Non-profit Joint-stock Company "SHAKARIM UNIVERSITY"		
Level 4 QMS document	Edition № 1 02.03.2026	FP 042-2.07-2026
The program of the entrance exams to PhD-doctoral studies in the educational program		

Research School Food Engineering

Department of Bioengineer systems

The program of the entrance exams to PhD-doctoral studies in the group of educational programs D103 Mechanics and Metalworking

Semey – 2026

1 DEVELOPED

Compilers:

Kabulov B., Cand. Sc. (Tech.), Associate Professor of the Department of Bioengineer systems

(signature) «24» 02 2026

Abdilova G., Cand. Sc. (Tech.), Associate Professor of the Department of Bioengineer systems

(signature) «24» 02 2026

2 DISCUSSED

At the meeting of the department of Bioengineer systems

Protocol № 7 "24" 02 2026.

Head of the Department (signature) "24" 02 2026 Bekbayev K.
(full name)

3 AGREED

Head of the CTCSP (signature) «02» 03 2026 Kassymov S.
(full name)

4 APPROVED

Member of the Management Board
Vice- Rector for Science (signature) «02» 03 2026 Kalibekkyzy Zh.
(full name)

1. Introduction

The program of the entrance exam in the special discipline of doctoral studies is formed in the scope of the program of the previous stage of higher education (master's degree).

The main requirements for the level of training of specialists in the educational program "Technological machines and equipment":

Applicants for PhD-doctoral studies must

have an idea:

- about current trends in the development of the food industry;
- about the nutritional and biological value of meat and dairy products;
- on the factors determining the main indicators of the quality of raw materials in the meat and dairy industry;
- about the factors determining the main indicators of the quality of raw materials after its grinding.

To know:

- basic (basic) laws of the course on the educational program «Technological machines and equipment»;
- possess the skills and techniques of using this knowledge for theoretical and practical purposes;
- classification of food raw materials, semi-finished products, food products, technological processes for processing raw materials.

be able to:

- to carry out research on the structural and mechanical characteristics of food products;
- to carry out the design of enterprises of the meat and dairy industry;
- to understand the essence of the basic methods used in the design of meat and dairy industry enterprises.

have skills:

in solving typical design tasks of the course on the educational program «Technological machines and equipment», an understanding of the modern problems of the meat and dairy industry, an understanding of the essence of the main methods used in food research.

be competent:

demonstrate basic knowledge in the field of verification and design calculations of basic devices and machines of the food industry.

The doctoral entrance exam is conducted in written or computer format in accordance with the Model Regulations for admission to studies in educational organization, implementing educational programs of technical and vocational education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan of October 31, 2018 № 600.

2. The name of the discipline and its main sections

«TECHNOLOGICAL PROCESSES AND DEVICES OF FOOD PRODUCTION – 1»

General principles of calculation of technological processes and devices of food production. Fundamentals of modeling processes and devices. Fundamentals of the theory of similarity. Mechanical processes. Grinding. Cutting. Pressing. Sorting. Hydromechanical processes. Precipitation. Centrifugation. Filtration. Mixing. Dispersion. Fluidization. Granulation. Separation of gas heterogeneous systems.

Literature:

1. Yerengaliev A.E., Maslennikov S.L., Kakimov A.K., Tusipov N.O. Design of processes and devices of food production. A study guide. Shakarim SSU, 2008 – 208 p. (recommended by the Ministry of Education and Science of the Republic of Kazakhstan).

2. Kasenov A.L. Theoretical foundations of the intensification of heat and mass exchange processes in the production of animal feed – Semipalatinsk: SSU named after Shakarima, 2006. – 210 p.

3. Plaksin Yu.M., Malahov N.N., Larin V.A. Processy i apparaty pishchevyh proizvodstv. – 2-e izd., pererab. i dop. - M.: KolosS, 2017. – 760 p.

4. Tusipov N.O., Akimov A.A., Erengaliev A.E., Maslennikov S.L. Tekhnologicheskie processy i apparaty pishchevyh proizvodstv: praktikum k laboratornym rabotam – 2017.

5. A.N. Ostrikov, O.V. Abramov, A.V. Loginov et al. Processy i apparaty pishchevyh proizvodstv: ucheb. dlya vuzov; pod red. A.N. Ostrikova. — SPb.: GIORD, 2012. — 616 p.: il.

6. Teplyashin, V. N. Processy i apparaty pishchevyh proizvodstv [Elektronnyj resurs]: uchebnoe posobie / V. N. Teplyashin, L. I. Chencova, V. N. Nevzorov, I. V. Mackevich; Krasnoyarskij gosudarstvennyj agrarnyj universitet. – Krasnoyarsk, 2022. – 273 p.

«TECHNOLOGICAL PROCESSES AND DEVICES OF FOOD PRODUCTION – 2»

Heat exchange processes. Fundamentals of heat transfer. The equation of thermal balance. The similarity of thermal processes. Evaporation. Mass transfer processes. Fundamentals of mass transfer. Drying. Absorption. Adsorption. Distillation of liquids. Rectification. Extraction. Crystallization.

Literature:

1. Yerengaliev A.E., Maslennikov S.L., Akimov A.K., Tusipov N.O. Design of processes and devices of food production. A study guide. Shakarim SSU, 2008 – 208 p. (recommended by the Ministry of Education and Science of the Republic of Kazakhstan).

2. Tusipov N.O., Akimov A.A., Erengaliev A.E., Maslennikov S.L. Tekhnologicheskie processy i apparaty pishchevyh proizvodstv: praktikum k laboratornym rabotam. – 2017.

3. Plaksin Yu.M., Malahov N.N., Larin V.A. Processy i apparaty pishchevyh proizvodstv. – 3-e izd., pererab. i dop. - M.: KolosS, 2017. – 760 p.

4. Kaveckij G.D. Processy i apparaty pishchevoj tekhnologii: uchebnik / G.D Kaveckij, B.V. Vasil'ev .- M: Kolos, 2000.

«TECHNOLOGICAL EQUIPMENT OF MEAT AND DAIRY INDUSTRY ENTERPRISES - 1»

The concept of technological equipment, classification, basic parameters. The speeds of the kinetics and movement of the product in the equipment. Working bodies of technological equipment. Suspension tracks. Installations for shooting skins in the meat industry. Machines with cutting working bodies. Machines with flexible and roller working bodies. Equipment based on drum, irrigation, spraying working bodies. Equipment based on screw and screw working bodies, the basics of their calculation. Equipment based on blade working bodies. Equipment for separating products in the field of gravity. Pressing equipment, calculation basics. Classification of methods and methods of heat treatment of meat products.

Literature:

1. Yerengaliev A.E., Akimov M.M., Kabulov B.B., Abdilova G.B. Technological equipment of the meat industry. A study guide. – Families: SSU named after him. Shakarima, 2015 – 239 p.

2. A.E. Yerengaliev, G.B. Abdilova, G.A. Zhumadilova. Technological equipment of the dairy industry . A study guide. ISBN 978-601-313-157-3. Recommended by the Academic Council. NAO "Shakarim University of Semey", No. 9 dated 05/31/2023 - 2023 - 300 p.

3. Kabulov B.B., Yerengaliev A.E., Kakimov A.K., Kakimova J.H. Equipment for mechanical processing of meat and dairy products - Families: Shakarim SSU, 2010. – 236 p.

4. Zolin V.P. Technological equipment of public catering enterprises: - M. Academy , 2006 – 245 p .

5. Ivashov V.I. Technological equipment of meat industry enterprises. – M.: Kolos, 2001. – 551 p.

«TECHNOLOGICAL EQUIPMENT OF MEAT AND DAIRY INDUSTRY ENTERPRISES - 2»

General characteristics of dairy equipment. Reservoirs of the dairy industry. Technological and thermal calculations. The device of pumps in the dairy industry. General information about homogenization. General information about the separation

process, classification of separators. Fundamentals of the theory of centrifugal separation. General characteristics of heat exchangers in the dairy industry. Classification of milk sterilization equipment. Equipment for the production of butter. Equipment for the production of ice cream. Cheese production equipment, technology features and equipment classification. Equipment for the production of cottage cheese. Technological calculations of equipment for the production of protein dairy products. Equipment for finishing operations for washing containers. Equipment for filling milk.

Literature:

1. Yerengaliev A.E., Akimov M.M., Kabulov B.B., Abdilova G.B. Technological equipment of the meat industry. A study guide. – Families: SSU named after him. Shakarima, 2015 – 239 p.

2. A.E. Yerengaliev, G.B. Abdilova, G.A. Zhumadilova. Technological equipment of the dairy industry . A study guide. ISBN 978-601-313-157-3. Recommended by the Academic Council. NAO "Shakarim University of Semey", No. 9 dated 05/31/2023 - 2023 - 300 p.

3. Dubrovin P.V. et al. Technological equipment of public catering enterprises: textbook – Pavlodar, 2006, - 516 p.

4. Yerengaliev A.E. Biotechnological equipment: textbook. a student's manual.universities – Semipalatinsk: Tengri, 2006.-295 p.

5. Zolin V.P. Technological equipment of public catering enterprises: - M. Academy , 2006 – 245 p .

6. A.E. Erengaliev, G.B. Abdilova, N.O., Tusipov, A.G. Dzhilkisheva. Tekhnologicheskoe oborudovanie dlya termicheskoj obrabotki pishchevyh produktov. Uchebnoe posobie. – Semej, 2022. – 185 p.

7. Golubev I.G., Gorin V.M., Parfen't'eva A.I., Konovalenko L.Yu. Mashiny i oblorudovanie dlya pererabotki moloka. Katalog. – M.: FGNU «Rosinformagrotekh», 2016. – 348 p.

8. Bredihin S.A. Tekhnologicheskoe oborudovanie pererabotki moloka: uchebnoe posobie / S.A. Bredihin: Sankt-Peterburg: Lan', 2018. – 412 p.

«REPAIR OF TECHNOLOGICAL MACHINES»

Ways to ensure the normal operation of technological equipment. Fundamentals of scientific methods for solving repair problems. Basics of planning repair work. Organization of scheduled preventive maintenance of equipment. Categories of repair complexity. Simple equipment repair. Wear and reliability of the equipment. Organization of rigging works. Revision of equipment, assembly of detachable and non-removable connections. Installation of bearings. Alignment of shafts, couplings, gears. Balancing rotating parts. Lubrication of equipment. Running-in at idle and under load. Fundamentals of repair technology for machines, their components and parts. Restoration of details. Requirements for restored parts and recovery methods. Repair of critical machine parts

and assemblies. Repair of threaded, keyed, pin and cotter joints. Repair of moving parts of assembly units and mechanisms. Repair of gears.

Literature:

1. Kabulov B.B., Dorokhov V.P., Kosoy V.D., Ryzhov S.A., Kakimov A.K., Azarova N.G. Mechanical processing of meat and meat and bone raw materials - M.: Publishing house "Delhi plus", 2011. - 470 p.

2. Farzane N.G., Iliyasov L.V., Azim-zadeh A.Yu. Technological measurements and devices. - M.: Higher School, 2005. - 456 p.

3. Afanasyeva R.F. et al. Ventilation. Equipment and technologies: an educational and practical guide. – M.: Stroyinform, 2007. - 418 p.

4. K.V. Krasov. Repair and installation of equipment of dairy industry enterprises. - M.: Light and food industry, 2002.

5. Galperin D.M., Milovidov G.V. Technology of installation, commissioning and repair of food production equipment. – M.: Agropromizdat, 1990. – 399 p.

6. V.V. Ilyuhin, I.M. Tambovcev. Montazh, naladka, diagnostika i remont oborudovaniya predpriyatij myasnoj promyshlennosti. – Spb.: GIORD, 2017. – 456 p.

7. A.A. Seregin, S.P. Psyukalo, A.G. Sergienko, V.A. Luhanin, E.V. Usova. Nadezhnost' i remont mashin: uchebnoe posobie dlya kursovogo proektirovaniya i vypusknoj kvalifikacionnoj raboty bakalavrov. – Zernograd: Azovo-Chernomorskij inzhenernyj institut FGBOU VO Donskoj GAU, 2019. – 197 p.

8. A.N. Batishchev. Montazh, ekspluataciya i remont tekhnologicheskogo oborudovaniya: uchebnik / Pod red. – M.: KolosS, 2017. – 423 p.

«CALCULATION AND DESIGN OF TECHNOLOGICAL EQUIPMENT»

Elements of plate theory. Elements of shell theory. The choice of the calculation scheme. Capacitive and heat exchangers. Design features. Cylindrical vertical devices. Calculation of cylindrical housings for strength. Shell-and-tube heat exchangers. Reliability and durability of capacitive and heat exchangers. The simplest rotary machines. Design features. Rotary machines. Design features.

Literature:

1. Akimov M.M., Yerengaliev A.E., Mustafayeva A.K. Calculation and design of technological equipment for food production: Textbook – Semey: Shakarim State University. – 2014. - 180 p.

2. Pirogova O.O., Akimov M.M. Course design: - Semipalatinsk, 2002. -153 p.

3. V.I. Sokolov. Fundamentals of calculation and design of food production machines and automata. - M.: "Mechanical Engineering", 2002.

4. Sokolov V.M. Fundamentals of calculation and design of machines and devices for food production. - M.: Kolos, 1992. - 399 p.

5. Ostrikov A.N., Abramov O.V. Raschet i konstruirovanie mashin i apparatov pishchevyh proizvodstv. Uchebnik dlya vuzov. - SPb: GIORD, 2013. - 352 p.

6. Petrov V.I. Osnovy rascheta i konstruirovaniya mashin i apparatov pishchevyh proizvodstv. Uchebnoe posobie. - Kemerovo: KTIPP, 2012. - 116 p.

3. List of recommended literature

1. Yerengaliev A.E., Maslennikov S.L., Kakimov A.K., Tusipov N.O. Design of processes and devices of food production. A study guide. Shakarim SSU, 2008 – 208 p. (recommended by the Ministry of Education and Science of the Republic of Kazakhstan).

2. Kasenov A.L. Theoretical foundations of the intensification of heat and mass exchange processes in the production of animal feed – Semipalatinsk: SSU named after Shakarima, 2006. – 210 p.

3. Plaksin Yu.M., Malahov N.N., Larin V.A. Processy i apparaty pishchevyh proizvodstv. – 2-e izd., pererab. i dop. - M.: KolosS, 2017. – 760 p.

4. Tusipov N.O., Akimov A.A., Erengaliev A.E., Maslennikov S.L. Tekhnologicheskie processy i apparaty pishchevyh proizvodstv: praktikum k laboratornym rabotam. – 2017.

5. A.N. Ostrikov, O.V. Abramov, A.V. Loginov et al. Processy i apparaty pishchevyh proizvodstv: ucheb. dlya vuzov; pod red. A.N. Ostrikova. — SPb.: GIORD, 2012. — 616 p.: il.

6. Teplyashin, V. N. Processy i apparaty pishchevyh proizvodstv [Elektronnyj resurs]: uchebnoe posobie / V. N. Teplyashin, L. I. Chencova, V. N. Nevzorov, I. V. Mackevich; Krasnoyarskij gosudarstvennyj agrarnyj universitet. – Krasnoyarsk, 2022. – 273 p.

7. Kaveckij G.D. Processy i apparaty pishchevoj tekhnologii: uchebnik / G.D Kaveckij, B.V. Vasil'ev .- M: Kolos, 2000.

8. Yerengaliev A.E., Akimov M.M., Kabulov B.B., Abdilova G.B. Technological equipment of the meat industry. A study guide. – Families: SSU named after him. Shakarima, 2015 – 239 p.

9. A.E. Yerengaliev, G.B. Abdilova, G.A. Zhumadilova. Technological equipment of the dairy industry . A study guide. ISBN 978-601-313-157-3. Recommended by the Academic Council. NAO "Shakarim University of Semey", No. 9 dated 05/31/2023 - 2023 - 300 p.

10. Kabulov B.B., Yerengaliev A. E., Kakimov A.K., Kakimova J.H. Equipment for mechanical processing of meat and dairy products - Families: Shakarim SSU, 2010. – 236 p.

11. Dubrovin P.V. et al. Technological equipment of public catering enterprises: textbook – Pavlodar, 2006, - 516 p.

12. V.A. Panfilov, V.Ya. Grudanov. Machines and apparatuses of food production Volume 1. Edited by academician Raskhn. - 2008. - 239 p.

13. Zolin V.P. Technological equipment of public catering enterprises: - M. Academy, 2006 – 245 p.

14. A.E. Erengaliev, G.B. Abdilova, N.O., Tusipov, A.G. Dzhilkisheva. Tekhnologicheskoe oborudovanie dlya termicheskoj obrabotki pishchevyh produktov. Uchebnoe posobie. – Semej, 2022. – 185 p.

15. Golubev I.G., Gorin V.M., Parfen't'eva A.I., Konovalenko L.Yu. Mashiny i oblorudovanie dlya pererabotki moloka. Katalog. – M.: FGNU «Rosinformagrotekh», 2016. – 348 p.

16. Bredihin S.A. Tekhnologicheskoe oborudovanie pererabotki moloka: uchebnoe posobie / S.A. Bredihin: Sankt-Peterburg: Lan', 2018. – 412 p.

17. Farzane N.G., Iliyasov L.V., Azim-zade A.Yu. Technological measurements and devices. - M.: Higher School, 2005. - 456 p.

18. Afanasyeva R.F. et al. Ventilation. Equipment and technologies: an educational and practical guide. – M.: Stroyinform, 2007. - 418 p.

19. K.V. Krasov. Repair and installation of equipment of dairy industry enterprises. - M.: Light and food industry, 2002.

20. Galperin D.M., Milovidov G.V. Technology of installation, commissioning and repair of food production equipment. – M.: Agropromizdat, 1990. – 399 p.

21. V.V. Ilyuhin, I.M. Tambovcev. Montazh, naladka, diagnostika i remont oborudovaniya predpriyatij myasnoj promyshlennosti. – Spb.: GIORD, 2017. – 456 p.

22. A.A. Seregin, S.P. Psyukalo, A.G. Sergienko, V.A. Luhanin, E.V. Usova. Nadezhnost' i remont mashin: uchebnoe posobie dlya kursovogo proektirovaniya i vypusknoj kvalifikacionnoj raboty bakalavrov. – Zernograd: Azovo-Chernomorskij inzhenernyj institut FGBOU VO Donskoj GAU, 2019. – 197 p.

23. A.N. Batishchev. Montazh, ekspluataciya i remont tekhnologicheskogo oborudovaniya: uchebnik / Pod red. – M.: KolosS, 2017. – 423 p.

24. Akimov M.M., Yerengaliev A.E., Mustafayeva A.K. Calculation and design of technological equipment for food production: Textbook – Semey: Shakarim State University. – 2014. - 180 p.

25. Pirogova O.O., Akimov M.M. Course design: - Semipalatinsk, 2002. -153 p.

26. V.I. Sokolov. Fundamentals of calculation and design of food production machines and automata. - M.: "Mechanical Engineering", 2002.

27. Sokolov V.M. Fundamentals of calculation and design of machines and devices for food production. - M.: Kolos, 1992. - 399 p.

28. Ostrikov A.N., Abramov O.V. Raschet i konstruirovanie mashin i apparatov pishchevyh proizvodstv. Uchebnik dlya vuzov. - SPb: GIORD, 2013. - 352 p.

29. Petrov V.I. Osnovy rascheta i konstruirovaniya mashin i apparatov pishchevyh proizvodstv. Uchebnoe posobie. - Kemerovo: KTIPP, 2012. - 116 p.

30. Vorobyova N.I. Fundamentals of automation of technological processes in the meat and dairy industry – M.: Light and food industry, 2003, -326 p.

31. G.V. Tverdohleb, V.N. Alekseev, F.S. Sokolov. Tekhnologiya moloka i molochnyh produktov. Kiev: Vysshaya shkola, 2008. - 408 p.

32. Ivashov V.I. Technological equipment of meat industry enterprises. – M.: Kolos, 2001. – 551 p.

33. Yerengaliev A.E. Biotechnological equipment: textbook. a student's manual.universities – Semipalatinsk: Tengri, 2006.-295 p.

34. Kabulov B.B., Kakimova J.H., Kakimov A.K., Zharykbasova K.S., Yessimbekov J.S., Moldabaeva J.K. Modern technologies for the production of dairy products - Semey: Publishing house "Tengri", 2011. - 99 p.

35. Krus G.N. Milk technology and equipment of dairy industry enterprises: Textbook - M. Agropromizdat, 2006. - 280 p.

36. Demsky A.B. Equipment for the production of flour, cereals and compound feeds: Handbook- Delhi print, 2005. - 760c.

37. Ilyukhin V.I. Technological equipment of meat industry enterprises: textbook for technical schools – Kolos, 2001. - 552 p.

38. Kabulov B.B., Urazbaev Z.Z., Ualiev S.N., Kakimov A.K. Fundamentals of mechanical processing of raw materials of animal and vegetable origin and technology of production of combined meat products - Semey: RIO Semipalatinsk State University named after Shakarim, 2010. - 260 p.

39. Kabulov B.B., Dorokhov V.P., Kosoy V.D., Ryzhov S.A., Kakimov A.K., Azarova N.G. Mechanical processing of meat and meat and bone raw materials - M.: Publishing house "Delhi plus", 2011. - 470 p.

40. Kabulov B.B., Kakimova Zh.Kh., Kakimov A.K., Zharykbasova K.S., Yessimbekov Zh.S., Moldabaeva Zh.K. Theoretical foundations and equipment of mechanical processing of meat and meat and bone raw materials - Monograph. – Semey: Publishing house «Tengri», 2012. – 260 p.