**Al-Farabi Kazakh National University**

**Faculty of Biology and Biotechnology**

**Department of Biotechnology**

**Final exam program by discipline**

**« Biotechnology of Agricultural plants»**

**7M05109 Biotechnology 1 course**

2023

The program of the final exam of the discipline "Biotechnology of agricultural plants" of the specialty 7M05109 Биотехнология,was compiled by Kenzhebayeva S.S. –Professor of the Department of Biotechnology

Reviewed and approved at a meeting of the Department of Biotechnology

From "\_\_\_" \_\_\_ 2023, No. \_\_

Head Department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Kistaubaeva A.S.

**The final exam form for the discipline is testing in an Univer system standart.**

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.**

Plants biotechnology. Micropropagation technologies of plants. Technology for production of virus-free plants. Cell engineering of plants. Cell selection. Somatic Embryogenesis Major Steps of Tissue Culture. Plant tissue cultures, types, techniques, process and their application. Methods of organ culture and protoplast culture. Techniques used to create recombinant DNA. Sexual reproduction: natural selective breeding, hybridization, gene splicing. Genetic modification. Creating a genetically modified organisms as a multi-step process. Preparation of vector DNA. Choice of host organism and cloning vector. Gene cloning using plasmids,  [b](https://image1.slideserve.com/3090721/gene-cloning-using-viruses-l.jpg)acteriophage and bacterial artificial chromosome. Agrobacterium tumefaciens for genetic engineering. Agrobacterium‐mediated transformation of a plant cell. Mechanisms of infection process for further increases in the efficiency of *Agrobacterium*‐mediated transformation. Agroinfiltration. Production of plants doubled haploids (DHs) and their applications plant breeding.

Plant breeding for organic agriculture. Organic farming, food supply, and the environment.

Organic plant breeding. Methods and tools.

# CRISPR-Based Genome Editing for Nutrient Enrichment in Crops: A Promising Approach Toward Global Food Security.

The use of DNA markers in molecular breeding. Marker assisted selection (MAS).

A quantitative trait locus (QTL).

**Main:**

### Rajmohan Joshi. Agricultural Biotechnology [2006] India, 272 P, ISBN 81-8205-380-3-272.

1. H. D. Kumar · Agricultural Biotechnology [2005]. Daya Publishing House, ISBN 8170354129, 9788170354123. P. 407.
2. Eugene W. Nester and etc. Microbiology: a human perspective, sixth edition [2011]. ISBN 978–0–07–299543–5
3. Prescott, Harley, and Klein’s microbiology, seventh edition [2008]. ISBN 978–0–07–299291–5
4. Nathan S. Mosier, Michael R. Ladisch. Modern biotechnology: connecting innovations in microbiology and biochemistry to engineering fundamentals [2009]. ISBN 978-0-470-11485-8
5. Tortora, Gerard J. Microbiology: an introduction [2010]. ISBN-13: 978-0- 321-55007-
6. Madsen, Eugene L. Environmental microbiology [2008].ISBN-13: 978-1- 4051-3647-
7. T.A. Egorova, S.M. Klunova, E.A. Zhivukhin. Fundamentals of biotechnology: a tutorial. Moscow: "Academy", 2003. 208 P.
8. Pershina L.A. Cultivation of isolated cells and tissues of higher plants: a textbook. Part 1. - Novosibirsk: NSU, 2010. – 46 р.

**Additional:**

# Wanjohi L., Mwambur L., Too E., Loo B., Kosgei J. Isolation and identification of bacteria for bioremediation potential of oil spills in lake Nakuru, KENYA. Asian Jr. of Microbiol. Biotech. Env. Sc. 2015, Vol. 17, No. (4): 831-838.

# Editors: **Segev**, Nava (Ed.) Trafficking Inside Cells Pathways, Mechanisms and Regulation 2009.

1. Kristiina Himanen (2015). Cell cycle regulation during plant growth and development, Jörg D. Becker (2012) Decision- Making in the Plant Cell Cycle. Canal BQ-n.9.

**Internet resources:**

* <https://www.biologydiscussion.com/biotechnology/microbial-polysaccharides-application-production-and-features/10412>
* <https://link.springer.com/chapter/10.1007/978-981-15-2604-6_11>
* <https://www.researchgate.net/publication/260201214_Production_of_microbial_polysaccharides_for_use_in_food>
* [https://www.sciencedirect.com/science/article/pii/B9780857093431500214#:~:text=Currently%20there%20are%20some%20vitamins,or%20more%20microbial%20enzymatic%20step](https://www.sciencedirect.com/science/article/pii/B9780857093431500214).