

Federal State Autonomous Educational Institution of Higher Education
«Peoples' Friendship University of Russia»

Medical Institute

Recommended MCSD

SYLLABUS
(STUDY GUIDE)

Subject

Molecular Genetics in practical Biology and Medicine

Recommended for the direction of training (specialty)

31.05.01 General Medicine

Program (profile, specialization)

General Medicine

1. Aims and objectives of discipline:

Students' acquisition of knowledge in the field of molecular genetics, which is necessary for the formation of the scientific worldview and practical activities of the physician.

The principal objectives are the study of:

- methods of molecular genetics,
- Advances in molecular genetics,
- the application of molecular genetics in the diagnosis and treatment of various forms of hereditary pathology.

2. Position of the discipline in the structure of the Educational program:

Block 1 – Educational disciplines (modules), disciplines of choice (elective).

Preceding and following disciplines forming competencies of the discipline are shown in table 1.

Table 1. Preceding and following disciplines forming the given competencies

№	Code of competence	Preceding disciplines	Following disciplines (discipline groups)
General professional competencies			
1	GPC-5.1 GPC-5.3		Anatomy, Histology, embryology, cytology, Microbiology, Virology, Normal physiology, clinical disciplines

Note: Molecular Genetics in practical Biology and Medicine is studied in the 1st year so there are no preceding disciplines in the table.

3. Requirements for the results of the discipline study

Discipline studying is designed to form the following competences shown in table 2:

Table 2. Formed competences

Competence	Competence name	Competence achievement indicators
GPC-5	Being able to assess morpho-functional, physiological conditions and pathological processes in the human body to solve professional tasks	GPC-5.1. Mastering the algorithm of clinical, laboratory and functional diagnosis when dealing with professional tasks GPC-5.3 Being able to determine morpho-functional, physiological states and pathological processes of the human body

In consequence of studying the discipline a student should:

Know:

1. Methods used in modern molecular genetics.
2. Advances of molecular genetics
3. Trends of molecular genetics.
5. Application of molecular genetics.

Be able to do:

1. Use modern methods of molecular genetics to study the human heredity.
2. Independently work with educational, scientific, reference books, the Internet for professional activities

Have the skills in:

1. Methods of molecular genetics used studying human heredity.
2. Performing experiments in molecular genetics.
3. Application of the acquired knowledge in future medical practice.

4. Discipline hours and types of training activity

General labor intensity is 2 credit units.

№	Type of academic load	Totally hours	Semesters	
			1	2
1.	Class exercises (academic hours)	34	34	
	Including:			
1.1.	Lectures			
1.2.	Practical classes	34	34	
2.	Self-study work (academic hours)	38	38	
3.	Total labor intensity (academic hours)	72	72	
	<i>Total labor intensity (credit units)</i>	2	2	

5. Content of the discipline

5.1. The content of the discipline units

№	Discipline unit	Content of the unit
1.	Introduction into Molecular Genetics	History of Molecular Genetics. Important trends and advances in Molecular Genetics.
2	Transfer of genetic material in prokaryotes	Conjugation. Transformation. Transduction
3	Polymerase chain reaction	Polymerase chain reaction. Types of PCR. Detection of amplified products.
4	Genetic engineering. Hybridization methods	Genetic engineering. Vectors. Restriction Enzyme Digest Analysis. Hybridization methods. Types of

		nucleic acid hybridization.
5	DNA sequencing	History of the method. DNA sequencing techniques and their application.
6	Molecular cytogenetic methods	Classical cytogenetics: karyotyping techniques. Fluorescence in situ hybridization (FISH). Comparative genomic hybridization (CGH).
7	Stem cells and genome reprogramming	Types of stem cells and their characteristics. Induced pluripotent stem cells. Nuclear reprogramming technologies. Genome-editing technologies and their application.
8	Methods of epigenetic analysis	Introduction into Epigenetics. Factors influencing the epigenotype. Methods of epigenetic analysis.

5.2. Units of the discipline and types of classes

№	Unit	Lectures	Practical classes and laboratory works		Self-study work	Totally
			S	PC		
1.	Introduction into Molecular Genetics			2	2	4
2.	Transfer of genetic material in prokaryotes			2	2	4
3.	Polymerase chain reaction			4	5	9
4.	Genetic engineering. Hybridization methods			4	6	10
5.	DNA sequencing			4	6	10
6.	Molecular cytogenetic methods			6	7	13
7.	Stem cells and genome reprogramming			6	4	10
8	Methods of epigenetic analysis			6	6	12

6. Practical classes

№	№ of the unit	PC	Labor intensity (hours)
1	1	History of Molecular Genetics. Important trends and advances in Molecular Genetics	2
2	2	Conjugation. Transformation. Transduction	2
3	3	Polymerase chain reaction. Types of PCR	2
4	3	Detection of amplified products	2

5	4	Concepts of genetic engineering	2
6	4	Hybridization methods	2
7	5	DNA sequencing	2
8	5	Modern DNA sequencing techniques	2
9	6	Classical cytogenetics: karyotyping techniques.	2
10	6	Fluorescence in situ hybridization (FISH)	2
11	6	Comparative genomic hybridization	2
12	7	Types of stem cells and their characteristics. Induced pluripotent stem cells.	2
13	7	Nuclear reprogramming technologies.	2
14	7	Genome-editing technologies	2
15	8	Introduction into Epigenetics.	2
16	8	Methods of DNA methylation analysis.	2
17	8	Chromatin Analysis.	2

7. Lab classes are not provided.

8. Equipment and material support of the discipline:

- Pictures
- Computers
- Multimedia projectors
- The PCR laboratory.

9. Academic support:

a) main literature

1. Klug W.S., Cummings M.R., Spencer C.A., Palladio M.A. Concepts of genetics. – Pearson Education International. – 2014.

b) additional literature

1. Fletcher H., Hickey I. Genetics. – Garland Science. – 2013.
2. Lewin B. Genes. – Oxford University Press. – 2012.
3. Vogel and Motulsky's Human Genetics: Problems and Approaches / M. Speicher, Antonarakis S.E., Motulsky A.G. – Springer. – 2010.

10. Data bases, information, reference and search systems:

1. Educational portal of the PFUR - <http://web-local.rudn.ru/web-local/kaf/rj/index.php?id=6>
2. National Center for Biotechnology Information (NCBI) - www.ncbi.nlm.nih.gov

3. Royal Society of Chemistry <http://pubs.rsc.org/>
4. ScienceDirect - <http://www.sciencedirect.com>
5. Scientific electronic library: - <http://elibrary.ru>
6. Google Academy - <http://scholar.google.ru/>
7. Nature - <http://www.nature.com/siteindex/index.html>
8. OxfordJournals - <https://academic.oup.com/journals/>

11. Methodological recommendations on discipline study organization:

During practical classes corresponding topics are studied with the use of computers and multimedia projectors. For all classes Power Point presentations are prepared.

Before every class students must read the corresponding topic in the recommended main and additional text-books and try to answer questions for self-study control.

Self-study work is organized in the class rooms of the department where students may study topics with presentations prepared by the teachers.

Electronic study guides on some topics are also posted in the Internet on the site of the department:

<http://esystem.pfur.ru/>

Out-of-class self-study work includes:

- Learning topics with the use of text-books, study guides;
- Preparation for tests.

12. Evaluation instrument fund

Evaluation instrument fund for discipline “Molecular Genetics in practical Biology and Medicine” including a description of assessment scales, examples of written tests or other materials necessary for the assessment of knowledge, abilities, and skills are available for students at TUIS RUDN.

The program is compiled in accordance with the requirements of the FSES HE.

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