**Al-Farabi Kazakh National University**

**Faculty of Biology and Biotechnology**

**Department of Biotechnology**

**Final exam program by discipline**

**MMB 7302 «Methods of molecular biotechnology»**

**“8D05105, Биотехнология” 1 course**

2024

The program of the final exam of the discipline "Methods of molecular biotechnology" of the specialty “7M05109, 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 "11"11 \_\_\_ 2024, No. 5 \_\_

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

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| Limitations of DNA microarrays.  |
| Preparation of DNA chip and the experiment **Collection and analysis of microarry** |
| Give characterization of Constructing a DNA library andgenomic 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**

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| **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. 2021Santos 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 ApplMicrobiol[.](https://www.ncbi.nlm.nih.gov/pubmed/25970140) 2015 Aug;61(2):179-85. Dilhari A, Sampath A, Gunasekara C., Fernando N, Weerasekara D., Sissons C., McBain A, WeerasekeraM, . Evaluation of the impact of six diffent 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.

**Additional:**1. J. Schnell, M. Steele, J. Bean, M. Neuspiel, N. Dormann, C. Pearson, A. Savoie L. Bourbonnie`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 р.

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

**Internet resources:**

https://www.springer.com/series/7651/editorshttps://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-biotechnologyhttp://www.britannica.com/EBchecked/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_%28Nickle_and_Barrette-Ng%29/08%3A_Techniques_of_Molecular_Genetics)

**RUBRICTOR FOR CRITERIAL ASSESSMENT OF FINAL CONTROL**

 **Discipline:** «Plants Physiology” **Form:** written exam, standard form, offline  **Platform:** IS Univer

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|  | **Criterion/score** |  **Дескрипторы**  |
|  | **Great** | **Fine** | **Satisfactorily** | **UnSatisfactorily** |
| **№** | **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 question3**3 scores** | Understanding the theoretical basis of Plants Physiology | 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 | 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. | 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 | The answer contains incorrect coverage of the question posed, erroneous argumentation, factual errors, incorrect conclusions. | Ignorance of basic concepts.Violation of the Rules of the final control |
| 2 question3**3 scores** | Application of physiological methods to solve problems of productivity of agricultural pplants. Based on specific examples, present regulations for physiological processes/or explain the use of specific methods 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 material are allowed, which do not affect the conclusions that are generally correct, visualization of the results of the justification, if necessary. | 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 and conclusions that do not affect a good overall level of task performance are allowed. | 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 the processing of the results of a practical solution | 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. |

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|  | **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** | Analysis of the applicability of the key physiological methods to the proposed practical task, justification of the result obtained | 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

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| Additional Information: |
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| **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 | Failure  |
| F | 0 | 0-24 |
| 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. | - | 30-6050-100 | "Certification"(shall not be taken into account when calculating GPA) |
| Uncert. | - | 0-290-49 | "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) |

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**Dean \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Kurmanbayeva M.S.**

**Head of Department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Kistaybayeva A.S.**

**Lecturer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Kenzhebayeva S.S.**