

**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL  
SCIENCES OF UKRAINE**

Radiobiology and Radioecology Department

**“CONFIRMED”**

Acting Dean of Faculty of Plant Protection,  
Biotechnology and Ecology

\_\_\_\_\_ J.V. Kolomiets  
“    ” \_\_\_\_\_ 2020

**CONSIDERED AND APPROVED**

at the meeting of Radiobiology and Radioecology Department

Protocol № 12 from “ 17 ” June 2020 p.

Head of the Department

\_\_\_\_\_ A.V. Klepko

**CURRICULUM WORKING PROGRAM**

**“HYGIENE AND SOCIAL FACTORS OF POPULATION LIFE ON  
RADIONUCLIDE CONTAMINATED TERRITORIES”**

<b>Specialty:</b>	101 - Ecology
<b>Educational program:</b>	«Ecology and Environmental Protection»
<b>Faculty:</b>	Plant protection, biotechnology and ecology
<b>Developers:</b>	Volodymyr Illienko , PhD in Biology, senior lecturer of Radiobiology and Radioecology Department
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**Kyiv – 2020**

## **1. PURPOSE AND OBJECTIVE OF THE DISCIPLINE**

The purpose of teaching the discipline "Hygiene and social factors of population life on radionuclide contaminated territories" is the formation of knowledge about the peculiarities of the environment formation with a complex of unfavorable factors for the population (environmental, sanitary, hygienic, economic, economic and social) arising as a result of radiation accidents.

The task is to provide opportunities for using the acquired knowledge and skills for the development of recommendations, decision-making, long-term planning of countermeasures in the event of radiation accidents and territory radioactive contamination by radioactive isotopes, as well as for master's thesis.

## **2. AFTER FINISHING OF COURSE STUDENTS HAVE TO**

The student should know the peculiarities of protecting a person from sources of external and internal irradiation while living on contaminated radionuclide territories (obtaining agricultural products that meet the requirements of PL-2006, reducing the equivalent dose of internal irradiation, the feasibility of countermeasures), possible solutions to socio-economic problems and rehabilitation of the territories affected by radionuclide contamination.

Student should be able to:

- analyze information about the levels of radionuclide pollution of environmental objects;
- in accordance with the requirements of the permissible levels of agricultural products pollution to evaluate its suitability for human consumption;
- make short-term and long-term forecasts for the development of the situation on the territory after radionuclide contamination.

### 3. DISCIPLINE CONTENT AND TYPES OF EDUCATIONAL WORK

Types of educational activity	Total hours
The total laboriousness of the discipline	54
Lectures	10
Laboratory works	20
Independent student work	30
Type of final control	Test

### 4. CONTENTS OF DISCIPLINE MODULES AND TYPES TO WORK

№	Topic	The topic content, recommended literature	Types of educational activity, hours.		
			lectures	Laboratory works	independent work

#### Module 1. Biological regulation of ionizing radiation and the basis of radiation hygiene

1.1.	Basic principles of biological regulation of ionizing radiation	The limitless concept of the ionizing radiation action on human body. The concept of acceptable risk. The principle of not exceeding, optimizing and justifying. Categories of exposed persons and their regulation. Permissible levels and temporarily permissible levels of radionuclide content in food. <i>Literature: 1, 2, 4, 22, 23</i>	2	4	6
1.2	Basic sanitary rules of radiation protection	Population in the conditions of radiation accidents. Radiation and hygiene regulations. Radiotoxicity groups of radioactive isotopes. Principles of protection against closed and open sources of ionizing radiation. Rationing of radionuclide content in agricultural products. <i>Literature: 1, 2, 4, 22, 23</i>	2	4	4

1.3	The basic documents of radiation safety standards regulation	Activities of the International Commission on Radiation Protection (ICRP) and the National Commission for Radiation Protection of Ukraine (NCRP). "The principle of optimizing ALARA". Norms of radiation safety of Ukraine. Law of Ukraine "On the Use of Nuclear Energy and Radiation Safety"	2	2	4
<i>Lliterature: 1, 2, 4, 7</i>					
<b>Module 2. Population in the close and remote period after a radiation accident</b>					
2.1	Combined action of hygiene and social factors against the background of the radiation factor. caused by the consequences of the accident	Significance of social and psychogenic factors against the The quality of information provision, management decisions and mechanisms for their implementation in the implantation of anti-radiation measures. Features of social and physical well-being, mental state of different groups of the population.	2	4	8
<i>Lliterature: 1, 15,16</i>					
2.2	System approach to public health research radiation accidents	Level and dynamics of population morbidity in radionuclide at contaminated territories. Features of the subjective perception of the situation and the level of socio-psychological stress. Hygienic and social approaches to preventive measures for the preservation of public health. Population in the event of Chernobyl disaster and Fukushima -1 nuclear power plant accident.	2	6	8
<i>Lliterature: 15, 16, 19, 23</i>					
<b>Total:</b>			<b>10</b>	<b>20</b>	<b>30</b>

## 5. STUDENT RATINGS

5.1 Criteria for calculating the maximum number of points in conditions of rating by hours:

**Lectures** - for each hour of listened and recapitulated lecture – 0.5 points.

**Laboratory works** - for every hour of completed and assigned task of practical classes - 1 point.

**Independent work** - for every hour of self-prepared and assigned task - 0.5 points.

Rating (maximum) of the student by modules considering hours as a criterion

Module	$R_{e.w.}$	Credits	Lectures	Practice sessions	Independent work	Total
1	$M_1$	1,0	$6 \cdot 0,5 = 3$	$10 \cdot 1 = 10$	$14 \cdot 0,5 = 7$	20
2	$M_2$	1,0	$4 \cdot 0,5 = 2$	$10 \cdot 1 = 10$	$16 \cdot 0,5 = 8$	20
	Total	2,0	5	20	15	<b>40</b>

Rating of educational work  $R_{e.w.} = 70\%$ , and rating of exam  $R_{exam} = 30\%$  from the total number of points (according to the Regulations).

In case of 100% mastering of discipline the student can get  $R_{e.w.}$  - 28 points, and  $R_{exam}$  - 12 points.

### 5.2 Rating of attestation for discipline

National score	ECTS	Definition ECTS	$R_{dis.}$ , points	$R_{dis.}$ , actual points for discipline
Excellent	A	<b>Excellent</b> - perfectly performance, with only a small number of errors.	$(0,9 - 1,0) \cdot R_{dis.}$	36 – 40
Good	B	<b>Very good</b> - above average level with several mistakes	$(0,82 - 0,89) \cdot R_{dis.}$	32 – 35
	C	<b>Good</b> - generally correct with some mistakes	$(0,75 - 0,82) \cdot R_{dis.}$	30 – 31

Satisfactory	D	<b><i>Satisfactory</i></b> - not bad, but with a significant number of shortcomings	$(0,66 - 0,74) \cdot R_{\text{dis.}}$	26 – 29
	E	<b><i>Enough</i></b> - execution satisfies the minimum criteria	$(0,60 - 0,65) \cdot R_{\text{dis.}}$	24 – 25
Unsatisfactory	FX	<b><i>Unsatisfactory</i></b> - you need to work before getting a score (positive rating)	$(0,35 - 0,59) \cdot R_{\text{dis.}}$	14 – 23
	F	<b><i>Unsatisfactory</i></b> - serious further work is needed	$(0,01 - 0,34) \cdot R_{\text{dis.}}$	1 – 13

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### 5.3 Discipline rating

$$R_{\text{dis.}} = R_{\text{e.w.}} + R_{\text{exam}} + R_{\text{add.w.}} - R_{\text{penal}}$$

Assume that the student scored only 60 points, which is 75% of 2.0 credits or  $R_{\text{dis.}}$  of student is 1.5 credit.

## 6. EXAMPLE OF CONTROL TASKS

National University of Life and Environmental Sciences of Ukraine			
Master 2st year study Specialty Radioecology	Radiobiology and Radioecology Department 2019/2020 study year	Test № ____ from the course <b>Hygiene and social factors of population life on radionuclide contaminated territories</b>	Approved Head of department  <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> <b>Gudkov I.M.</b>
Tests			
1.	A maximum accessible equivalent dose received by any individual within one year is .....		
2.	By whom does the control levels are established? a) ICRP;      b) ALARA;      c) IAEA;      d) enterprise manager		
3.	Please combine and description of principles of biological norm setting of radiological protection		
	1. Optimization	a) All doses should be kept as low as reasonably achievable, social and economic factors being taken into account	
	2. Dose limits	b) Actions should be more good than harm	
	3. Justification	c) Limitation to the degree of exposure to “acceptable” levels	
4.	Please, decipher abbreviation ALARA		
5.	The development of the organism under the exposure in doses , in dozens and hundreds of times lower than LD <sub>50</sub> will cause? a) Stimulation    b) Morphological changes    c) Inhibition of growth    d) Radisensitization		
6.	What does dose-response curve describes?		
7.	.....- time during which the number of radionuclides in the body being reduced twice due to biological processes during metabolic processes.		
8.	Who of the named categories of population refers to category B according to radiation safety norms? a) the persons who do not work directly with sources of ionizing radiations, but nevertheless may be additionally exposed to irradiation due to location of their workplaces in premises, on industrial sites of radiation-nuclear technologies enterprises or due to location of their living places. Such persons belong to the personnel b) the personnel (professional workers) – individuals working constantly or temporarily directly with sources of ionizing radiation. Those are workers of the nuclear fuel cycle enterprises, physicians-radiologists, some other categories of individuals which may be exposed to irradiation when perform their duties c) population that lives on a contaminated territories		
9.	Arrange the correct links,		
	1	Radioblockers	
	2	Radiodecorporants	
	3	Radiorenewals	
	4	Radioprotectors	
		a	Adaptogens
		b	Complexons - 2
		c	Enterosorbents
		d	Regeneration activators
10.	The first atomic bomb was tested in ..... year.		
11.	Radiodecorporants are .....		
12.	Please select the stochastic types of radiobiological effects? a) Radiation stimulation; b) Morphological changes; c) Acute radiation syndrome (ARS); d) Genetic effects; e) The acceleration of aging and reduction in life expectancy; f) Radiation induced death		
13.	Please, decipher abbreviation IAEA .....		
14.	Combined in the correct sequence the group of radiotoxicity and isotopes:		

	1. group A	a) $^3\text{H}$ , $^7\text{Be}$ , $^{14}\text{C}$ , $^{15}\text{O}$ , $^{40}\text{K}$	
	2. group B	b) $^{90}\text{Sr}$ , $^{106}\text{Ru}$ , $^{131}\text{I}$ , $^{134,137}\text{Cs}$ , $^{233-238}\text{U}$	
	3. group C	c) $^{210}\text{Pb}$ , $^{210}\text{Po}$ , $^{211}\text{At}$ , $^{226}\text{Ra}$ , $^{239}\text{Pu}$	
	4. group D	d) $^{22,24}\text{Na}$ , $^{32}\text{P}$ , $^{35}\text{S}$ , $^{60}\text{Co}$	
15.	Limiting intake of radionuclides with food and water; Blocking processes of radionuclide absorption in the gastrointestinal tract and deposition in specific organs; Accelerating excretion of radionuclides which were included into tissue (incorporated radionuclides) are principles of <ul style="list-style-type: none"> <li>a) minimizing the income and accumulation of radionuclides in the human body</li> <li>b) maximizing of useful properties</li> <li>c) ALARA</li> <li>d) ICRP</li> </ul>		
16.	Hematopoietic, gastrointestinal, neurovascular are symptoms of .....		
17.	What are the units for surface radioactivity? <ul style="list-style-type: none"> <li>a) Bq/kg</li> <li>b) Bq/m<sup>2</sup></li> <li>c) Ci</li> <li>d) Sv/m<sup>2</sup></li> <li>e) Gy/m<sup>2</sup></li> </ul>		
18.	Changes that occur in the living organism during the ontogeny are inherited? <ul style="list-style-type: none"> <li>a) genetic</li> <li>b) ontogenetic</li> <li>c) somatic</li> <li>d) stochastic</li> </ul>		
19.	Please, decipher abbreviation ICRP .....		
20.	Is there a completely safe dose of ionizing radiation? (True/False)		
21.	Which organization approved PL-2006? a) NCRP, b) Cabinet of Ministers, c) ICRP, d) Ministry of Health.		
22.	How do you deactivate hair contaminated by radioactive substances? a) water and shampoo with 3% solution of citric acid, b) with soap and water, c) solution of potassium permanganate, d) 5% solution of sodium sulfate.		
23.	From what age persons are allowed to work with sources of ionizing radiation? a) 16 years, b) 21 years, c) 18 years, d) 25 years.		
24.	How many classes of work with radioactive substances are regulated by the Basic Sanitary Regulations? a) 5, b) 2, c) 4, d) 3.		
25.	Is it allowed to carry out the same radiation diagnostic procedures several times? (True/False).		
26.	What is the maximum permissible dose rate of $\gamma$ -radiation in projected accommodation ( $\mu\text{R} / \text{h}$ )? a) 30, b) 50, c) 20, d) 70.		
27.	What is the permissible content of $^{137}\text{Cs}$ in drinking water, according to PL-2006 (Bq/l)? a) 2, b) 5, c) 10, d) 20.		
28.	Is it introduced restriction on the consumption of local food products in the late phase of a radiation accident? (True/False).		
29.	What type of detergents is Trilon B used to remove the residual activity of radioactive substances as a result of their reaction with skin proteins a) weak acid solutions, b) adsorbents, c) complexing agents.		
30.	What is the maximum annual effective dose during the preventive screening of the population (fluorography), mSv? a) 1, b) 5, c) 10, d) 0,1.		



## 7. RECOMMENDED LITERATURE

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