# AL-FARABI KAZAKH NATIONAL UNIVERSITY

# Faculty of Biology and Biotechnology

**Department of Biotechnology**

**Department of Molecular Biology and Genetics**

**Final exam program for the discipline**

OB 2212 “Basic of Biotechnology” /

“6B05101 - Biological Engineering”

2022

The program of the final exam of the discipline "Basic of Biotechnology" specialty "6B05101 - Biological Engineering" was compiled by Ph.D., Acting Professor Akimbekov N.S.; Ph.D., Associate Professor Turasheva S.K.; Ph.D., Associate Professor Amirova A.K.

Reviewed and approved at the meeting of the Department of Biotechnology from 15.02.2022 Protocol No.10

Head of department Kistaubayeva А.S.

Reviewed and approved at the meeting of the Department of Molecular Biology and Genetics from 18.02.2022 Protocol No.9

Head of department Zhunusbaeva Zh.K.

Reviewed and approved at the meeting of the methodological Council of the faculty

From 18.02.2022 Protocol No.9

Chairman of the methodological

Council of the faculty Аsrandina S.Sh.

**Exam form:** written (traditional: answers to questions).

**LMS Univer**

The exam format is **offline**.

The process of passing a written exam involves an **examination card** for a student, to which it is necessary to write the answer by directly entering the text into the system.

# Assessment criteria:

A (90-100%) - the student has thoroughly studied the educational material; consistently and exhaustively answers the questions; freely applies the knowledge gained in practice. B (75-89%) - the student knows the training material; does not make serious mistakes in the answer; he can apply the knowledge gained in practice.

C (60-74%) - the student knows only the main material, and does not always give a clear and complete answer.

D (50-59%) - the student has separate ideas about the material being studied; cannot fully and correctly answer the questions, and makes gross mistakes when answering them.

# Procedure for checking for originality.

The system provides an option for checking responses for originality. Verification is enabled automatically.

# Recommended literature sources for exam preparation

**Literature:**

1. Zayadan B.K. Basics of Biotechnology. - 2019. -427 p.

2. Reinhard Renneberg. Biotechnology for Beginners. - 2007. -426 p.

3. Gladys Alexandre and etc. Advances in applied microbiology. - 2009. -325 p.

4. John Wiley & Sons Ltd. Dictionary of Microbiology and Molecular Biology. - 2006. -315 p.

5. Moselio Schaechter. Encyclopedia of microbiology. Third edition. - 2009. - 451 p.

6. Turasheva S.K. Basics of Biotechnology: Plant Biotechnology. Textbook. Almaty. 2016. -198 p.

7. Acquaah G. 2007. Principles of Plant Genetics and Breeding. Blackwell Publishing, Malden, MA, USA, 569 p.

8. Chrispeels M., Sadava D. 2003. Plants, Genes and Crop Biotechnology. Jones and Bartlett Publishers. Mississauga, ON, Canada, 562 p.

9. Gordon I.R.Reproductive Technologies in Farm Animals. 2004. DOI 10.1079/9780851998626.0000

10. Animal Biotechnology. Technologies, Markets & Companies – Edited by Prof. K.K. Jain. Jain PharmaBiotech. A Jain Pharma Biotech Report. 2013. 215 p.

**Internet sources:**

<http://elibrary.kaznu.kz/ru/>

<https://study.com/academy/lesson/what-is-biotechnology-definition-history-examples.html>

<https://www.edx.org/course/the-science-and-business-of-biotechnology?index=product&queryID=00f7bdcd41964882a27dbd2a9f8dadcf&position=1>

<https://www.coursera.org/learn/industrial-biotech>

# <https://bmcmicrobiol.biomedcentral.com/>

# TOPICS FOR WHICH TASKS WILL BE COMPILED FINAL EXAM PROGRAM

# THEORETICAL:

# Microbial Biotechnology: fundamentals of applied microbiology.

# Inoculum, production media and biomass production in microbial biotechnology.

# Introduction to Concepts and Technologies in Microbial Biotechnology.

# Scientific, technical, and economic aspects of microbial products.

# Prokaryotic cells in biotech production.

# Investigation the potentials of isolated cultures from soil.

# Fermentation Biotechnology: principles, processes, and products.

# Isolation of end masses as fermentation products.

# Bioreactors, fermentation systems and metabolic pathways.

# Investigation the potentials of isolated cultures from fermented products.

**Artificial conditions for cultivation plant cells**

* Ways of plant cells morphogenesis in vitro
* The Stages of the Cellular technologies for production secondary metabolites of plants
* Clonal micropropagation of plants and its advantages
* Methods of clonal micropropagation technology of plants
* Factors affecting on the process of plant micropropagation

**The use micropropagation technology of plants and its prospects**

* The culture of apical meristems
* Methods of diagnosis of infected plants
* Obtaining virus-free plant material
* Method of cell engineering. Theoretical and practical value of cell engineering
* Methods of isolating protoplasts.
* Method cultivation of protoplast in vitro

# The main directions and tasks of modern Animal biotechnology.

# Bioethics issues in Animal biotechnology.

# Objects used in Animal biotechnology.

# Rules for keeping and breeding animals in the laboratory conditions.

**Totipotency, multipotency, pluripotency of animal cells.**

* Hormonal regulation of mammalian reproduction. Sexual cycles.
* Artificial insemination, In vitro fertilization, and embryo transfer in animals.
* Cryopreservation of gametes and embryos. Embryoengineering.
* Animal cloning.

# PRACTICAL:

**Biochemistry and physiology of growth and metabolism of microorganisms.**

* Sterilization in Biotechnology. Types of sterilization. Aseptic techniques.
* Isolation the perspective cultures from soil.
* Isolation the microbial cultures from fermented beverages.
* Isolation the cultures from fermented products.
* Isolation, Cultivation, and Cultural Characterization of Microorganisms.

**Protoplast fusion techniques. Plant regeneration from cultivated protoplasts**

* Somatic hybridization: advantages and disadvantages
* Cell selection
* Methods of cell selection
* Genetic basis of somatic hybridization
* The use of somatic hybridization in plant breeding
* Methods for analysis of hybrid plants

**Haploid technology**

* Genetic Engineering. Current status and prospects of modern genetic engineering
* Vector systems used for plant transformation
* Methods of gene transfer into genome of plants
* Kryoconservation techniques in plant biotechnology

**Stem cells and the perspectives of practical application.**

* Genetic transformation of animal somatic cells.
* Genetic transformation of animals.
* Method of embryonic cloning.
* Cloning method using the somatic cell nuclear transplantation.
* Cloning amphibians. Cloning mammals.