**Al-Farabi Kazakh National University**

**Faculty of Biology and Biotechnology**

**Department of Biotechnology**

**Final exam program by discipline**

**«Waste management »**

*6B05101 Biological Engineering, full-time,*

**3 course**

2023

The program of the final exam of the discipline " **Waste management** " of the specialty *6B05101 Biological Engineering,*

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 writing form on Univer system .**

The exam in the discipline "Waste management" will be conducted in the form of writing form on Univer system, according to the schedule (exam duration - 60 minutes).

Для успешного прохождения экзамена студенту необходимо знать следующие правила:

1. Необходимо ознакомиться с правилами проведения итогового контроля в форме тестирования в системе Univer, размещенными на сайте dl.kaznu.kz,
2. Банк экзаменационных вопросов по дисциплине " Waste management" содержит 60 вопросов.

 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.**

Waste management or waste disposal includes the processes and actions required to manage [waste](https://en.wikipedia.org/wiki/Waste) from its inception to its final disposal. This includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process and waste-related laws, technologies, economic mechanisms.

Waste can be solid, liquid, or gases and each type have different methods of disposal and management. Waste management deals with all types of waste, including industrial, biological, household, municipal, organic, [biomedical](https://en.wikipedia.org/wiki/Biomedical), [radioactive wastes.](https://en.wikipedia.org/wiki/Radioactive_waste) In some cases, waste can pose a threat to human health.

 Health issues are associated throughout the entire process of waste management. Health issues can also arise indirectly or directly: directly through the handling of solid waste, and indirectly through the consumption of water, soil and food. Waste is produced by human activity, for example, the extraction and processing of raw materials.

Waste management is intended to reduce adverse effects of waste on human health, the environment, planetary resources and aesthetics.

The aim of waste management is to reduce the dangerous effects of such waste on the environment and human health. A big part of waste management deals with municipal solid waste, which is created by industrial, commercial, and household activity.

Proper management of waste is important for building sustainable and liveable cities, but it remains a challenge for many developing countries and cities.

Principles of waste management

Waste hierarchy

Life-cycle of a product

**Information resources**

**Main:**

**Literature:\*\***

1. Waste to Resources. A Waste Management Handbook. The Energy and Resources Institute, 2014. P. 90.

Zero Waste: Management Practices for Environmental Sustainability by Ashok K. Rathoure

Call Number: TD793.9 .Z47 2020

ISBN: 9780367180393, 2019.

Waste Management by Er Sunil Kumar P. 240

Wastewater Management Through Aquaculture by B. B. Jana (Editor); R. N. Mandal (Editor); P. Jayasankar (Editor)

Call Number: TD755 .W294 2018

ISBN: 9789811072475, 2018

Household Recycling and Consumption Work by Kathryn Wheeler; Miriam Glucksmann

Call Number: HD4482 .W47 2015

ISBN: 1137440430, 2015

Natural Wastewater Treatment Systems, Second Edition by Ronald W. Crites; E. Joe Middlebrooks; Robert K. Bastian

Call Number: TD755 .C75 2014

ISBN: 1466583266, 2014

Waste Management Practices by John Pichtel

Call Number: TD791 .P46 2014

ISBN: 1466585188, 2014

Principles of Sustainability by Donald Franceschetti (Editor)

Call Number: GE196 .P75 2017

ISBN: 9781682176078, 2017

[Sustainable Solid Waste Management by Ni-Bin Chang](https://wisconsin-uwsp.primo.exlibrisgroup.com/permalink/01UWI_SF/1c32tab/cdi_askewsholts_vlebooks_9781118964545)

ISBN: 1118964543, 2015

Publication Date: 2015

1. Gollakota, Anjani R. K.; Gautam, Sneha; Shu, Chi-Min (1 May 2020). "Inconsistencies of e-waste management in developing nations – Facts and plausible solutions". *Journal of Environmental Management*. 2617
2. Gollakota, Anjani R. K.; Gautam, Sneha; Shu, Chi-Min (1 May 2020). "Inconsistencies of e-waste management in developing nations – Facts and plausible solutions". *Journal of Environmental Management*. **261**7.
3. Cook, E.; Velis, C. A. (6 January 2021). "Global Review on Safer End of Engineered Life". *Global Review on Safer End of Engineered Life*.
4. [Journal of Environmental Economics and Management](https://en.wikipedia.org/wiki/Journal_of_Environmental_Economics_and_Management)
5. Chen, Dezhen; Yin, Lijie; Wang, Huan; He, Pinjing (December 2014). "Pyrolysis technologies for municipal solid waste: A review". Waste Management.
6. Ding, Yin (2021). "A review of China's municipal solid waste (MSW) and comparison with international regions: Management and technologies in treatment and resource utilization". Journal of Cleaner Production. **293**: 126144
7. Types of Recycling". *ISM Waste & Recycling*.  February 2020.
8. Segregation of waste". *The Nation*. 2 February 2019.

**Internet resources:**

Internet resources (at least 3-5)

1. http://elibrary.kaznu.kz/ru

2. [Waste Valorization"](https://www.aiche.org/topics/energy/waste-valorization). *www.aiche.org*. Retrieved 17 June 2021.

3.  "what is recycling". What is Recycling. 28 September 2020 – via conserve energy future.

4. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4484336>

[Energies"](http://www.mdpi.com/journal/energies). *www.mdpi.com*. [Archived](https://web.archive.org/web/20201011025330/https%3A/www.mdpi.com/journal/energies) from the original on 11 October 2020**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).