

**Al-Farabi Kazakh National University
Faculty of Biology and Biotechnology
Department of Biotechnology**

Final exam program by discipline

***7M05109* «Modern methods in biotechnology»
Биотехнология” 1 course**

2025

The program of the final exam of the discipline " Modern methods in biotechnology " of the specialty “7М05109, Биотехнология” was compiled by Kenzhebaeva S.S. –Professor of the Department of Biotechnology

Reviewed and approved at a meeting of the Department of Biotechnology

From "28"08 _ 2025, No. 1 __

Head Department _____ Kistaubaeva A.S.

The exam in the discipline " Methods of molecular biotechnology " will be held in writing offline, according to the schedule (exam duration - 120 minutes).

To successfully pass the exam, the student needs to know the following rules:

1. It is necessary to familiarize yourself with the rules for conducting final control in writing offline.
2. Bank of examination questions on the discipline "Risk management of transgenes" contains 45 questions. The database provides 3 types of examination questions:
3. The maximum mark for the exam is 100 points.
4. The exam takes place at a strictly specified time on schedule.
5. 30 minutes before the start, students must prepare for the exam in accordance with the requirements of the instructions.

The bank of examination questions for the discipline is aimed at checking the achievement of learning outcomes and contains questions to test the cognitive (knowledge and understanding of the learning object), system (the ability to synthesize and evaluate information) and functional (the ability to apply and analyze information) competencies.

The bank of test questions for a discipline is aimed at checking the achievement of learning outcomes and contains questions for testing cognitive (knowledge and understanding of the learning object), systemic (ability to synthesize and evaluate information) and functional (ability to apply and analyze information) competencies.

Topics for which assignments will be drawn up

The list of topics submitted for consideration in the final exam in accordance with the syllabus of the discipline. The list of topics should cover lectures, seminars, as well as tasks submitted to the IWS (IWS, IWS).

The exam will include the following sections of the course.

Methods of extraction of nucleic acids from different biological materials

Methods used for cell lysis

Main principles of DNA extraction

Main principles of RNA extraction

Main approaches and methods of molecular biotechnology

Hybridization Conditions and Melting Temperature

Analysis and Characterization of nucleic acids
Important Factors that affect Stringency and Hybridization
Relation between melting temperature and Oligonucleotide concentration
Modification of nuclear acids
Different types of endonucleases and their use in molecular biotechnology
Main principles of electrophoresis for analysis of nucleic acids
Nucleic Acid Detection DNA
Mismatches and single nucleotide polymorphisms (SNPs)
Use of SDS-PAGE for analysis of nuclear
Separation Techniques for different types of DNA
Characterization of DNA cloning techniques
Subclone characterization and use.
Multiple cloning site (MCS) characterization and use in molecular biotechnology.
Sequencing techniques of nuclear acids
Limitations of DNA microarrays.
Preparation of DNA chip and the experiment **Collection and analysis of microarray**
Give characterization of Constructing a DNA library and genomic library
Present the methods of molecular cloning
Describe of sequencing techniques of protein.
Show the methods of blotting for nucleic acids and proteins
To Describe the methods to study transcriptomes and proteomes

Information resources

Main:

John M. Walker. Methods in molecular biology.
Khalid Z. Masoodi, Sameena Maqbool Lone and Rovidha Saba Rasool. Advanced Methods in Molecular Biology and Biotechnology *A Practical Lab Manual* Book. 2021
Santos SS, Nielsen TK, Hansen LH, Winding A. Comparison of three DNA extraction methods for recovery of soil protist DNA. J Microbiol Methods. 2015;115:13-9. Li M, Ishiguro Y, Kageyama K., Zhu Z. A simple method for normalization of DNA extraction to improve the quantitative detection of soil-borne plant pathogenic oomycetes by real-time PCR. Lett Appl Microbiol. 2015 Aug;61(2):179-85.

Dilhari A, Sampath A, Gunasekara C., Fernando N, Weerasekara D., Sissons C., McBain A, Weerasekera M, . Evaluation of the impact of six different DNA extraction methods for the representation of the microbial community associated with human chronic wound infections using a gel-based DNA profiling method. *AMB Express*. 2017 Sep 19;7(1):179.

Maroney, P. A., Chamnongpol, S., Souret, F., Nilsen, T. W. (2008) Direct detection of small RNAs using splinted ligation. *Nat. Protoc.* 3, 279–87.

Curr Protoc Mol Biol. Author manuscript; available in PMC 2014 May 6.

Published in final edited form as: *Curr Protoc Mol Biol.* 2013 Jan; 0 22: Unit–22.1.

1. Glik, B., Pasternak J. Molecular biotechnology. Principles and applications.- M.: “Mir”, 2002. - 589 p.

2.

Additional:

1.J. Schnell, M. Steele, J. Bean, M. Neuspiel, N. Dormann, C. Pearson, A. Savoie L. Bourbonnien`re, P. Macdonald. A comparative analysis of insertional effects in genetically engineered plants: considerations for pre-market assessments. *Rev. Transgenic Res* (2015) 24:1–17.

2.Nathan S. Mosier, Michael R. Ladisch. Modern biotechnology: connecting innovations in microbiology and biochemistry to engineering fundamentals [2009]. ISBN 978-0-470-11485-8

3. Tortora, Gerard J. Microbiology: an introduction [2010]. ISBN-13: 978-0- 321-55007-

4. Madsen, Eugene L. Environmental microbiology [2008].ISBN-13: 978-1- 4051-3647-

5. T.A. Egorova, S.M. Klunova, E.A. Zhivukhin. Fundamentals of biotechnology: a tutorial. - Moscow: "Academy", 2003. - 208 p.

Pershina L.A. Cultivation of isolated cells and tissues of higher plants: a textbook. Part 1. - Novosibirsk: NSU, 2000. – 46 p.

Internet resources:

<https://www.springer.com/series/7651/editors><https://www.khanacademy.org/science/biology/cellular-molecular-biology/mitosis/a/cell-cycle-phases>

<https://www.sciencedirect.com/book/9780128244494/advanced-methods-in-molecular-biology-and-biotechnology><http://www.britannica.com/EB-checked/topic/623731/vascular-system>

<https://www.sciencedirect.com/book/9780444010827/basic-methods-in-molecular->

https://www.researchgate.net/publication/258351786_Methods_in_Molecular_Biology

[https://bio.libretexts.org/Bookshelves/Genetics/Book%3A_Online_Open_Genetics_\(Nickle_and_Barrette-Ng\)/08%3A_Techniques_of_Molecular_Genetics](https://bio.libretexts.org/Bookshelves/Genetics/Book%3A_Online_Open_Genetics_(Nickle_and_Barrette-Ng)/08%3A_Techniques_of_Molecular_Genetics)

RUBRICATOR FOR CRITERIAL ASSESSMENT OF FINAL CONTROL

Discipline: «Plants Physiology» **Form:** written exam, standard form, offline

Platform: IS Univer

Дескрипторы			
Great	Fine	Satisfactorily	UnSatisfactorily

№	Criterion/score	90–100% (27-30 баллов)	70–89% (21-26 баллов)	50–69% (15-20 баллов)	25–49% (8-14 баллов)	0–24% (0-7 баллов)
1 question 33 scores	Understanding the theoretical and practical basis of biochemical modern methods in biotechnology	<i>The answer contains an exhaustive disclosure of the question, a detailed argumentation of each conclusion and statement, is built logically and consistently, supported by examples</i>	<i>The answer contains a full, but not exhaustive coverage of the issue, a shortened argumentation of the main provisions, allows violation of the logic and sequence of the presentation of the material. Stylistic errors and inaccurate use of terms are allowed in the response.</i>	<i>The answer contains incomplete coverage of the issue, the main provisions are superficially reasoned, violations of logic and sequence of presentation of the material are allowed in the presentation, theoretical provisions are not illustrated with practical examples</i>	<i>The answer contains incorrect coverage of the question posed, erroneous argumentation, factual errors, incorrect conclusions.</i>	Ignorance of basic concepts. Violation of the Rules of the final control
2 question 33 scores	Application of methods to study the structural organization and functions of cellular organelles. Based on specific examples, present of biophysical methods to study the structural organization and functions of cellular organelles and practical applications	Full completion of the task, a detailed, reasoned answer to the question, followed by the solution of a practical problem. Consistent, logical and correct justification of scientific provisions and the applied methodology and technology, literacy, compliance with the norms of scientific language, 1-2 inaccuracies in the presentation of the	Partial completion of the task, incomplete, sometimes reasoned answer to a question with an incomplete solution of a practical problem; illiterate use of the norms of scientific language. 3-4 inaccuracies in the use of conceptual material, minor errors in generalizations	The material is presented in fragments, with a violation of logical sequence, factual and semantic inaccuracies are allowed, theoretical knowledge of the course is used superficially. Conclusions on the applicability of sound scientific provisions are vague and unconvincing, there are stylistic and grammatical errors, as well as inaccuracies in	An irrational method of solving a task or an insufficiently thought-out response plan; inability to solve tasks, perform tasks in general; assumption of more than 4 errors and shortcomings; the presence of gross errors; conceptual material and argumentation are poorly used.	The task has not been completed, there are no answers to the questions posed, materials and analysis tools have not been used. Violation of the Rules of the final control.

№	Criterion/score	Дескрипторы				
		Great	Fine	Satisfactorily	UnSatisfactorily	
		90–100% (36–40 баллов)	70–89% (35–28 баллов)	50–69% (27–20 баллов)	25–49% (19–10 баллов)	0–24% (0–9 баллов)
3 question 34scores	Application of molecular methods to study the structural organization and functions of biological compounds. Based on specific examples, present of key molecular methods to study the structural organization and functions of biological components and practical applications	Consistent, logical and correct justification of scientific positions and the applied methodology and technology, literacy, compliance with the norms of scientific language, 1-2 inaccuracies in the presentation of the material are allowed, which do not affect the generally correct you -water (+visualization of justification results using graphical data).	Allowed 3-4 неточности в использовании понятийного материала, незначительные погрешности в обобщениях и выводах, которые не влияют на хороший общий уровень выполнения задания.	Conclusions on the applicability of well-founded scientific principles are vague and unconvincing, there are stylistic and grammatical errors, as well as inaccuracies in processing the results of a practical solution	The task was completed with gross errors, the answers to the questions were incomplete, the conceptual material and argumentation were poorly used.	The task has not been completed, there are no answers to the questions posed, materials and analysis tools have not been used. Violation of the Rules for conducting final control.

Exam tickets consist of 3 questions. For correctly completed tasks, the maximum is 100 points, of which 33 points for the first question, 33 points for the second question, and 34 points for the third question.

Formula for calculating the final grade:

Final grade = score for question 1 + score for question 2 + score for question 3

Additional Information:

Letter Grade	Grade Point Value	Percentage	Conventional Grade
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	Good
B	3,0	80-84	
B-	2,67	75-79	
C+	2,33	70-74	
C	2,0	65-69	Satisfactory
C-	1,67	60-64	
D+	1,33	55-59	

D	1,0	50-54	
FX	0,5	25-49	
F	0	0-24	Failure
I (Incomplete)	-	-	Incomplete (shall not be taken into account when calculating GPA)
AU (Audit)	-	-	Audit (shall not be taken into account when calculating GPA)
Cert.	-	30-60 50-100	"Certification" (shall not be taken into account when calculating GPA)
Uncert.	-	0-29 0-49	"Uncertification" (shall not be taken into account when calculating GPA)
R-difference	-	-	"Discipline difference on curriculum" (shall not be taken into account when calculating GPA)

Dean _____ **Kurmanbayeva M.S.**

Head of Department _____ **Kistaybayeva A.S.**

Lecturer _____ **Kenzhebayeva S.S.**