, epiphytes, rhizospheric bacteria).
4. Principles of molecular biological methods of diagnosis of bacteria

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 2

1. Physiological role of the main mechanisms of plant immunity in plant life

2. The role of microbiologists in the development of phytobacteriology as a science
3. Soft plant rot
4. Principle of the method of immunodiagnosics of phytopathogenic bacteria

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 3

1. Methods of collecting plant material for the diagnosis of bacteriosis
2. Chemical with the remaining cell wall bacteria, spare substances
3. Ways of distribution of phytopathogenic bacteria
4. The principle of the method of isolation of bacteria into a pure culture. Selective media.

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 4

1. Obligate plant pathogens (Phytoplasma, Xylella, Liberibacter)
2. Survival of phytopathogenic bacteria in the soil
3. Saprophytic (epiphytic, rhizospheric) stage of life of phytopathogenic bacteria
4. Carriers of bacterial phytopathogens

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 5

1. Plant Protective Reaction Elisators (MAMPs/PAMPs)
2. Types of diagnostics of phytopathogenic bacteria (microbiological, phytopathological, immunological and molecular-biological)
3. Selection of plant samples for the diagnosis of infestation
4. ELISA – principles, advantages and disadvantages. .

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 6

1. Physiological role of exoenzymes in pathogenesis

2. Types of diagnostics and identification of taxonomic affiliation of plant pathogens

3. Reaction of bacteria to environmental factors

4. Principle of PCR method

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 7

1. The role of bacteriosis in crop losses of major crops.

2. Classification of bacteria - the main genetic groups

3. Pseudomonas

4. Principles of combating bacterial diseases of plants

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

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Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 8

1. Xanthomonas & Xylella

2. Phytopathogenic bacteria in the soil and in irrigation water.

3. Genetic methods in the diagnosis of bacteria

4. Chemical methods of plant protection against bacteriosis

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

PEOPLES FRIENDSHIP UNIVERSITY OF RUSSIA

Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 9

1. Gram-positive phytopathogenic bacteria
2. Microbiome and metagenome – importance for the fight against plant diseases
3. Disinfection of seeds from pathogens of bacteriosis
4. The principle of biochemical method for determining bacterial species

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

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Agrarian-Technological Institute

Agrobiotechnology Department

Discipline: BACTERIAL DISEASES

CREDIT TICKET No 10

1. Phytopathological diagnosis of bacteriosis
2. Succession of bacterial pathogens
3. Biological method of combating bacteriosis

4. Agrobacterium

Minutes of No _____ discussed at the meeting of the Department _____

Compiled by ____

Director of Department _____

Evaluation criteria:*(in accordance with the current regulatory framework)*

Compliance of grading systems (previously used grades of final academic performance, ECTS grades and the point-rating system (BRS) of assessments of current academic performance).

BRS Scores	Traditional Assessments of the Russian Federation	Evaluation ECTS
95 - 100	5	A
86 - 94		B
69 - 85	4	C
61 - 68	3	D
51 - 60		E
31 - 50	2	FX
0 - 30		F
51-100	Credit	Passed

Tests on the course "BACTERIAL DISEASES"**Test tasks**

1. What questions does phytobacteriology focus on?
 - a) soil microflora and influence on the fertility and composition of soils, as well as the beneficial and pathogenic microflora of cultivated plants;
 - b) develops a technology for obtaining various products from microorganisms for the national economy and medicine (antibiotics, vaccines, enzymes, vitamins, etc.);
 - c) microorganisms pathogenic to humans: bacteria, viruses, fungi, protozoa.
 - d) microflora of the seas and other water bodies;
 - e) microorganisms of outer space and other planets;

2. Epiphytes are:
 - a) peaceful cohabitants - inhabitants of the surface tissues of plant organisms
 - b) pathogens that cause plant diseases
 - c) symbiotic microorganisms living in the digestive tract of insects
 - d) inhabitants of the integumentary tissues of warm-blooded animals and humans;

3. Abiogenic substrates of microorganisms include:
 - (a) Soils
 - b) insect organism
 - c) water
 - d) plant organism
 - e) air;

4. A bacterial cell from a eukaryotic cell is distinguished by the following features:
 - (a) Presence of an endoplasmic reticulum
 - b) no nuclear membrane
 - c) the presence of a cytoplasmic membrane
 - d) binding of oxidative phosphorylation enzymes with the plasma membrane
 - e) lack of highly organized organelles;

5. Microorganisms with a prokaryotic cell structure include:

- (a) Viruses
- b) phytoplasmas
- c) Prions
- d) actinobacteria (actinomycetes)
- e) mushrooms
- (e) Rickettsia;

6. Bacterial mobility is not ensured:

- (a) The presence of flagella
- b) endospora
- c) fimbriae
- d) reduction of the cell wall
- e) the presence of a capsule;

7. Mandatory for the bacterial cell internal structures are:

- (a) Cytoplasm
- b) disputes
- c) nucleoid
- d) Volutin grains
- e) chloroplasts;

8. The main functions of the cytoplasmic membrane are:

- (a) Regulation of metabolite and ion transport
- b) formation of enzymes
- c) regulation of osmotic pressure
- d) participation in the synthesis of cell wall components
- e) participation in spore formation;

9. Among the phytopathogenic bacteria, the most common are:

- (a) Obligate aerobes
- b) obligate anaerobes
- c) facultative anaerobes
- d) extremely oxygen-sensitive;

10. For the coloring of microorganisms, complex methods are most often used:

- (a) On Zil-Nilsson
- b) according to Romanovsky - Giemse
- c) according to Gram
- d) according to the Tempest;

11. Which of the listed dyes is most often used to color microorganisms?

- (a) Fuchsin
- b) crystal-violet with iodine
- c) methylene blue
- d) erythrosan
- e) mascara;

12. The optimal temperature regime for the cultivation of phytobacteria is:

- a) + 6-20 0C
- b) + 25-30 0C
- c) +35-40 0C
- d) +40-45 0C;

13. Indicate the reason for the manifestation of pathogenic properties of conditionally pathogenic phytobacteria.

- a) biochemical properties of the strain
- b) adhesive properties (the ability of cells to stick together with each other or with other bodies) of bacterial cells
- c) decreased plant immunity
- d) a complex of properties of microorganisms and features of a plant organism
- e) toxins of phytobacteria;

14. The main sources of primary infection in phytobacteriosis are:

- (a) Irrigated water
- b) plant residues
- c) air
- d) seeds
- e) planting material

15. Indicate the main ways of penetration of phytobacteria into plant tissues.

- (a) Mechanical damage
- b) integumentary tissues
- c) stomata, lentils, hydatodes
- d) root hairs

16. Which of these genera of phyto bacteria belong to the Department of Firmicutes?

- (a) Xanthomonas
- b) Bacillus
- c) Agrobacterium
- d) Clavibacter
- e) Ralstonia

17. Representatives of which genera of phyto bacteria are spore-forming?

- (a) Burkholderia
- b) Pseudomonas
- c) Bacillus
- d) Agrobacterium
- e) Clavibacter

18. The most common method of sterilization

The nutrient medium is:

- a) dry-cooked
- b) autoclaving
- c) filtration
- d) boiling;

19. For the isolation of phytopathogenic bacteria of the genus *Pseudomonas*, it is preferable to use nutrient media:

- (a) Meat-peptic broth
- b) LB
- c) Čapeka
- d) Kings B
- e) potato-dextrose agar;

20. What type of disease is caused by phyto bacteria of the genus *Erwinia*?

- (a) Bacterial cancer
- b) gommosis
- c) burn
- d) soft rot
- e) mottled spotting;

21. Indicate the disease caused by the bacterium *Xanthomonas campestris* pv. *campestris*.

- a) root cancer of fruit
- b) tomato vascular cancer
- c) wet lettuce rot
- d) vascular bacteriosis of cabbage
- e) pome burn

22. Indicate the disease caused by the bacterium *Pseudomonas syringae* pv. *lachrymans*.

- a) mucous bacteriosis of cabbage
- b) angular spotting of cucumber
- c) toxic bacteriosis of watermelons and melons
- d) spotting of pumpkin leaves and cucumbers
- e) vascular bacteriosis of cucumber

23. What disease is caused by the causative agent *Clavibacter michiganensis* subsp. *michiganensis*?

- a) bacteriosis of carrots
- b) tomato bacterial cancer
- c) necrosis of the core of the tomato stem
- d) black bacterial spot of tomato
- e) mottling of tomato fruits

Evaluation criteria:

(in accordance with the current regulatory framework)

Compiled by ___

Director of department ____

" ____ " ____

Evaluation materials and a point-rating system for assessing the level of formation of competencies (parts of competencies) based on the results of mastering the discipline "BACTERIAL DISEASES" are presented in the Appendix to this Work Program of the discipline.

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