

Catalog of elective subjects

1. Department: of chemical disciplines, Biology and Biochemistry

2. Level of preparation: baccalaurea

3. Specialty: 6B10106 – Pharmacy boosters

4. Course: 1

5. Name of elective discipline: "Physical and colloid chemistry"

6. Amount of credits: 4

7. Purpose: To form knowledge of the general theoretical foundations of physical and colloid chemistry and train in the application of the knowledge and skills acquired during the analysis of medicinal substances at all stages of their manufacture and quality control of medicinal forms.

8. Tasks: - to form students' understanding of the patterns of the course of physicochemical processes.

- To give knowledge of the basic concepts and laws of thermodynamics.

- to form an idea about the properties of diluted solutions.

- to give an idea of the thermodynamics of electrolyte solutions, methods for measuring the pH of solutions, the properties of buffer solutions.

- to form an idea about the basic concepts and methods of electrochemistry.

- to give an idea of the kinetics of chemical reactions and catalysis.

- to form an understanding of dispersed systems and surface phenomena.

- to acquaint with physical and chemical methods of measurements.

9. Justification of the choice of discipline:

Physical and colloidal chemistry is one of the main disciplines in the field of pharmaceutical education, which has a significant role in the preparation of highly qualified specialists - pharmacists. This item forms chemical thinking, determines the patterns of physical and chemical processes and the conditions for achieving chemical equilibrium, teaches to analyze and draw conclusions about the influence of external factors, the nature of substances on the course of chemical reactions.

10. Justification of the choice of discipline: The formation of theoretical knowledge and practical skills of physical and chemical laws in the preparation of drugs is the basis of teaching physical and colloidal chemistry. Physical and colloidal chemistry is the basis of such special disciplines as pharmaceutical chemistry, technology of synthetic drugs, pharmacognosy. technology of phytopreparations, technology of medicines, etc. This implies the great importance of physical and colloidal chemistry as an important academic discipline, the development of which is given great importance in the system of pharmaceutical education.

11. Learning outcomes

Knowledge (cognitive sphere)	Skills and abilities (psychomotor sphere)	Personal and professional competencies (relationships)
- the general theoretical foundations of physical and colloid chemistry for the application of the acquired knowledge and skills at all stages of manufacturing and quality control of drugs; - general energy and kinetic patterns of chemical processes; - laws governing the physicochemical processes and the conditions for achieving chemical equilibrium;	- solves all typical tasks in physical and colloid chemistry; - owns the skills of experimental determination of the thermal effect of chemical reactions. - able to determine the osmotic pressure of solutions; -prepare buffer solutions with a given pH value. -determines the rate constants of chemical reactions. - able to determine the coefficient of surface tension	- informs and explains the observed patterns in the field of physical and physic chemist chemistry regarding their use in pharmacy; - transmits information obtained from educational, reference, scientific literature and Internet resources; - demonstrates the ability to work in a team, conduct a discussion, discuss the results of laboratory work on physical and colloidal chemistry. - uses skills and abilities in the field of physical and colloid chemistry to

	of the liquid according to the method of detachment of drops; - prepares stable colloidal systems and emulsions, determines the degree of their stability; - determines the molecular weight, size and degree of swelling of the polymer.	perform R & D, draws up the results in the form of an abstract, presentations, reports and presents at meetings of the student circle, student scientific conferences, etc.
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12. Prerequisites: inorganic chemistry.

13. Post requisites: analytical chemistry, organic chemistry, toxicological chemistry.

14. Literature

The main:

1. Belyaev A.P., Kuchuk V.I., Evstratova K.I., Kupina N.A. Physical and colloidal chemistry. M.: GEOTAR-Media 2008.

2. Verentsova L.G., Nechepurenko E.V. Inorganic, physical and colloid chemistry. –Almaty: Evero Publishing, 2014.

Additional:

1. Evstratova K.I., Kupina N.A., Malakhova N.E. Physical and colloidal chemistry. M.: High School. 1990

2. Krasnov K.S., Vorobev N.K., Godnev I.N. and others. Physical chemistry. In 2 books. M.: Higher School, 2001.

Additional:

1. Utelbaev B.T. Chemistry 2 vol. - Shymkent, 2000.

2. Musabekov K.B., bдиеv K.ZH. Colloidty chemistry. Оқулық. - Almaty, 2011.

1. Department: Drug Technology and Pharmacognosy

2. Level of education: Bachelor's degree

3. Educational program: Pharmacy (accelerated 3 g)

4. Year of study: 1

5. Name of the elective discipline: Good Pharmacy Practice (GPP)

6. Number of credits: 5

7. The purpose of the discipline: To form an understanding of the requirements of good pharmacy practice.

8. Content of the discipline: The Standard of Good Pharmacy Practice (GPP). General provisions. The structure of the GPP standard. The regulatory framework of NAP. Internal pharmacy documentation. The content and recommended structure of the SOP of a pharmacy organization. Sanitary conditions in the pharmacy organization, occupational safety and health. Organization of acceptance, storage, and release of medicines and other pharmacy products, taking into account the requirements of the NAP. Control and supervision of pharmaceutical activities, taking into account the requirements of NAP.

9. Objectives:

– to teach the basics of the Standard of Good Pharmacy Practice (GPP. General provisions. The structure of the GPP standard. The regulatory framework of NAP. Internal pharmacy documentation. The content and recommended structure of the SOP of a pharmacy organization; , to familiarize organizations with the acceptance, storage, and release of medicines and other pharmacy products, taking into account the requirements of the NAP. Control and supervision of pharmaceutical activities, taking into account the requirements of NAP.

10. Justification of the choice of the discipline: The program contains general provisions on the implementation of the Rules of Good Pharmacy Practice (GPP); demonstrates knowledge of the sanitary regime in a pharmacy organization, occupational safety and health; knows pharmaceutical activities related to the retail sale of medicines and medical devices, with the manufacture of medicines. Organizes the activities of pharmacy organizations in accordance with the NAP standard. Is able to organize the

acceptance, storage, and release of medicines and other pharmacy products, taking into account the requirements of the NAP; demonstrates knowledge of the control and supervision of pharmaceutical activities, taking into account the requirements of the NAP (GPP). The above determines the need to study Good Pharmacy Practice (GPP) at the Faculty of Pharmacy, where the main attention should be paid to the relationship of environmental factors with the organization of sanitary, hygienic and anti-epidemic regime in pharmacies and pharmaceutical industry enterprises.

11. Learning outcomes:

LO1.	General provisions on the implementation of law enforcement pharmacy practice (GPP); demonstrates knowledge of the sanitary regime in a pharmacy organization, occupational safety and health; knows pharmaceutical activities related to the retail sale of medicines and medical devices, with the manufacture of medicines.
LO2.	The organization of primary care organizations in accordance with the standard nap. It is necessary to organize the application of medicines, medicines and other products in the first-aid kit; it demonstrates the knowledge of the control and control of pharmaceutical activity with the use of medicines (GPP).
LO3.	The work was aimed at improving and controlling the quality of medical forms according to prescriptions, requirements or applications of medical organizations, organizations of improvement and social security, standard recommendations, intraaptechnical examinations in compliance with the requirements of the Ministry of health of the Republic of Kazakhstan. according to the approved recommendations, it is possible to develop standard operational procedures for the organization of apothecary activities.
LO4.	It demonstrates the need to transfer their knowledge and confidence in the planning and conduct of the production process, to disclose the facts and circumstances of their interaction.
LO5.	It demonstrates the work with pharmaceutical and scientific literature, electronic databases and computer training programs in the field of professional activity.
LO6.	It is known and named after the combination of prices and principles, the highest level of training in training at the entrance to the pussy works (abstracts, essays, test tasks and Dr.), answers to questions and examples, in research, improving your position, in communication with academic staff, teachers and other students.

11. Prerequisites: Latin Language, Technology of medical forms.

12. Post-requisites: technology of extraction drugs, industrial technology of medicines, technology. it is an innovative drug.

13. Literature

Main:

1. Sagyndykova, B. A., Anarbayeva, R.M. Darilerdin darikhanalyk technologiysi [Matin] : okulyk. - Karaganda : Medet Group, 2021. - 556 bet. p.
2. Shertaeva, K. D. Organization of pharmaceutical activity [Text] : textbook / K. D. Shertaeva , G. I. Utegenova. Shymkent : [B. I.], 2021. 202 p.
3. Shertaeva, K. D. Pharmaceutikalyk kyzmetti uyymdastyru [Matin] : okulyk / K. D. Shertaeva. G.I. Utegenova. Shymkent : [B. I.], 2021. - 228 bet
4. Gazaliev, A.M. The system of ensuring the safety and quality of medicinal substances [Text] : textbook / A.M. Gazaliev, S. K. Kabieva, L. M. Vlasova. - Almaty : ESPI, 2021. - 372 bet. p. - ISBN 978-601-342-672-5

Additional information:

1. Torlanova, B. O. Good manufacturing practice and principles of waste-free production : an educational and methodological guide / B. O. Torlanova, K. M. Turdaly, B. A. Bakhtiyarova. Shymkent : YUKMA, 2024. 85 p.
2. Good practice of storage and transportation of medicines. Guidelines and rules of the World Health Organization [Text] : monograph / translated from English. under the general editorship of A.V. Alexandrova, Moscow : VIALEK, 2020, 644 p.
3. Tiisti pharmaceutical praktikalardi uyymdastyru zhane baskaru negizderi: okulyk / K. D. Shertaeva [et al.]. - Shymkent : [B. I.], 2022. - 173 b.

4. Organizational and managerial foundations of good practices [Text] : textbook / K. D. Shertaeva [et al.]. Shymkent : [B. I.], 2022, 180 p.
5. Arystanova, T. A. Pharmaceutical quality system and good pharmaceutical practices [Text] : textbook / T. A. Arystanova, J. M. Arystanov. Karaganda : Medet Group, 2021. 150 p .
6. Boldysh S.K., Murzalieva G.T. Tiisti pharmaceutical praktikalar (GLP, GCP, GMP,GSP, GDP, GPP, GVP): Oku-adistemelik kural.Aynur-2023
7. Ordabayeva S. K., Tursubekova B.I. Zhana darilik zattardy zhasau kezenindegi GLP yeregeleri: darister kesheni. Shymkent : ALMA Publ., 2025.

Electronic resource:

1. Panin OAK bilim beru portalynda ornalaskan <https://ukma.kz>
2. The YUKMA Electronic Library - <https://e-lib.skma.edu.kz/genres>
3. Republican Interuniversity Electronic Library (RMEB) – <http://rmebrk.kz/>
4. Aknurpress Digital Library - <https://www.aknurpress.kz>
5. The Epigraph Electronic Library - <http://www.elib.kz/>
6. Epigraph - multimedia textbook portal <https://mbook.kz/ru/index/>
7. EBS IPR SMART <https://www.iprbookshop.ru/auth>
8. Information and legal system "Zan" - <https://zan.kz/ru>
9. Medline Ultimate EBSO
10. eBook Medical Collection EBSO
11. Scopus - <https://www.scopus.com/>

Online resource:

1. Menshutina N.V., Mishina Yu.V., Alves S.V., Gordienko M.G., Guseva E.V., Troyankin A.Yu. Innovative technologies and equipment of pharmaceutical production. -Vol.2.–M.: BINOM Publishing House, 2013.-480 p., ill. https://vk.com/doc229684649_441671126?hash=e0fZH4p1iGlzEbAphSpmyzzcXUQDLf9I8O5jTuEcjMo
2. Order of the Acting Minister of Health of the Republic of Kazakhstan dated February 4, 2021 No. KR DSM-15 "On Approval of Good Pharmaceutical Practices" <https://adilet.zan.kz/rus/docs/V2100022167#z14>
3. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 1. Moscow, Eurasian Economic Commission, 2020 https://eec.eaeunion.org/upload/medialibrary/bd2/Farmakopeya-2020-t1_1.pdf
4. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 2. Moscow, Eurasian Economic Commission, 2023 <https://eec.eaeunion.org/upload/medialibrary/9de/2 - chast-1-toma-Farmakopei-Soyuza- s-vozmozhnostyu-poiska .pdf>
5. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 3. Moscow, Eurasian Economic Commission, 2024 https://eec.eaeunion.org/upload/medialibrary/6e6/xponnslaimcy12pg22o1r4t7jy2kttla/3-ch-I-Toma-FS- s - vozmozhnostyu-poiska_-07/22/24.pdf

1. Department: Drug Technology and Pharmacognosy

2. Level of education: Bachelor's degree

3. Educational program: Pharmacy (accelerated 3 g)

4. Year of study: 1

5. Name of the elective discipline: Technology of dosage forms.

6. Number of credits: 5

7. The purpose of the discipline: Formation of students' systemic knowledge and skills in the manufacture and quality control of dosage forms in a pharmacy setting.

8. Content of the discipline: Solid dosage forms (powders), liquid dosage forms (solutions for external and internal use, IUD solutions and colloidal solutions, suspensions, emulsions, drops, infusions and decoctions), soft dosage forms (ointments, suppositories, liniments), sterile and aseptically prepared dosage forms (solutions for injections, eye ointments and drops, with antibiotics, children's dosage forms).

9. Objectives:

– mastering the theoretical foundations of the technology of dosage forms;

- obtaining professional skills and manufacturing skills of dosage forms;
- implementation of intra - pharmacy control of pharmaceutical dosage forms;
- training in the use of regulatory documents (orders, instructions and pharmacopoeia articles of the Republic of Kazakhstan) in the preparation of medicines.

10. Justification of the choice of the discipline: When studying this subject, students for the first time gain knowledge about the concepts: medicine, medicinal substance, dosage form, drug, medicinal product, technological process, stages, operations, classification of medicinal products (potent, non-potent, poisonous, narcotic), dosage forms, excipients, etc. They acquire the skills of technological operations: weighing, dosing, mixing, grinding, filtering, dissolving, stabilizing, solubilizing, prolonging, isotoning, calculating the concentration of solutions, higher single and daily doses of medicinal substances, preparing infusions, decoctions, eye drops and other medicinal products.

11. Learning outcomes:

LO1	Demonstrates knowledge of the main provisions of regulatory documents governing the manufacture, quality control, storage and use of medicines.
LO2	Organizes the technological process of preparation of medicines, manufactures all types of dosage forms, concentrates, semi-finished products and preparations in accordance with the requirements of regulatory documents of the Ministry of Health of the Republic of Kazakhstan and Good Pharmacy Practice (GPP).
LO3	Knows and understands a set of values and principles that express the student's honesty in learning when performing written work (essays, essays, test assignments, etc.), answering classes and exams, in research, expressing his position, in relationships with academic staff, teachers and other students.
LO4	Demonstrates the ability to work with reference and scientific pharmaceutical literature, electronic databases and computer training programs in the field of professional activity.
LO5	Substantiates his own thoughts through a structured text, stylistically competently builds sentences, correctly indicates literary sources.
LO6	Is able to transfer knowledge on the development and implementation of innovative technologies in the field of pharmaceutical production to students and other interested parties.

12. Prerequisites: Latin language.

13. Post-requirements: extraction drug technology, industrial drug technology, pharmacy management and economics.

14. Literature

Main:

1. Pharmaceutical technology. High-molecular compounds in pharmacy and medicine: a textbook /edited by I.I.Krasnyuk. Moscow: GEOTAR-Media, 2016.-560c.
2. Pharmaceutical technology: a textbook. Grossman V.A. 2013
3. Loyd V. Allen. Pharmaceutical technology. Manufacture of medicines studies. The manual, Moscow: GEOTAR - Media, 2014. 512 p.
4. Plisov, V. A. The latest pharmacist's Handbook: a reference edition. Moscow : House of Slavic Books, 2013. 800 p.
5. Additional information:
6. The State Pharmacopoeia of the Republic of Kazakhstan. Vol. 1. Almaty: Zhibek Zholy Publishing House, 2008. 591 p.
7. The State Pharmacopoeia of the Republic of Kazakhstan, vol. 2. Almaty: Zhibek Zholy Publishing House, 2009 – 804 p.
8. The State Pharmacopoeia of the Republic of Kazakhstan, vol. 3. Almaty: Zhibek Zholy Publishing House, 2014, 872 p.
9. Loyd V. Allen, Gavrilov A.S. Pharmaceutical technology. Manufacturing of medicines: a textbook, Moscow: GEOTAR – Media, 2014. 512 p.
10. Krasnyuk I.I. Pharmaceutical technology. High-molecular compounds in pharmacy and medicine: a textbook / edited by I. I. Krasnyuk. Moscow: GEOTAR - Media, 2016. 560 p.
11. Sagyndykova B.A., Anarbayeva R.M. Darilik turlerdin tajiribelik tehnologiyasi. Okulyk. Karaganda: "Medet Group" ZHSHS, 2021. – 427 bet.
12. Sagyndykova B.A., Anarbayeva R.M. Darilerdin darikhanalyk tehnologiyasi. Okulyk. Karaganda: "Medet Group" ZHSHS, 2021. – 560 bet.

Electronic resource:

1. The UMKD of the discipline is posted on the educational portal of the UCMA <https://ukma.kz>
2. The YUKMA Electronic Library - <https://e-lib.skma.edu.kz/genres>
3. Republican Interuniversity Electronic Library (RMEB) – <http://rmebrk.kz/>
4. Aknurpress Digital Library - <https://www.aknurpress.kz/>
5. Epigraph Electronic Library - <http://www.elib.kz/>
6. Epigraf - multimedia textbook portal <https://mbook.kz/ru/index/>
7. EBS IPR SMART <https://www.iprbookshop.ru/auth>
8. Information and legal system "Zan" - <https://zan.kz/ru>
9. Medline Ultimate EBSSO
10. eBook Medical Collection EBSSO
11. Scopus - <https://www.scopus.com/>

Online resource:

1. Kazakhstan Republicasi Densaulyk Aktau Minister of Health 2021 zhylgy 7 shildegi No. KR DSM-58 buyrgy "Darilik zattar men meditsinalyk buyimdardyn aynaly salasyndagy objectylerge koylatyn sanitariyalyk-epidemiologiyalyk talaptar" sanitariyalyk kagidalaryn bekit turaly" <https://adilet.zan.kz/kaz/docs/V2100023416>
2. Kazakhstan Republicasi Densaulyk Aktau Minister of Finance 2021 zhylgy 27 kantardagi No. KR DSM-11 buyrgy "Darilik zattar men meditsinalyk buyimdardi tanbalau kagidalaryn bekit turaly" <https://adilet.zan.kz/kaz/docs/V2100022146>
3. Kazakhstan Republicasi Densaulyk aktau ministerin 2020 zhylgy 20 zheltoksandagy No. KR DSM-286/2020 buyrgy "Darilik preparation men meditsinalyk buyimdardy dayindaug licensy bar, darilik preparation men meditsinalyk buyimdardyn ainalysy salasyndagy subjectylerdin darilik drug men meditsinalyk buyymdardy dayindau kagidalaryn bekitu turaly" <https://adilet.zan.kz/kaz/docs/V2000021840>
4. Kazakhstan Republicasi Densaulyk Aktau ministerin 2020 zhylgy 20 zheltoksandagi No. KR DSM-287/2020 buyrgy "Dayyndalghan darilik preparation targa darikhanaishilik bakylau zhurgizu kagidalaryn bekit turaly" <https://adilet.zan.kz/kaz/docs/V2000021835>
5. Kazakhstan Republikasy Densaulyk Aktau Minister M.A. 2021 zhylgy 4 akpandagi No. KR DSM-15 buyrgy. Tiisti Pharmaceuticals praktikalards bekit turaly <https://adilet.zan.kz/kaz/docs/V2100022167>
6. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 1. Moscow, Eurasian Economic Commission, 2020 https://eec.eaeunion.org/upload/medialibrary/bd2/Farmakopeya-2020-t1_1.pdf
7. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 2. Moscow, Eurasian Economic Commission, 2023 <https://eec.eaeunion.org/upload/medialibrary/9de/2-chast-1-toma-Farmakopei-Soyuza-s-vozmozhnostyu-poiska.pdf>
8. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 3. Moscow, Eurasian Economic Commission, 2024 <https://eec.eaeunion.org/upload/medialibrary/6e6/xponnslaimcy12pg22o1r4t7jy2kttla/3-ch-I-Toma-FS-s-vozmozhnostyu-poiska-22.07.24.pdf>
9. General formulation: a textbook / T. R. Grishina, O. A. Gromova, I. V. Gogoleva [et al.]. Moscow : IP Media, 2023. 134 p. — ISBN 978-5-4497-2299-7. — Text : electronic // Digital educational resource IPR SMART : [website]. — URL: <https://www.iprbookshop.ru/132145.html>

1. Department: Drug Technology and Pharmacognosy

2. Level of education: Bachelor's degree

3. Educational program: Pharmacy (accelerated 3 g)

4. Year of study: 2

5. Name of the elective discipline: Technology of extraction preparations

6. Number of credits: 5

7. The purpose of the discipline: To develop theoretical knowledge and practical skills in the production of extraction preparations.

8. Content of the discipline: Basic concepts and terms. The goals and objectives of extraction drug technology. State rationing of drug production. General principles of organization of the production of

ready-made dosage forms. Pharmaceutical industry processes and devices. Powders. Fees. Medical solutions. Syrups. Fragrant waters. Alcoholimetry. Extraction medicines: tinctures, extracts. Preparations made from fresh vegetable raw materials. Preparations of biogenic stimulants. Maximally purified phytopreparations. (Novogalenic drugs). Individual phytopreparations. Preparations from animal raw materials. Enzyme preparations

9. Objectives: to form knowledge on mastering the basic principles of pharmaceutical production organization; – build knowledge about good manufacturing practices – GMP; – to teach the theoretical foundations and professional skills, as well as the skills of manufacturing extraction preparations; to teach methods of step-by-step control and standardization of extraction preparations.

10. Justification of the choice of the discipline: The course "Technology of extraction preparations" studies the basic processes and devices of pharmaceutical production, the processes of preparation of medicinal plant raw materials and preparation of extractants, methods of obtaining extraction preparations, standardization of the finished product, packaging and packaging. As well as the structure and principles of operation of machines and apparatuses that are used during the technological process.

11. Learning outcomes:

LO1	Knowledge and understanding: Demonstrates knowledge of relevant professional activities, terminology used in the field of pharmaceutical activity, is guided by the nomenclature of pharmaceutical positions, refers to the collection of Legislative and regulatory legal acts regulating pharmaceutical activity in the Republic of Kazakhstan.
LO2	Application of knowledge and understanding: Uses the current regulatory legal acts regulating pharmaceutical activity, is guided by the main problems of modern science, uses the acquired knowledge in understanding the main problems, directions and prospects the development of pharmacy.
LO3	The formation of judgments: Formulates arguments for the ability to promote a healthy lifestyle, conducts disease prevention activities.
LO4	Communication skills: Is able to transfer to students their own knowledge and skills in working with information (educational, reference, scientific literature)
LO5	Learning skills or learning abilities: He is able to present personal judgments, formalize them in the form of an abstract, make presentations and present them at practical classes, student circle meetings, student scientific conferences and self-determination in the profession.
LO6	Knows the methods of scientific research and academic writing and applies them in the field under study: He has the skills to work with educational, reference literature, systematization of information and uses it to solve specific problems.

12. Prerequisites: technology of dosage forms.

13. Post-requirements: industrial drug technology, innovative pharmaceutical technology.

14. Literature

In the Kazakh language

Main

1. Darilerdin ondiristik technologiysi: oku kuraly / B.A.Sagyndykova- "AKHNUR" baspasy, 2024 volume 1, 306 bet
2. Darilerdin ondiristik technologiysi: oku kuraly / B.A.Sagyndykova- "AKHNUR" baspasy, 2024 volume 2, 413 bet
3. Biopharmaceutical zhane darilik preparattards biopharmaceutical zertteu: oku kuraly / B. A. Sagyndykova, R. M. Anarbayeva. - Karaganda, 2021. - 172 b.
4. Darilik zattardyn onerkasiptik technologiysi : oku kuraly / S. K. Kabieva, R. K. Jaslan. Almaty : Epigraph, 2022. 124 b.
5. Pharmaceutical technology. Industrial production of medicines. Vol. 1 : textbook: in 2 volumes / edited by I. I. Krasnyuk [et al.]. Moscow : GEOTAR - Media, 2020. 352 p.
6. Pharmaceutical technology. Industrial production of medicines. Vol. 2: textbook: in 2 volumes / edited by I.I.Krasnyuk [et al.]. - M.: GEOTAR - Media, 2022. - 448 p.
7. Orymbetov, A. M. Khimiya-pharmaceutikalyk ondiristiyn protesteri men apparatary : okulyk / A. M. Orymbetov. Shymkent : ALMA Publ., 2023. .

In the Russian language:

1. Darilerdinondiristiktehnologiyasi: okukuraly /B.A.Sagyndykova- "AKNUR" baspasy, 2024 volume 1, 306 bet
2. Darilerdinondiristiktehnologiyasi: okukuraly /B.A.Sagyndykova- "AKNUR" baspasy, 2024 volume 2, 413 bet
3. Pharmaceutical technology. Industrial production of medicines. Vol.1: textbook: in 2 volumes / edited by I.I.Krasnyuk [et al.]. Moscow: GEOTAR - Media, 2020. 352 p.
4. Pharmaceutical technology. Industrial production of medicines. Vol. 2: textbook: in 2 volumes / edited by I. I. Krasnyuk [et al.]. Moscow: GEOTAR - Media, 2022. 448 p.: ill.
5. Menshutina N.V., Mishina Yu.V., Alves S.V., Gordienko M.G. Guseva E.V., Troyankin A.Yu. Innovative technologies and equipment of pharmaceutical production.-Vol.2. – Moscow: BINOM Publishing House, 2013.- 480 p., ill. https://vk.com/doc229684649_441671126?hash=e0fZH4p1iGlzEbAphSpmyzzcXUQDLf9I8O5jTuEcjM o
6. Gavrilov A.S. Pharmaceutical technology. Manufacturing of medicines: a textbook / A.S.Gavrilov. - 2nd ed., revised ; Moscow : GEOTAR - Media, 2016. - 760 p.

Additional information:

1. The State Pharmacopoeia of the Republic of Kazakhstan. – volume 1 – Almaty. – Publishing house: Zhibek Zholy.- 2008.– 592 p.
2. The State Pharmacopoeia of the Republic of Kazakhstan.– volume 2. – Almaty.– Publishing house: Zhibek Zholy.- 2009. – 792 p. 3. The State Pharmacopoeia of the Republic of Kazakhstan.– volume – Almaty.– Publishing house: Zhibek Zholy.- 2014. – 872 p.
3. Technology of dosage forms. (Ed. Ivanova L.A.).– M., Medicine.– 1991. – 2nd volume.– 544 p.
4. Guidelines for laboratory classes on the factory technology of dosage forms. (Edited by A.I. Tentsova). Moscow, 1986, 271 p.
5. Torlanova B.O. Machines and automata for filling and packaging of dosage forms. Shymkent, 2003, 166 p.
6. Pharmaceutical technology: a guide to laboratory classes. / Bykov V.A., Demina N.B., Skatkov S.A., Anurova M.N./ Moscow: GEOTAR – Media, 2009. 304 p.

Electronic resources

1. The YUKMA Electronic Library - <https://e-lib.skma.edu.kz/genres>
2. Republican Interuniversity Electronic Library (RMEB) – <http://rmebrk.kz/>
3. Aknurpress Digital Library - <https://www.aknurpress.kz/>
4. The Epigraph Electronic Library - <http://www.elib.kz/>
5. Epigraph - multimedia textbook portal. <https://mbook.kz/ru/index/>
6. EBS IPR SMART<https://www.iprbookshop.ru/auth>
7. Information and legal system "Zan" - <https://zan.kz/ru>
8. Medline Ultimate EBSO
9. eBook Medical Collection EBSO
10. Scopus - <https://www.scopus.com/>

Electronic textbooks

1. B.A. Sagyndykova. Darilerdinondiristiktehnologiyasi (electronic resource):okulyk. – the electron.text data.(5.30 Mb).- Almaty, 2008. – 1 copy.
2. Omarova R.A. Processes and devices of chemical and pharmaceutical production. Textbook. 2020<https://aknurpress.kz/login>

1. **Department:** Drug Technology and Pharmacognosy
2. **Level of education:** Bachelor's degree
3. **Educational program:** Pharmacy (accelerated 3 g)
4. **Year of study:** 3
5. **Name of the elective discipline:** GMP and cleanroom technology
6. **Number of credits:** 4
7. **The purpose of the discipline:** To form an understanding of the requirements of good manufacturing practices and clean rooms.
8. **Content of the discipline:** Clean rooms. Classification. Clean room air requirements, personnel requirements. Operations in NWP zones. Control of the parameters of clean rooms. Certification of clean

rooms and areas. Barrier systems. The use of insulators in the pharmaceutical industry. Air and water treatment systems in pharmaceutical enterprises. Classification of filters for air purification. Constructions. Principles of multi-stage air purification.

9. Objectives:

- study of the theoretical foundations of creating clean rooms;
- study of the regulations governing Good Manufacturing Practices in the EAEU.

10. **Justification of the choice of the discipline:** The pharmaceutical industry cannot be imagined without clean production facilities, the purpose of which is to strictly control the spread of pollutants, ensure the sterility of the workspace where medicines and medical devices are manufactured, as well as create a safe environment for employees of the enterprise. Cleanroom technologies have been particularly developed with the spread of GMP Good Manufacturing Practice standards. These requirements are currently mandatory.

11. Learning outcomes:

LO 1.	Demonstrates knowledge and understanding: knows the main provisions of regulatory documents in the manufacture of medicines in accordance with GMP requirements; demonstrates knowledge of monitoring and testing of clean rooms; knows the principles of protection against pollution during the operation of clean rooms.
LO 2.	Uses knowledge and understanding at a professional level, formulates arguments and solves the problems of the field under study: applies knowledge of the requirements of good manufacturing practice (GMP) for the production of medicines; uses the requirements of good manufacturing practice (GMP) for the selection of personnel and for the organization of clean rooms.
LO 3.	Formation of judgments: is able to identify, according to regulatory, technological and operational documents, the requirements for the implementation of the technological process of production and preparation of medicines in premises of the appropriate purity class in accordance with the rules of the GMR.
LO 4.	Communication skills: demonstrates the ability to transfer students' own knowledge and skills in planning and conducting the production process, to explain the observed facts and phenomena, their cause-and-effect relationships.
LO 5.	Learning skills or learning abilities: demonstrates the ability to work with reference and scientific pharmaceutical literature, electronic databases and computer training programs in the field of professional activity.
LO 6.	Understands the importance of the principles and culture of academic honesty: knows and understands the set of values and principles that express the student's honesty in teaching when doing written work, answering classes and exams, in research, expressing his position, in relationships with academic staff, teachers and other students.

12. Prerequisites of the discipline: Microbiology; Industrial technology – 1, 2; Pharmacy management and Economics – 1, 2.

13. Post-requirements of the discipline: –

14. Main literature:

1. Biopharmaceutical zhane darilik preparattards biopharmaceutical zertteu: oku kuraly / B.A.Sagyndykova, R. M. Anarbayeva. - Karaganda: Medet Group, 2021. - 172 b.
2. Pharmaceutical technology. Industrial production of medicines. Vol. 1: textbook: in 2 volumes /edited by I.I. Krasnyuk [et al.]. Moscow: GEOTAR - Media, 2020. 352 p.
3. Pharmaceutical technology. Industrial production of medicines. Vol. 2: textbook: in 2 volumes / edited by I. I. Krasnyuk [et al.]. - M.: GEOTAR - Media, 2022. - 448 p.
4. Organizational and managerial foundations of proper practices: textbook /K.D.Shertaeva, O.V.Blinova.- Jasulan 2022
5. Gavrilov A.S. Pharmaceutical technology. Manufacturing of medicines: a textbook / A.S.Gavrilov. - 3rd ed., revised Ministry of Education and Science of the Russian Federation. Rec. GBOU VPO "First Moscow State Medical University I. M. Sechenov University. Moscow: GEOTAR - Media, 2022.
6. Boldysh S.K., Murzalieva G.T. Tiisti pharmaceutical praktikalar (GLP, GCP, GMP,GSP, GDP, GPP, GVP): Oku-adistemelik kural.Aynur-2023.

Additional literature:

1. The State Pharmacopoeia of the Republic of Kazakhstan. Vol. 1: monograph / Ministry of Healthcare of the Republic of Kazakhstan. - 3rd ed.; Approved by the order of the Ministry of Health of the Republic of Kazakhstan. Almaty: Publishing house "Zhibekzholy", 2015. 720 p.
2. The State Pharmacopoeia of the Republic of Kazakhstan. Vol. 3: monograph / Ministry of Healthcare of the Republic of Kazakhstan. - 3rd ed. ; Approved by the order of the Ministry of Health of the Republic of Kazakhstan. - Almaty : Publishing house "Zhibekzholy", 2014. - 872 p.
3. Kazakhstan Republikasyn Memlekettik pharmacopoeias. Vol. 1. Almaty: "Zhibek zholy" baspa uyi, 2015. 720 bet
4. Kazakhstan Republikasyn Memlekettik pharmacopoeias. Vol. 3. – Almaty: "Zhibek zholy" baspa uyi, 2014. – 864 bet
5. Arystanova T. A. Pharmaceutical quality system and good pharmaceutical practices : a textbook / T. A. Arystanova, Zh. M. Arystanov. Karaganda : Medet Group, 2021. 150 p.
6. Ordabayeva S. K. Zhana darilik zattardy zhasau kezenindegi GLP yeregeleri: darister kesheni / S. K. Ordabayeva, B. I. Tursubekova. Shymkent : ALMA Publ., 2025. 38 b.

Electronic resource:

1. The discipline's curriculum is located on the educational portal <https://ukma.kz> 1. Electronic Library of YUKMA JSC - <https://e-lib.skma.edu.kz/genres>
2. Republican Interuniversity Electronic Library (RMEB) – <http://rmebrk.kz/>
3. Aknurpress Digital Library - <https://www.aknurpress.kz>
4. The Epigraph Electronic Library - <http://www.elib.kz/>
5. Epigraf - multimedia textbook portal <https://mbook.kz/ru/index/>
6. EBS IPR SMART <https://www.iprbookshop.ru/auth>
7. Information and legal system "Zan" - <https://zan.kz/ru>
8. Medline Ultimate EBSO
9. eBook Medical Collection EBSO
10. Scopus - <https://www.scopus.com/> 2.

Online resource:

1. Menshutina N.V., Mishina Yu.V., Alves S.V., Gordienko M.G., Guseva E.V., Troyankin A.Yu. Innovative technologies and equipment of pharmaceutical production. -Vol.2. – M.: BINOM Publishing House, 2013. - 480 p., ill. https://vk.com/doc229684649_441671126?hash=e0fZH4p1iGlzEbAphSpmyzzcXUQDLf9I8O5jTuEcjMo
2. Order of the Acting Minister of Health of the Republic of Kazakhstan dated February 4, 2021 No. KR DSM-15 "On Approval of Good Pharmaceutical Practices" <https://adilet.zan.kz/rus/docs/V2100022167#z14>
3. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 1. Moscow, Eurasian Economic Commission, 2020 https://eec.eaeunion.org/upload/medialibrary/bd2/Farmakopeya-2020-t1_1.pdf
4. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 2. Moscow, Eurasian Economic Commission, 2023 <https://eec.eaeunion.org/upload/medialibrary/9de/2-chast-1-toma-Farmakopei-Soyuza-s-vozmozhnostyu-poiska.pdf>
5. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 3. Moscow, Eurasian Economic Commission, 2024 https://eec.eaeunion.org/upload/medialibrary/6e6/xponnslaimcy12pg22o1r4t7jy2ktla/3-ch-I-Toma-FS-s-vozmozhnostyu-poiska_-22.07.24.pdf

1. **Department:** Drug Technology and Pharmacognosy
2. **Level of education:** Bachelor's degree
3. **Educational program:** Pharmacy (accelerated 3 g)
4. **Year of study:** 3
5. **Name of the elective discipline:** Innovative pharmaceutical technology.
6. **Number of credits:** 5
7. **The purpose of the discipline:** Theoretical and experimental substantiation of the creation of new and improvement of existing medicines, taking into account the latest achievements in pharmaceutical production technology, quality control, storage and release of effective and safe medicines.

8. **Content of the discipline:** Technology of creating innovative drugs: production of new chemical products; synthesis of pharmacologically active metabolites or their isomers: creation of new dosage forms with improved pharmacokinetic properties. Biotechnological drugs with a new mechanism of action. Pharmaceutical nanotechnology as a direction of creating means of targeted drug delivery. Computer simulation of LP. Forecasting the compatibility of medicinal and auxiliary substances..
9. **Objectives:** – study of the theoretical foundations of the creation of innovative medicines; – study of the peculiarities of preparation of dosage forms with improved pharmacokinetic properties; – study of modern requirements for the production of medicines and the introduction of GMP in the pharmaceutical industry of the Republic of Kazakhstan.
10. **Justification of the choice of the discipline:** The discipline "Innovative Pharmaceutical Technologies" is one of the special pharmaceutical disciplines and is aimed at the formation of a pharmacist specialist with special technological training. The program of the discipline reflects the main concepts of the development of pharmacy and medicine at the present stage and the achievements of pharmaceutical science and practice.
11. **Learning outcomes:**

LO 1.	Demonstrates knowledge of creating new and improving existing medicines, taking into account the latest achievements of pharmaceutical science in the field of production, quality control, storage and release of effective and safe medicines.
LO 2.	Organizes the production process for the manufacture of individual groups of medicines – homeopathic, pediatric, geriatric, veterinary, with a modified release profile and demonstrates knowledge of biopharmaceutical factors and their effects on the therapeutic effectiveness of drugs.
LO 3.	Knows and understands a set of values and principles that express the student's honesty in learning when performing written work (essays, essays, test assignments, etc.), answering classes and exams, in research, expressing his position, in relationships with academic staff, teachers and other students.
LO 4.	Demonstrates the ability to work with reference and scientific pharmaceutical literature, electronic databases and computer training programs in the field of professional activity.
LO 5.	Substantiates his own thoughts through a structured text, stylistically competently builds sentences, correctly indicates literary sources.
LO 6.	Is able to transfer knowledge on the development and implementation of innovative technologies in the field of pharmaceutical production to students and other interested parties.

12. **Prerequisites of the discipline:** technology of dosage forms, technology of extraction preparations, industrial technology of medicines.

13. **Post-requirements of the discipline:** –

14. **Basic literature:**

1. Pharmaceutical technology. Industrial production of medicines. Vol.1: textbook: in 2 volumes / edited by I.I. Krasnyuk [et al.]. Moscow: GEOTAR - Media, 2020. 352 p.
2. Pharmaceutical technology. Industrial production of medicines. Vol. 2: textbook: in 2 volumes / edited by I.I. Krasnyuk [et al.]. - M.: GEOTAR - Media, 2022. - 448 p.
3. Pharmaceutical technology. High-molecular compounds in pharmacy and medicine: a textbook / edited by I.I.Krasnyuk. Moscow: GEOTAR - Media, 2016. 560 p.
4. Pharmaceutical technology. Technology of dosage forms: textbook / edited by I.I. Krasnyuk, Moscow: GEOTAR - Media, 2015, 656 p.
5. Pharmaceutical technology. Technology of dosage forms: textbook / edited by I.I. Krasnyuk [et al.]. Moscow: GEOTAR - Media, 2018.
6. Tikhonova S.A., Zheterova S.K., Zatybekova A.K. Methodological recommendations for practical classes on the technology of homeopathic medicines: methodological recommendations. for students. the farm. universities and fac. Almaty: Evero Publ., 2016. 140 p.
7. Baizoldanov T. Homeopathyalyk darilik kalyptar: oku kuraly. Almaty: Evero Publ., 2020. 184 p.

8. Biopharmaceutical, or the basics of pharmaceutical development, production and design of dosage forms: a textbook / I. I. Krasnyuk [et al.]. Moscow : GEOTAR - Media, 2024. 192 p.

Additional information:

1. Kazakhstan Republikasyn Memlekettik pharmacopoeias.– Almaty: "Zhibek zholy" baspa uyi, 2015. – Vol.1. – 720 bet.
2. Kazakhstan Republikasyn Memlekettik pharmacopoeias. Vol. 2. – Almaty: "Zhibek zholy" baspa uyi, 2009. – 792 bet.
3. Kazakhstan Republikasyn Memlekettik pharmacopoeias. Vol. 3. – Almaty: "Zhibek zholy" baspa uyi, 2014. – 864 bet.
4. Gavrilov A.S. Pharmaceutical technology. Manufacturing of medicines: a textbook / A.S. Gavrilov. - 3rd ed., revised - Moscow: GEOTAR - Media, 2022. - 864 p.
5. Loyd V. Allen. Pharmaceutical technology. Manufacture of medicines studies. manual- M.: GEOTAR - Media, 2014.
6. Tiisti pharmaceutical praktikalardi uyymdastyru zhane baskaru negizderi: okulyk / K.D. Shertaeva , O.V. Blinova.–Zhasulan, 2022
7. Organizational and managerial foundations of proper practices: textbook / K.D. Shertaeva, O.V. Blinova.–Zhasulan, 2022

Electronic resource:

1. The UMKD of the discipline is posted on the educational portal <https://ukma.kz>
2. The YUKMA Electronic Library - <https://e-lib.skma.edu.kz/genres>
3. Republican Interuniversity Electronic Library (RMEB) – <http://rmebrk.kz/>
4. Aknurpress Digital Library - <https://www.aknurpress.kz/>
5. The Epigraph Electronic Library - <http://www.elib.kz/>
6. Epigraph - multimedia textbook portal <https://mbook.kz/ru/index/>
7. EBS IPR SMART <https://www.iprbookshop.ru/auth>
8. Information and legal system "Zan" - <https://zan.kz/ru>
9. Cochrane Library - <https://www.cochranelibrary.com/>

Online resource:

1. Menshutina N.V., Mishina Yu.V., Alves S.V., Gordienko M.G., Guseva E.V., Troyankin A.Yu. Innovative technologies and equipment of pharmaceutical production. -Vol.2. – Moscow: BINOM Publishing House, 2013. - 480 p. https://vk.com/doc229684649_441671126?hash=e0fZH4p1iGlzEbAphSpmyzzcXUQDLf9I8O5jTuEcjMo
2. Order of the Acting Minister of Health of the Republic of Kazakhstan dated February 4, 2021 No. KR DSM-15 "On Approval of Good Pharmaceutical Practices" <https://adilet.zan.kz/rus/docs/V2100022167#z14>
3. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 1. Moscow, Eurasian Economic Commission, 2020 https://eec.eaeunion.org/upload/medialibrary/bd2/Farmakopeya-2020-t1_1.pdf
4. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 2. Moscow, Eurasian Economic Commission, 2023 <https://eec.eaeunion.org/upload/medialibrary/9de/2-chast-1-toma-Farmakopei-Soyuza- s-vozmozhnostyu-poiska .pdf>
5. Pharmacopoeia of the Eurasian Economic Union (EAEU), Volume 1, Part 3. Moscow, Eurasian Economic Commission, 2024 https://eec.eaeunion.org/upload/medialibrary/6e6/xponnslaimcy12pg22o1r4t7jy2kttla/3-ch-I-Toma-FS- s-vozmozhnostyu-poiska_-22.07.24.pdf