Department of pharmaceutical and toxicological chemistry
Working curriculum of the discipline (Syllabus)
Educational program 6B07201 “Pharmaceutical manufacturing technology ”

Discipline code:	MOFA 4201
Discipline title:	Methods and equipment for pharmaceutical analysis
Prerequisites:	Inorganic chemistry, organic chemistry
Post-requisites:	Professional activities
Cycle:	CS
Academic year:	2024-2025
Year:	4
Term:	VII
Number of credits (ECTS):	120 hours/ 4 credits
Component:	EC

2.	**Course description (maximum 50 words)**		
Physicochemical (Instrumental) Methods for Pharmaceutical Analysis of Drugs. Principles and conditions for conducting work on equipment (instruments), sample preparation for analysis, interpretation of the obtained results of instrumental analysis. Refractometry, polarimetry. Methods based on the absorption of electromagnetic radiation: in the UV, visible (photoelectric colorimetry (FEC)), and IR regions. Chromatographic methods.			
3.	**Summative assessment form**		
3.1	Testing	3.5	Coursework
3.2	Writing	3.6	Essay
3.3	Oral ✓	3.7	Project
3.4	Assessment of practical skills	3.8	Other (specify)
4.	**Discipline objectives**		
Training in the most important instrumental analysis methods and work on modern pharmaceutical equipment necessary to ensure the quality and safety of drugs.			
5.	**Final learning outcomes (LO disciplines)**		
LO1	**Demonstrates knowledge and understanding in the area of study, based on advanced knowledge in this area:** - demonstrates knowledge and understanding of the purpose of chemical-technological processes and the implementation of pharmaceutical analysis of biologically active compounds on modern equipment.		
LO2.	**Apply knowledge and understanding at a professional level, formulate arguments and solve problems in the studied area:** - apply the theoretical foundations of general chemical technology to obtain chemical substances, conduct qualitative and quantitative analysis, own the technique of performing on modern analytical equipment for pharmaceutical analysis of drugs; - form arguments and solve problems in the studied area, based on knowledge in the field of natural sciences and on the skills of acquired new knowledge in the disciplines of the module; - formulate arguments and solve problems of cause-and-effect relationship between the actual result of synthesis and the requirements of regulatory documents for the quality of the substance at the stages of obtaining, production.		
LO3.	**Collects and interprets information to form judgments taking into account social, ethical and scientific considerations:** - interprets the choice of modern equipment and devices based on the physical and chemical properties of the compounds being studied, analyzes and evaluates the tasks set, finds something new in solving problems in the field of professional activity.		
LO4	**Communicates information, ideas, and problem solutions to both specialists and non-specialists:**		

	- communicates information, ideas, and problem solutions to specialists in conducting chemical-technological processes and documenting the results obtained, as well as to non-specialists on the quality of medicines.
LO5	**Learning skills required for independent continuation of learning in the studied area:** - has the skills to search and analyze information, acquire new knowledge necessary for professional activity in the field of pharmaceutical production; - interprets the results of own laboratory work on chemical and technological processes, methods and equipment of pharmaceutical analysis, gives a conclusion in accordance with the requirements of regulatory documents on the quality of medicines.
LO6	**Knows research and academic writing techniques and applies them to the field of study:** knows methods of scientific research, methodological foundations of scientific research, modern problems of chemical production, methods of theoretical and empirical research, methodology for organizing and conducting scientific experiments, rules of academic writing and presentation of research results.
LO7	**Applies knowledge and understanding of facts, phenomena, theories and complex relationships between them in the field of study:** knows and understands the relationship between the parameters of CTP and the physical, chemical properties and methods of obtaining biologically active compounds; carries out all types of CTP biologically active compounds and qualitative and quantitative analyzes of the product using modern equipment.
LO8	**Understands the importance of principles and a culture of academic integrity** understands the principles and culture of academic integrity in the educational process, expressing the honesty of students when performing all assessment work in the process of mastering theoretical and practical material in the disciplines of this module.

5.1	**Course LO**	**The learning outcomes of the EP, which are related to the learning outcomes of the course**
	LO 1	LO1, LO2, LO4
	LO 2	LO4, LO10
	LO 3	LO1, LO2, LO4
	LO 4	LO8, LO10
	LO 5	LO4, LO10
	LO 6	LO1, LO8, LO11
	LO 7	LO1, LO2, LO3

	LO 8	LO10				
6.	**Details of the course**					
6.1	Location (building, auditorium): **main building, auditoriums: 101B-105B** **Contact Information** South Kazakhstan Medical Academy, Department of Pharmaceutical and Toxicological Chemistry. Al-Farabi Square, building 1. Telephone 8 (7252) 408 222, internal 266.					
6.2	Number of hours	Lectures	Practical lessons	Lab. lesson	STIW	SIW
		10	-	30	12	68

7. Information about teachers

№	Ф.И.О.	Degrees and title	Email address
1.	Ordabaeva Saule Kutymovna	professor, pharm s.d.,	ordabaeva@mail.ru
2.	Sopbekova Anara Onlabekovna	ass. prof.., c. of pharm. s.	anarkulsopbekova@mail.ru
3.	Asilbekova Akmaral Dzhienbekovna	ass.prof., c. of engin. s.	asilbekova_akmaral@mail.ru
4.	Kadeeva Mansia Sadilovna	ass. prof.., c. of pharm. s.	bc_kadeyeva@mail.ru
5.	Tursubekova Bayan Izteleuovna	ass. Prof., c. of pharm. s.	baian.69@mail.ru
6.	Karakulova Aizhan Shirinbekovna	senior teacher, master of pharmacy	ayzhan2015@bk.ru
7.	Dzhanaralieva Kakha Saidovna	senior teacher	mansur5_62@ mail.ru

8. Thematic plan

Week	Topic name	Summary	Course LO	Number of hours	Forms / methods /learning technologies	Forms / assessment methods
1	**Lecture. Topic:** Introduction. State principles and provisions regulating the quality of medicines.	Regulatory legal acts in the field of standardization of medicines. The system of standardization in healthcare of the Republic of Kazakhstan and standardization of medicines.	LO1, LO5, LO6	1	thematic	feedback
	Laboratory lesson. Topic: Analysis of medicinal products by spectrophotometri	Analysis of medicinal products by spectrophotometric method in the UV region.	LO2, LO3, LO5	2	work in pairs	laboratory work protection: 1. theoretical preparedness; 2. performing laboratory

	c method in the UV region.					work; 3. protocol formatting
	STIW/SIW Task of the SIW: State principles and provisions governing the quality of medicines.	Standardization system in healthcare of the Republic of Kazakhstan. Normative documentation (ND) governing the quality, safety and efficacy of medicines: State Pharmacopoeia of the Republic of Kazakhstan, International Pharmacopoeia of the WHO, European Pharmacopoeia, Eurasian Economic Community Pharmacopoeia. Quality assurance of medicines. Control and permit system. Quality assurance system of medicines according to international standards.	LO1, LO3, LO4, LO5	-/3	preparation and defense of abstracts, review of abstracts, checking in the Anti-plagiat. University system/project work	assessment of the abstract/ project monitoring
2	**Lecture. Topic:** Pharmacopoeial testing methods for individual quality indicators.	Rules for drafting regulatory and technical documents on quality control and safety of medicines. State Pharmacopoeia of the Republic of Kazakhstan.	LO1, LO5, LO6	1	thematic	feedback
	Laboratory lesson. Topic: Analysis of medicinal products by spectrophotometric method in the UV region.	Analysis of medicinal products by spectrophotometric method in the UV region.	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: General principles and methods of drug identification. Identification of drugs by physical properties and constants.	Pharmacopoeial testing methods for individual quality indicators. Physical properties and constants used to identify drugs: appearance, odor, solubility, melting point, boiling point, solidification, relative density, optical rotation, viscosity, etc. Pharmacopoeial methods of analysis used to identify drugs.	LO1, LO3, LO4	1/4	preparation and defense of abstracts, review of abstracts, checking in the Anti-plagiat. University	assessment of the abstract/ project monitoring

					system/ project work	
3	**Lecture. Topic:** Methods of photometry in the ultraviolet and visible spectral regions.	Instrumental methods of testing for individual quality indicators. Spectrophotometric methods in pharmaceutical analysis. Spectrophotometry in the UV and visible region. Equipment for spectrophotometric analysis.	LO1, LO5, LO6	1	thematic	feedback
	Laboratory lesson. Topic: Analysis of medicinal products by spectrophotometric method in the visible region.	Analysis of medicinal products by spectrophotometric method in the visible region.	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Methods based on radiation emission: atomic absorption spectrometry, fluorimetry.	Pharmacopoeial methods of testing for individual quality indicators. Methods based on radiation emission: atomic adsorption spectrometry, fluorimetry. Methods based on radiation emission: atomic adsorption spectrometry, fluorimetry in pharmaceutical analysis. Equipment for adsorption spectrometry, fluorimetry.	LO1, LO3, LO4, LO5	1/4	preparation and defense of abstracts, review of abstracts, checking in the Anti-plagiat. University system/ project work	assessment of the abstract/ project monitoring
4	**Lecture. Topic:** Methods of photometry in the ultraviolet and visible spectral regions.	Instrumental methods of testing for individual quality indicators. Spectrophotometric methods in pharmaceutical analysis. Spectrophotometry in the UV and visible region. Equipment for spectrophotometric analysis.	LO1, LO5, LO6	1	thematic	feedback
	Laboratory lesson. Topic: Analysis of medicinal	Analysis of medicinal products by spectrophotometric method in the visible region.	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical

	products by spectrophotometric method in the visible region.					preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Methods based on the absorption of electromagnetic radiation: nephelometry	Pharmacopoeial methods of testing for individual quality indicators. Methods based on the absorption of electromagnetic radiation. Methods based on the absorption of electromagnetic radiation in pharmaceutical analysis. Equipment for conducting electromagnetic radiation.	LO1, LO3, LO4, LO5	1/3	presentation, review of presentation/project work	presentation evaluation/project monitoring
5	**Lecture. Topic:** Spectroscopy methods in drug analysis (IR, Mass, NMR)	Application of IR spectroscopy methods in determining the authenticity of drugs. Application of IR, Mass, NMR spectroscopy in pharmaceutical analysis. Near IR spectroscopy. Theoretical foundations of methods. Basic concepts. Spectroscopy methods in IR, Mass, NMR. Application of IR, Mass, NMR spectroscopy methods.	LO1, LO5, LO6	1	thematic	feedback
	Laboratory lesson. Topic: Analysis of medicinal products by photoelectrocolorimetric method.	Analysis of medicinal products by photoelectrocolorimetric method.	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Methods based on the use of a magnetic field: NMR spectroscopy.	Instrumental methods of testing for individual quality indicators. Methods based on the use of a magnetic field: NMR spectroscopy. Methods based on the use of a magnetic field in pharmaceutical	LO1, LO3, LO4	-/4	preparation and defense of abstracts, review of abstracts, checking in the	assessment of the abstract/ project monitoring

		analysis. Equipment for conducting NMR spectroscopy.			Anti-plagiat. University system/ project work	
6	**Lecture. Topic:** Chromatographic methods of drug analysis. Classification.	Chromatographic methods in pharmaceutical analysis. Classification. Gas chromatography in quality control of medicines. Equipment for gas chromatography. Liquid chromatography in quality control of medicines.	LO1, LO5, LO6	1	thematic	feedback
	Laboratory lesson. Topic: Analysis of medicinal products by refractometric method.	Analysis of medicinal products by refractometric method	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Methods based on the use of a magnetic field: PMR spectroscopy.	Instrumental methods of testing for individual quality indicators. Methods based on the use of a magnetic field: PMR spectroscopy. Methods based on the use of a magnetic field in pharmaceutical analysis. Equipment for conducting PMR spectroscopy.	LO1, LO3, LO4	1/4	preparation and defense of abstracts, review of abstracts, checking in the Anti-plagiat. University system/ project work	assessment of the abstract/ project monitoring
7	**Lecture. Topic:** Chromatographic methods of drug analysis. Classification.	Chromatographic methods in pharmaceutical analysis. Classification. Gas chromatography in quality control of medicines. Equipment for gas chromatography. Liquid	LO1, LO5, LO6	1	thematic	feedback

		chromatography in quality control of medicines.				
	Laboratory lesson. Topic: Analysis of medicinal products by refractometric method.	Analysis of medicinal products by refractometric method	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Magnetic field based methods: mass spectroscopy.	Instrumental methods of testing for individual quality indicators. Methods based on the use of a magnetic field: mass spectroscopy. Methods based on the use of a magnetic field in pharmaceutical analysis. Equipment for conducting mass spectroscopy.	LO1, LO3, LO4, LO5	1/3	presentation, review of presentation/project work	presentation evaluation/project monitoring
8	**Lecture. Topic:** Principles of plane and column chromatography. Application area. Advantages and disadvantages.	Principles of planar and column chromatography. Application area. Advantages and disadvantages.	LO1, LO5, LO6	1	thematic	feedback
	Laboratory lesson. Topic: Analysis of medicinal products by thin layer chromatography.	Analysis of medicinal products by thin layer chromatography	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol

	STIW/SIW Task of the SIW: Midterm control - 1	Topics 1-7 weeks .	LO1, LO3, LO4	1/4	testing/interim report of project work	Evaluation/defense of the interim report of the project work
9	**Lecture. Topic:** Principles of Plane and Column Chromatography. Application Area. Advantages and Disadvantages.	Principles of Plane and Column Chromatography. Application Area. Advantages and Disadvantages	LO1, LO5, LO6	1	thematic	feedback
	Laboratory lesson. Topic: Analysis of medicinal products by thin layer chromatography.	Analysis of medicinal products by thin layer chromatography	LO2, LO3, LO5	2	work in pairs	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Optical methods of analysis: polarimetry	Instrumental methods of testing for individual quality indicators. Optical methods of analysis: polarimetry. Optical methods of research in pharmaceutical analysis. Equipment for conducting polarimetry.	LO1, LO3, LO4, LO5	-/4	preparation and defense of abstracts, review of abstracts, checking in the Anti-plagiat. University system/ project work	assessment of the abstract/ project monitoring
10	**Lecture. Topic:** Pharmacopoeial methods for testing dosage forms according to the parameters “dissolution”, “disintegration”	Instrumental methods for testing solid dosage forms. Validation of the methods of the "Dissolution" test. Disintegration test of solid dosage forms. Strength and abrasion test of solid dosage forms. Validation characteristics and	LO1, LO5, LO6	1	thematic	feedback

	and "wearability", etc.	requirements.				
	Laboratory lesson. Topic: Analysis of medicinal products by high performance liquid chromatography.	Analysis of medicinal products by high performance liquid chromatography	LO2, LO3, LO5	2	work in pairs	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Theoretical foundations of gas chromatography. Application of gas chromatography in drug analysis.	Theoretical foundations of gas chromatography. Application of gas chromatography in drug analysis. Equipment for gas chromatography in pharmaceutical analysis.	LO1, LO3, LO4, LO5	1/3	presentation, review of presentation/ project work	presentation evaluation/project monitoring
11	**Laboratory lesson. Topic:** Analysis of medicinal products by high performance liquid chromatography.	Analysis of medicinal products by high performance liquid chromatography	LO2, LO3, LO5	2	work in pairs	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Theoretical foundations of liquid chromatography. Application of liquid chromatography in drug analysis.	Theoretical foundations of liquid chromatography. Application of liquid chromatography in drug analysis. Equipment for liquid chromatography in pharmaceutical analysis.	LO1, LO3, LO4, LO5	1/4	presentation, review of presentation/ project work	presentation evaluation/project monitoring

12	**Laboratory lesson. Topic:** Analysis of dosage forms for the dissolution test.	Regulatory documents on quality control of tableted medicinal products. Specifications of quality of tableted medicinal products. Testing of tablets in accordance with the requirements of the State Pharmacopoeia of the Republic of Kazakhstan in sections of regulatory documents: dissolution.	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Electrochemical methods of analysis: potentiometry. Potentiometric titration.	Electrochemical methods of analysis: potentiometry. Potentiometric titration. Equipment for conducting electrochemical research methods in pharmaceutical analysis.	LO1, LO3, LO4	1/4	presentation, review of presentation/ project work	presentation evaluation/project monitoring
13	**Laboratory lesson. Topic:** Analysis of dosage forms for the dissolution test.	Regulatory documents on quality control of tableted medicinal products. Specifications of quality of tableted medicinal products. Testing of tablets in accordance with the requirements of the State Pharmacopoeia of the Republic of Kazakhstan for sections of regulatory documents: dissolution.	LO2, LO3, LO5	2	work in small groups	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Electrochemical methods of analysis: anodic and cathodic polarography.	Electrochemical methods of analysis: anodic and cathodic polarography. Equipment for conducting electrochemical research methods in pharmaceutical analysis.	LO1, LO3, LO4, LO5	1/3	presentation, review of presentation/ project work	presentation evaluation/project monitoring
14	**Laboratory lesson. Topic:** Analysis of dosage forms for the "disintegration" and "wearability" tests.	Regulatory documents on quality control of tableted medicinal products. Specifications of quality of tableted medicinal products. Testing of tablets in accordance with the requirements of the State Pharmacopoeia of the Republic of Kazakhstan in sections of regulatory	LO2, LO3, LO5	2	work in pairs	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol

		documents: abrasion, resistance to crushing, disintegration, dissolution.				
	STIW/SIW Task of the SIW: Electrochemical methods of analysis: anodic and cathodic polarography.	Electrochemical methods of analysis: anodic and cathodic polarography. Equipment for conducting electrochemical research methods in pharmaceutical analysis.	LO1, LO3, LO4, LO5	1/4	preparation and defense of abstracts, review of abstracts, checking in the Anti-plagiat. University system/ project work	assessment of the abstract/ project monitoring
15	**Laboratory lesson. Topic:** Analysis of dosage forms for the "disintegration" and "wearability" tests.	Regulatory documents on quality control of tableted medicinal products. Specifications of quality of tableted medicinal products. Testing of tablets in accordance with the requirements of the State Pharmacopoeia of the Republic of Kazakhstan in sections of regulatory documents: abrasion, resistance to crushing, disintegration, dissolution.	LO2, LO3, LO5	2	work in pairs	Defense of laboratory work: 1. theoretical preparation; 2. performance of laboratory work; 3. preparation of the protocol
	STIW/SIW Task of the SIW: Midterm control - 2	Topics 8-15 weeks .	LO1, LO3, LO4	1/5	testing/interim report of project work	Evaluation/defense of the interim report of the project work
	Preparation and implementation of interim assessment			12		
	***Note :** Evaluation of students' work is carried out according to the criteria specified in the methodological recommendations for SIW					

9	**Methods of learning and evaluation**	
9.1	Lectures	Thematic lectures in the form of presentations.
9.2	Laboratory lessons	Laboratory lessons: work in small groups, work in pairs.
9.3	SIW/STIW	Preparation of test assignments, review of tests, checking in the Antiplagiat. VUZ system; preparation and defense of abstracts, review of abstracts, checking in the Antiplagiat. VUZ system; presentation, review of presentation. In case of project work,

		students submit an interim report after testing in RK-1, and a full report on the project in week 15.
9.3.1	Project topics	1. Development of spectral methods for drug analysis. 2. Development of chromatographic methods for drug analysis. 3. Development of photometric methods for drug analysis.
9.4	Midterm control	Midterm assessment is conducted in 2 stages: testing/oral survey. In case of project work, students submit an interim report after testing in RK-1, and a full report on the project in week 15.

10. Evaluation criteria

10.1 Criteria for assessing the learning outcomes of the discipline

№LO	Name of learning outcomes	Unsatisfactory	Satisfactory	Good	Excellent

LO1	**Demonstrates knowledge and understanding in the subject area, based on advanced knowledge in the field:-** demonstrates knowledge and understanding of the purpose of chemical-technological processes and the implementation of pharmaceutical analysis of biologically active compounds on modern equipment.	- Demonstrates minimum knowledge and understanding of the organizational, legal, and methodological foundations for conducting all types of pharmaceutical analysis to control the quality of medicinal substances and finished dosage forms at the stages of development, receipt, storage, and use; - Demonstrates minimum knowledge and understanding in the selection of appropriate chemical and physicochemical methods for identification, purity analysis, and quantitative determination of medicinal products without justification. - Performs pharmacopoeial and non-pharmacopeial analysis methods and conducts pharmaceutical analysis for medicinal products using chemical and various physicochemical methods of analysis under the guidance of a teacher. - Provides an incomplete conclusion on the quality of medicinal products in accordance with the requirements of regulatory documents; - Draws up protocols not in accordance with the established format, they are rather brief and inconsistent, calculation formulas and results of quantitative determination are not provided, units of measurement are not provided; reactions of identification and purity of medicinal products are not accompanied by the chemistry of reactions, quality indicators are not accompanied by drawings, illustrations based on the results of the analysis.	• -Demonstrates partial knowledge and understanding of the organizational, legal, and methodological foundations for conducting all types of pharmaceutical analysis to control the quality of medicinal substances and finished dosage forms at the stages of development, receipt, storage, and use; • -Demonstrates partial knowledge and understanding in choosing the appropriate chemical and physicochemical methods for identification, purity analysis, and quantitative determination of medicinal products without justification. • -Partially proficient in the methods of pharmacopoeial and non-pharmacopeial analysis and conducts pharmaceutical analysis of medicinal products using chemical and physicochemical methods of analysis under the guidance of a teacher. • -Interprets the results of his own laboratory work on pharmaceutical analysis of medicinal products without justification; • -Gives a partial conclusion on the quality of medicinal products in accordance with the requirements of regulatory documents; • -Draws up protocols in accordance with the established format, partial calculation formulas and results of quantitative determination are provided, units of measurement are partially provided; reactions of identification and purity of medicinal products are accompanied by the chemistry of reactions, quality indicators are partially accompanied by drawings, illustrations based on the results of the analysis.	-Demonstrates complete knowledge and understanding of the organizational, legal, and methodological foundations for conducting all types of pharmaceutical analysis to control the quality of medicinal substances and finished dosage forms at the stages of development, receipt, storage, and use; -Demonstrates complete knowledge and understanding in the selection of appropriate chemical and physicochemical methods for identification, purity analysis, and quantitative determination of drugs depending on the physicochemical properties and type of dosage form. -Independently masters the methods of pharmacopoeial and non-pharmacopeial analysis and conducts pharmaceutical analysis of drugs using chemical and various physicochemical methods of analysis and obtains exceptional results. -Interprets the results of his own laboratory work on pharmaceutical analysis of drugs depending on the physicochemical properties and type of dosage form; • Gives the correct conclusion on the quality of drugs in accordance with the requirements of regulatory documents; -Draws up protocols in accordance with the established format, they are written neatly and competently, all calculation formulas and results of quantitative determination are provided, expressed in units of measurement; reactions of identification and purity of medicinal products are accompanied by the chemistry of reactions, quality indicators are accompanied by drawings, illustrations based on the results of the analysis and correspond to the level of the corresponding course.	-Demonstrates exceptional knowledge and understanding of the organizational, legal, and methodological foundations for conducting all types of pharmaceutical analysis to control the quality of medicinal substances and finished dosage forms at the stages of development, receipt, storage, and use; -Demonstrates exceptional knowledge and understanding in the selection of appropriate chemical and physicochemical methods for identification, purity analysis, and quantitative determination of medicinal products depending on the physicochemical properties and type of dosage form; -Fluently uses pharmacopoeial and non-pharmacopeial analysis methods and conducts pharmaceutical analysis for medicinal products using chemical and physicochemical methods and obtains exceptional results; -Gives a substantiated conclusion on the quality of medicinal products in accordance with the requirements of regulatory documents; -Independently draws up protocols in accordance with the established format: they are written correctly and consistently, all calculation formulas and results of quantitative determination are provided, expressed in units of measurement; reactions of identification and purity of medicinal products are accompanied by the chemistry of reactions. In the protocols, all quality indicators are accompanied by drawings and illustrations based on the analysis results and correspond to the level of the corresponding course.
LO2	**Apply knowledge and understanding at a professional level, formulate arguments**	-presents some results of research in the field of quality control of medicines;	- presents partial, fragmentary results of research in the field of quality control of medicines;	- independently presents the results of research in the field of quality control of medicines; - shows readiness	- independently conducts pharmaceutical analysis of medicinal substances and finished medicinal products in the section

	and solve problems in the studied area: -apply the theoretical foundations of general chemical technology to obtain chemical substances, conduct qualitative and quantitative analysis, master the technique of performing on modern analytical equipment for pharmaceutical analysis of drugs; -formulate arguments and solve problems in the studied area, based on knowledge in the field of natural sciences and on the skills of acquired new knowledge in the disciplines of the module; -formulate arguments ar solve problems of cause and-effect relationship between the actual resul of synthesis and the requirements of regulato documents for the qualit of the substance at the stages of obtaining and production.	-shows some readiness to inform specialists and the public about the compliance of medicines with some requirements of regulatory documents; -demonstrates some skills of readiness to introduce ideas for solving problems in case of non-compliance of the quality of medicines with the requirements of regulatory documents.	- shows a partial level of readiness to inform specialists and the public about the compliance of medicines with the requirements of regulatory documents; - demonstrates partial, fragmentary skills of readiness to contribute ideas for solving problems in case of non-compliance of the quality of medicines with the requirements of regulatory documents.	to inform specialists and the public about the compliance of medicines with the requirements of regulatory documents; - demonstrates sufficiently complete skills of readiness to contribute ideas for solving problems in case of non-compliance of the quality of medicines with the requirements of regulatory documents.	"identification", correctly arguing the choice of chemical and physical methods; - "Identification" is the basic term for pharmaceutical substances and finished medicinal products; - independently conducts pharmaceutical analysis of medicinal products and finished medicinal products in the section "purity", correctly arguing the relationship between the methods of obtaining and proper storage of medicinal products; - independently conducts pharmaceutical analysis of finished medicinal products in the section "quality indicators", correctly arguing the type of medicinal product with the corresponding quality indicator; - independently conducts pharmaceutical analysis of medicinal products and finished medicinal products in the section "Quantitative determination", correctly arguing the choice of analysis method taking into account the type of medicinal product, therapeutic dose, sensitivity and selectivity of the analysis method.
LO3	**Collects and interprets information to form judgments taking into account social, ethical and scientific considerations:** - interprets the choice of modern equipment and devices based on the physical and chemical properties of the compounds being studied, analyzes and evaluates the tasks set, finds new solutions to problems in the field of professional activity.	- demonstrates some skills in working with analytical normative documentation (AND), normative and technical documentation (NTD) and the State Pharmacopoeia of the Republic of Kazakhstan (SP RK) on quality control, standardization and safety of medicines; - interprets some results of his own laboratory work and gives an unsubstantiated conclusion in accordance with the requirements of regulatory documents for the quality of medicines; - demonstrates some skills in working with scientific pharmaceutical and medical literature; - shows some knowledge when evaluating domestic and foreign experiences on the topic of research in the field of quality control and standardization of medicines.	- demonstrates partial, fragmentary skills in working with analytical regulatory documentation (ARD), regulatory and technical documentation (RTD) and the State Pharmacopoeia of the Republic of Kazakhstan (SP RK) on quality control, standardization and safety of medicines; - interprets partial, fragmentary results of his own laboratory work and gives a conclusion in accordance with the requirements of regulatory documents for the quality of medicines; - demonstrates partial, fragmentary skills in working with scientific pharmaceutical and medical literature; shows a partial level of knowledge when assessing domestic and foreign experiences on the topic of research in the field of quality control and standardization of medicines.	- full skills in working with analytical normative documentation (AND), normative and technical documentation (NTD) and the state pharmacopoeia of the Republic of Kazakhstan (SP RK) on quality control, standardization and safety of medicines; - independently interprets the results of his own laboratory work and gives a competent conclusion in accordance with the requirements of regulatory documents for the quality of medicines; - demonstrates sufficiently complete skills in working with scientific pharmaceutical and medical literature; - shows knowledge when assessing domestic and foreign experiences on the topic of research in the field of quality control and standardization of medicines.	- demonstrates fundamental skills in working with analytical regulatory documentation (ARD), regulatory and technical documentation (RTD) and the State Pharmacopoeia of the Republic of Kazakhstan (SP RK) on quality control, standardization and safety of medicines; - independently and competently interprets the results of his/her own laboratory work and gives a competent, well-founded conclusion in accordance with the requirements of regulatory documents for the quality of medicines; - demonstrates fundamental skills in working with scientific pharmaceutical and medical literature; shows a high level of knowledge when assessing domestic and foreign experiences on the topic of research in the field of quality control and standardization of medicines
LO4	**Communicates information, ideas, and problem solutions to both specialists and no specialists:** - communicates	- presents some results of research in the field of quality control of medicines; - shows some readiness to inform specialists and the public	- presents partial, fragmentary results of research in the field of quality control of medicines; - shows a partial level of readiness to inform specialists	- independently presents the results of research in the field of quality control of medicines; - shows readiness to inform specialists and the public about the compliance of medicines	- competently presents the results of research in the field of quality control of medicines; - shows a high level of readiness to inform specialists and the public about the compliance of medicines

	information, ideas, and solutions to problems to specialists in conducting chemical-technological processes and documenting the results obtained, as well as to non-specialists on the quality of medicines.	about the compliance of medicines with some requirements of regulatory documents; - demonstrates some skills of readiness to introduce ideas for solving problems in case of non-compliance of the quality of medicines with the requirements of regulatory documents.	and the public about the compliance of medicines with the requirements of regulatory documents; - demonstrates partial, fragmentary skills of readiness to contribute ideas for solving problems in the event of non-compliance of the quality of medicines with the requirements of regulatory documents.	with the requirements of regulatory documents; - demonstrates sufficiently complete skills of readiness to contribute ideas for solving problems in case of non-compliance of the quality of medicines with the requirements of regulatory documents.	with the requirements of regulatory documents; - demonstrates fundamental skills of readiness to contribute ideas for solving problems in case of non-compliance of the quality of medicines with the requirements of regulatory documents.
LO5	**Learning skills necessary to independently pursue further learning in the area of study**: - has the skills to search for and analyze information, acquire new knowledge necessary for professional activities in the field of pharmaceutical production; - interprets the results of his own laboratory work on chemical and technological processes, methods and equipment for pharmaceutical analysis, gives a conclusion in accordance with the requirements of regulatory documents on the quality of medicines.	- is unable to demonstrate knowledge of the state system of quality control and standardization of drugs in the Republic of Kazakhstan; - does not know enough and refers to regulatory documents governing the quality of drugs in the Republic of Kazakhstan (SPh RK, AND, VAND) and to international quality standards regulating the quality of drugs (European Pharmacopoeia, British Pharmacopoeia, U.S. Pharmacopoeia, Japanese Pharmacopoeia, SPh RF, SPh U, SPh RB). - complete lack of understanding when preparing documentation of the established form for quality control of drugs in accordance with the requirements of regulatory documents and orders; - does not sufficiently delve into the results of his own laboratory work, the design in the form of an analysis protocol and presents in class; makes an unreliable conclusion about the quality of drugs based on the results of the analysis.	-demonstrates partial understanding of the knowledge of the state system of quality control and standardization of drugs in the Republic of Kazakhstan; - partially knows and refers to regulatory documents governing the quality of drugs in the Republic of Kazakhstan (SPh RK, AND, VAND) and to international quality standards regulating the quality of drugs (European Pharmacopoeia, British Pharmacopoeia, U.S. Pharmacopoeia, Japanese Pharmacopoeia, SPh RF, SPh RU, SPh RB). - adequately draws up documentation of the established form on quality control of drugs in accordance with the requirements of regulatory documents and orders; - satisfactorily presents the results of his own laboratory work, draws up an analysis protocol and presents it in class; - makes a conclusion on the quality of drugs based on the results of the analysis, without justification.	- demonstrates a complete understanding of the state system of quality control and standardization of drugs in the Republic of Kazakhstan; - sufficiently knows and refers to regulatory documents governing the quality of drugs in the Republic of Kazakhstan (SPh RK, AND, VAND) and to international quality standards regulating the quality of drugs (European Pharmacopoeia, British Pharmacopoeia, U.S. Pharmacopoeia, Japanese Pharmacopoeia, SPh RF, SPh U, SPh RB). - prepares documentation of the established form on quality control of drugs in accordance with the requirements of regulatory documents and orders; - sufficiently substantiates the results of his own laboratory work, draws up an analysis protocol and presents it in class; makes the correct conclusion about the quality of drugs based on the results of the analysis.	- demonstrates exceptional knowledge of the state system of quality control and standardization of drugs in the Republic of Kazakhstan; - fully knows and appropriately refers to regulatory documents governing the quality of drugs in the Republic of Kazakhstan (SPh RK, AND, VAND) and to international quality standards regulating the quality of drugs (European Pharmacopoeia, British Pharmacopoeia, U.S. Pharmacopoeia, Japanese Pharmacopoeia, SPh RF, SPh U, SPh RB). - independently prepares documentation of the established form on quality control of drugs in accordance with the requirements of regulatory documents and orders; - reasonably presents the results of his own laboratory work, competently draws up an analysis protocol and presents it in class; reasonably and correctly makes a conclusion on the quality of drugs based on the results of the analysis.

LO6	**Knows methods of scientific research and academic writing and applies them to the area of study:**- knows the methods of scientific research activities, the methodological foundations of scientific research, modern problems of pharmaceutical production, methods of theoretical and empirical research, the methodology of organizing and conducting a scientific experiment, the rules of academic writing and presentation of research results.	- formulates some part of the problem, there are difficulties in determining the goal and objectives of the research work; - makes a plan, goal and objectives of the research work with the maximum number of errors; - conducts scientific research using chemical, physical and chemical methods with the help of a teacher and interprets some of the results of the research.	- partially formulates the problem, defines the purpose of the research work, understands and justifies the relevance, novelty, theoretical and practical significance of the research tasks; - partially draws up a plan, purpose and tasks of the research work; - partially masters new research methods, acquires new knowledge; - partially conducts scientific research using chemical, physicochemical methods, presents the results of his work and correctly interprets the results of the conducted research. - partially draws conclusions of the research work, correctly, logically and consistently presents the obtained results in writing, freely speaks about the results of his scientific work to an audience.	- formulates the problem, defines the purpose of the research work, understands and justifies the relevance, novelty, theoretical and practical significance of the research tasks; • - makes a plan, purpose and tasks of the research work; • - masters new research methods, acquires new knowledge; • - conducts scientific research using chemical, physicochemical methods and presents the results of his work and correctly interprets the results of the conducted research. - draws conclusions of the research work, correctly, logically and consistently presents the obtained results in writing, freely speaks about the results of his scientific work to an audience.	- independently formulates the problem, determines the purpose of the research work, understands and justifies the relevance, novelty, theoretical and practical significance of the research objectives; • - independently draws up a plan, purpose and objectives of the research work; • - independently masters new research methods, acquires new knowledge; • - independently conducts scientific research using chemical, physicochemical methods, presents the results of his work and correctly interprets the results of the conducted research. - independently draws conclusions of the research work, correctly, logically and consistently presents the obtained results in writing, freely speaks about the results of his scientific work to an audience.
LO7	**Applies knowledge and understanding of facts, phenomena, theories and complex relationships between them in the area of study:** selects methods for research and analysis of biologically active compounds based on their physical and chemical properties; - conducts all types of chemical and technological testing of biologically active compounds and pharmaceutical analysis of drugs using modern equipment.	- demonstrates a minimal understanding of the relationship between the quality indicators of drugs and their physical, chemical properties and production methods; - unreasonably selects methods for research and analysis of drugs, without taking into account their physical and chemical properties; - when forecasting, does not take into account the relationship between the chemical structure and pharmacological activity of drugs; - does not provide an accurate forecast of the storage conditions of drugs and does not take into account the physical, chemical properties, types and compositions of the dosage form	- demonstrates partial understanding of the relationship between the quality indicators of drugs, but cannot describe their physical, chemical properties and methods of production; - partially selects methods of research and analysis of drugs based on their physical and chemical properties; -when forecasting, partially takes into account the relationship between the chemical structure and pharmacological activity of drugs; - predicts storage conditions of drugs, without taking into account the physical, chemical properties, types and composition of the dosage form	- demonstrates a complete understanding of the relationship between the quality indicators of drugs and their physical, chemical properties and production methods; - selects methods for research and analysis of drugs based on their physical and chemical properties; - predicts the relationship between the chemical structure and pharmacological activity of drugs; - predicts the shelf life and storage conditions of drugs based on the physical, chemical properties, type and composition of the dosage form	- demonstrates exceptional knowledge and understanding of the relationship between the quality indicators of drugs and their physical, chemical properties and production methods; - independently selects methods for research and analysis of drugs based on their physical and chemical properties; - reasonably predicts the relationship between the chemical structure and pharmacological activity of drugs; - effectively and accurately predicts the shelf life and storage conditions of drugs based on the physical, chemical properties, type and composition of the dosage form

LO8	**Understands the importance of principles and culture of academic integrity** - understands the principles and culture of academic honesty in the educational process, expressing the honesty of students in completing all assessment work in the process of mastering theoretical and practical material in the disciplines of this module.	- partially observes academic honesty when completing assessed work, partially relying on his/her own knowledge and personal experience, conscientiously performs all functions of a student in an educational institution; - partially understands the ethics of citation: uses a method of transmitting someone else's information and thoughts with an indication of the author, title and source of the work; - partially selects and uses reliable and trustworthy sources of information.	-observes academic honesty when completing assessed work, relying on his/her own knowledge and personal experience, conscientiously performs all functions of a student in an educational institution; -understands the ethics of citation: meaningfully and logically uses the method of conveying someone else's information and thoughts, indicating the author, title and source of the work; -selects and uses reliable and trustworthy sources of information.	-observes academic honesty when completing assessed work, relying on his/her own knowledge and personal experience, conscientiously performs all functions of a student in an educational institution; -understands the ethics of citation: meaningfully and logically uses the method of conveying someone else's information and thoughts, indicating the author, title and source of the work; -selects and uses reliable and trustworthy sources of information.	- strictly observes academic honesty when completing assessed work, relying solely on his/her own knowledge and personal experience, conscientiously performs all functions of a student in an educational institution; - correctly understands the ethics of citation: meaningfully and logically uses the method of conveying someone else's information and thoughts, indicating the author, title and source of the work; - independently selects and uses reliable and trustworthy sources of information.

10.2 Methods and criteria for evaluation

10.2.1 Checklist for a laboratory lesson

№	Level evaluation criteria	Level			
		Very high level (9.1-10.0 points at each level)	High level (7,0-9,0 points at each level)	Average level (5,0-7,0 points at each level)	Lower level (0-5,0 points at each level)
1	readiness to perform laboratory work according to the workplace	readiness to perform laboratory work according to the workplace is very good	readiness to perform laboratory work according to the workplace is good	readiness to perform laboratory work according to the workplace is average	not ready to perform laboratory work according to the workplace
2	masters the technique of performing operations	very good at performing operations (calculates material balance, assembles a diagram, filters, titrates, etc.)	has a good command of the technique of performing operations (calculates material balance, assembles a diagram, filters, titrates, etc., allows minor errors)	average level of proficiency in the technique of performing operations (calculates material balance, assembles a diagram, filters, titrates, etc., makes significant errors)	does not have the technique for performing operations (cannot calculate the material balance, assemble a diagram, filter, titrate, etc.)
3	has skills in working with measuring utensils and measuring instruments	has skills in working with measuring utensils and measuring instruments	makes minor errors when working with measuring utensils and measuring instruments	makes significant mistakes when working with measuring utensils and	does not have the skills to work with measuring utensils and measuring instruments

				measuring instruments	
4	observes safety precautions in the workplace	properly observes safety precautions in the workplace	allows minor errors while observing safety precautions in the workplace	makes significant mistakes when observing safety precautions in the workplace	does not observe safety precautions in the workplace
5	correctly evaluates the results of the operations performed	correctly evaluates the results of the operations performed	makes minor errors when evaluating the results of completed operations	makes significant mistakes when evaluating the results of completed operations	cannot evaluate the results of the operations performed
6	knows how to correctly calculate the product yield, its quantitative content, etc.	knows how to correctly calculate the product yield, its quantitative content, etc..	when making calculations on the product yield, its quantitative content, etc., allows minor errors	when making calculations on the product yield, its quantitative content, etc., it makes significant errors	does not know how to correctly calculate the product yield, its quantitative content, etc.
7	knows how to work with regulatory documents and other reference literature	knows how to work with regulatory documents and other reference literature	when working with regulatory documents and other reference literature, makes minor mistakes	when working with regulatory documents and other reference literature, he makes significant mistakes	does not know how to work with regulatory documents and other reference literature
8	correctly calculates the product yield and gives the correct conclusion	correctly calculates the product yield and gives the correct conclusion	when calculating the product yield, when concluding the obtained results, allows minor errors	when calculating the product yield, when concluding the results obtained, it makes significant errors	incorrectly calculates the product yield and gives an incorrect conclusion
10	answers control tests on the topic of the laboratory lesson (75-	answers control tests on the topic of the laboratory lesson (91-100% correct answers)	answers control tests on the topic of the laboratory lesson (70-90% correct answers)	answers control tests on the topic of the laboratory lesson (50-70% correct answers)	answers control tests on the topic of the laboratory lesson (0-50% correct answers)

	100% correct answers)				
	conclusion	91-100 points Excellent	70-90 баллов Good	50-70 балла Satisfactory	0-50 баллов Unsatisfactory

10.2 Checklist for SIW

№	points	Evaluation criteria
1	**excellent** A(4,0; 95-100%); A-(3,67; 90-94%);	***Preparation and defense of the abstract*** · the abstract fully complies with the requirements for writing abstracts set out in the methodological recommendations for SIW; · when defending an abstract, demonstrates fluency in the material, presents it clearly, clearly, logically, competently, convincingly, and speaks professionally; · confidently and accurately answers questions; · submitted on time according to schedule. ***Review of the abstract*** · the review fully reflects: the relevance of the topic, novelty and practical significance, conclusions, recommendations, the degree to which the problem was solved and the work was completed, the correctness of its formulation, the author's familiarity with the scientific literature, the depth of the discussion, the literacy of the presentation; · sensible and principled comments and suggestions; · confidently and accurately answers questions; · submitted on time according to schedule. ***Presentation*** *1. General requirements:* · the design of the slides and the presentation of information fully complies with the requirements for the presentation, set out in the methodological recommendations for SIW; · when defending, demonstrates fluency in the material, presents it clearly, clearly, logically, competently, convincingly, and speaks professionally; · confidently and accurately answers questions; · submitted on time according to schedule. *2. Requirements for the presentation "Additions to the lecture".* Additions to the lecture should reflect: · rational name, synonyms of drugs; · functional analysis with the chemistry of reactions; · justification for the choice of pharmacopoeial and non-pharmacopoeial methods of quantitative analysis with the chemistry of reactions and the necessary calculations of quantitative measurements; · justification of the purity parameters recommended by regulations; · description of new drugs (chemical formula, Latin, rational names, physical and chemical properties, methods of analysis, application, etc.). ***Review of the presentation*** · the review fully reflects: compliance with the requirements for the presentation in terms of design style, presentation of information, content, text set out in the guidelines for SIW;

		· sensible and significant comments and suggestions; · confidently and accurately answers questions; · submitted on time according to schedule. ***Compilation of test tasks*** · test tasks (at least 20 tasks) meet the requirements: adequacy (validity), logic, conciseness and brevity of the text, correct arrangement of task elements, simplicity - one test task must contain one task of one level of difficulty, with one correct answer; · submitted on time according to schedule. ***Making a crossword:*** · crossword puzzle cells are clear, distinct, symmetrical; · the number of word intersections is not less than 8; · a unified style of tasks is maintained, the answer is a logical conclusion of the question posed; · tasks are composed lexically and stylistically correctly; · the number of tasks in the crossword puzzle is not less than 30, covering all the main questions of the topic. ***During midterm control*** *1.Testing* · 90-100% correct answers
2	**good** B+(3,33; 85-89%); B (3,0;80-84%); B-(2,67; 75-79%); C+(2,33; 70-74%)	Meets the above evaluation criteria but allows: ***Preparation and defense of the abstract*** · insignificant notes on design ; · non-fundamental mistakes when answering questions. ***Review of the abstract*** · typos, incorrect expressions; · not fundamental errors, inaccuracies in answering questions. ***Presentation*** · minor design comments; · non-fundamental errors when answering questions. ***Review of the presentation*** · typos, incorrect expressions; · non-fundamental mistakes, inaccuracies when answering questions. ***Compilation of test tasks*** · test tasks (at least 20 tasks) have insignificant comments (no more than 2-3) according to the above criteria. ***Making a crossword:*** · meets all the above criteria, but a uniform design style is not maintained. ***During midterm control*** *1.Testing* · 70-89% correct answers
3	**satisfactory** C (2,0; 65-69%); C- (1,67;	Meets the above assessment criteria but allows: ***Preparation and defense of the abstract*** · significant comments on the design; · fundamental mistakes in answering questions. ***Review of the abstract***

	60-64%) Д+(1,33; 55-63%); Д (1,0; 50-54%)	· insufficient disclosure of the points of the abstract (no more than 2 points); · fundamental errors, inaccuracies in answering questions; comments and suggestions require correction. ***Presentation*** · significant comments on the design; · fundamental errors in answering questions ***Review of the presentation*** fundamental errors, inaccuracies in answering questions, comments and suggestions that are not fundamental. ***Compilation of test tasks*** · test tasks have significant comments (no more than 2-3) according to the above criteria. ***Making a crossword:*** · meets all the above criteria, but the number of tasks in the crossword is less than 30. ***During midterm control*** *Testing* · 50-69% correct answers
4	**unsatisf.** FX(0,5; 25-49%)	***Preparation and defense of the abstract*** · does not meet some design requirements. · does not have sufficient knowledge of the material, reads the text, does not answer questions. ***Review of the abstract*** · does not meet the requirements, some points of the abstract are not sufficiently covered. ***Presentation*** · does not meet some design requirements. · does not have sufficient knowledge of the material, reads text from a slide, does not answer questions. ***Review of the presentation*** · does not meet the requirements, some points of the presentation are not sufficiently covered. ***Compilation of test tasks*** · test tasks have significant comments (more than 2-3) according to the above criteria. ***Making a crossword:*** · does not meet some requirements. ***During midterm control*** *Testing* · 25-49% correct answers.
	unsatisf. F (0; 0-49%)	***Preparation and defense of the abstract*** · does not meet the design requirements; · does not have the material; · not submitted on time. ***Review of the abstract*** · does not meet the requirements, all points of the abstract are not sufficiently covered; · not submitted on time. ***Presentation*** · does not meet the design requirements;

		· does not have the material; · not submitted on time. ***Review of the presentation*** · does not meet the requirements, all points of the presentation are not sufficiently covered; · not submitted on time. ***Compilation of test tasks*** · test tasks have significant comments (more than 4-5) on the above criteria; · not submitted on time. ***Making a crossword:*** · does not meet requirements; · not submitted on time. ***During midterm control*** *Testing* · less than 50% correct answers

10.3 Criteria for evaluating project work

Criteria **"Goal setting and project planning"**	Points
Goal is **not formulated**	unsatisf. 0-49%
The **goal** is **formulated**, but there is **no plan** to achieve it	satisf. 50-69%
The goal is formulated, **justified**, and a **schematic plan** for achieving it is given.	good 70-89%
The goal is formulated, clearly **justified**, and a detailed **plan** for achieving it is given.	excellent 90-100%
***Criterion* "Statement and justification of the project problem"**	
The project problem is **not formulated**	unsatisf. 0-49%
The formulation of the project **problem is superficial**	satisf. 50-69%
The project problem is **clearly formulated and justified**	good 70-89%
The project problem is **clearly formulated, justified and deep in nature**.	excellent 90-100%
Criterion "Diversity of information sources used"	
Information that was **not relevant** to the topic and purpose of the project was used	unsatisf. 0-49%
Most of the information presented is **not relevant** to the topic of the work.	satisf.

	50-69%
The work contains **a small amount** of relevant information from a **limited** number of **similar** sources	good 70-89%
The work contains fairly **complete** information from a **variety** of sources.	excellent 90-100%
***Criterion* "Depth of disclosure of the project topic"**	
Topic of the project is **not disclosed**	unsatisf. 0-49%
Topic of the project is disclosed in **fragments**	satisf. 50-69%
The topic of the project has been revealed, the author has demonstrated knowledge of the topic within the **framework of the work program in the discipline being studied**	good 70-89%
The topic of the project is fully disclosed; the author has demonstrated **deep knowledge that goes beyond the scope of the work program being studied.**	excellent 90-100%
***Criterion* "Analysis of the progress of work and the results obtained, conclusions"**	
No attempts have been made to analyze the progress and results of the work	unsatisf. 0-49%
The analysis is replaced by a **brief description** of the progress and order of work	satisf. 50-69%
A **detailed result** of the work to achieve the goals stated in the project is presented.	good 70-89%
An exhaustive analysis of the **obtained work** results is presented, the necessary **conclusions** are drawn, and work **prospects** are outlined.	excellent 90-100%
***Criterion* "Achieving the goal and compliance with the content of the project"**	
The goals stated in the project **were not achieved**	unsatisf. 0-49%
A significant part of the working methods used do **not correspond to** the theme and purpose of the project	satisf. 50-69%
The methods used **correspond** to the theme and purpose of the project, but are **insufficient**	Good 70-89%
The methods of work are **sufficient** and used appropriately and effectively, the **objectives of the project are achieved**	excellent 90-100%
***Criterion* "Personal participation, creative approach to work"**	

The work is **formulaic**, showing the **formal** attitude of the author	unsatisf. 0-49%
The author showed **little involvement** in the topic of the project, but did not demonstrate independence in work, did not use the possibilities of a creative approach	satisf 50-69%
The author showed **little involvement** in the topic of the project, but **did not demonstrate independence** in work, **did not use the possibilities of a creative approach**	good 70-89%
The work is distinguished by **a creative approach**, full participation and the author's own **original attitude** to the idea of the project	excellent 90-100%
***Criterion* "Compliance with the requirements for the written part"**	
The written part of the project does not meet the requirements, all sections of the work are not disclosed and the work is not submitted on time	unsatisf. 0-49%
In the written part of the work, all sections are partially disclosed,bfundamental mistakes	satisf. 50-69%
There are typos and incorrect expressions in the work.	good 70-89%
The work fully reflects: the relevance of the topic, novelty and practical significance, conclusions, recommendations, the degree of solution to the problem and completion of the work, the correctness of its formulation, the author's familiarity with the scientific literature, the depth of the discussion, the literacy of the presentation and the work was delivered on time according to schedule	excellent 90-100%
***Criterion* "Quality of presentation"**	
There are a large number of fundamental errors in the presentation and answer the questions.	unsatisf. 0-49%
The presentation contains minor fundamental errors and inaccuracies; partial fundamental errors when answering questions	satisf. 50-69%
The presentation contains typos, incorrect expressions, some non-fundamental errors, and inaccuracies in answering questions.	good 70-89%
The presentation in terms of design style, presentation of information, content, text meets the general requirements for presentation design. The author confidently and accurately answers questions	excellent 90-100%
***Criterion* "Quality of the final product"**	
There is **no project** product	unsatisfactory 0-49%
The design product **does not meet quality requirements** (aesthetics, ease of use, compliance with stated goals)	satisfactory 50-69%

The product **does not fully meet** quality requirements	good 70-89%
The product **fully meets the quality requirements** (aesthetically pleasing, easy to use, meets the stated purposes).	excellent 90-100%

10.4 Multi-point system of knowledge assessment

Letter System Evaluation	Digital Points Equivalent	% content	Traditional Rating Scale
A	4,0	95-100	Excellent
A -	3,67	90-94	
B +	3,33	85-89	Good
B	3,0	80-84	
B -	2,67	75-79	
C +	2,33	70-74	
C	2,0	65-69	Satisfactory
C -	1,67	60-64	
D+	1,33	55-59	
D-	1,0	50-54	
FX	0,5	25-49	Unsatisfactory
F	0	0-24	

11. Learning resources

11.1 Electronic resources, including but not limited to: databases of educational literature, animation simulators, professional blogs, websites, electronic reference materials.
Links to the lecture complex on the discipline "Methods and equipment for pharmaceutical analysis":

Electronic resources LIC:

Electronic library of SKMA - https://e-lib.skma.edu.kz/genres
Republican Interuniversity Electronic Library (RIEL) – http://rmebrk.kz/
Digital library «Aknurpress» - https://www.aknurpress.kz/
Electronic library «Epigraph» - http://www.elib.kz/
Epigraph - multimedia textbook portal https://mbook.kz/ru/index/
ЭБС IPR SMART https://www.iprbookshop.ru/auth
information and legal system "Zan" - https://zan.kz/ru
Cochrane Library - https://www.cochranelibrary.com/

11.2 **Electronic resources:**

1. Харитонов, Ю. Я. Аналитическая химия. Аналитика - 2. Количественный анализ. Физико-химические (инструментальные) методы анализа [Электронный ресурс] : учебник. - Электрон. текстовые дан. (43,1Мб). - М. : ГЭОТАР - Медиа, 2017

2. Харитонов, Ю. Я. Аналитическая химия. Аналитика - 1. Общие теоретические основы. Качественный анализ [Электронный ресурс] : учебник. - Электрон. текстовые дан. (44,3Мб). - М. : ГЭОТАР - Медиа, 2017
3. Харитонов, Ю. Я. Аналитическая химия. Качественный анализ. Титриметрия [Электронный ресурс] : учебник. - Электрон. текстовые дан. (39,9Мб). - М. : ГЭОТАР - Медиа, 2017
4. Ордабаева, С. К. Промышленные методы получения лекарственных средств [Электронный ресурс] : лабораторный практикум / С. К. Ордабаева, А. Д. Асильбекова. Шымкент : [б. и.], 2016. - 200 б. эл. опт. диск (CD-ROM).
5. Фармациядағы физикалық-химиялық әдістер. [Электронный ресурс] = Физико-химческие методы исследования. = Physicaland chemical impharmacy, on the absorption of electromagnetig Radiation :әдістемелік ұсыныс / С. К. Ордабаева [ж. б.] ; ОҚМФА; Фармацевтикалық және токсикологиялық химия каф. - Электрон. текстовые дан. (8,72 Мб). - Шымкент : Б. ж., 2013. - эл. опт. диск
6. Анализ лекарственных веществ. Ч.1. Общие реакции на подлинность: учеб. пособ. / В.А. Смирнов. - Самара. Самар. гос. техн. ун-т, 2008. - 55 с https://aknurpress.kz/reader/web/2637
7. Тюкавкина, Н. А. Биоорганическая химия [Электронный ресурс] : учебник / - Электрон. текстовые дан. (47,4 МБ). - М. : Издательская группа "ГЭОТАР- Медиа", 2011. - 416 с. эл. опт. диск (CD-ROM). - (Электронный учебник).

Laboratory resources: instruments and equipment for performing laboratory tasks:

- Electric aquadistiller АЭ-25 МО;
- Water bath thermostat WB-4MS;
- Laboratory ion meter И-160;
- Photoelectric concentration colorimeter КФК-2;
- Laboratory centrifuge СМ-6М:
- Laboratory microscope МС 50;
- Magnetic stirrer with heating MSH-300;
- Mini shaker 3D;
- Refractometer RL3;
- RefractometerИРФ-454 Б2М;
- pH meter - millivoltmeter pH-150MA;
- Rotamix RM-1;
- Spectrophotometer СФ-2000;
- Water thermostat U/UH;
- Photoelectric photometers КФК-3-«ЗОМЗ»;
- Fourier spectrometer infrared infralum ФТ-08
- Chromatograph ЛХМ-2000:
- Digital spectrophotometer PD-303S;

Electronic scales CAS ME - 410, PIONEER, AA-160, etc.;

11.3	Special programs: STATISTICA-Version 10 (StatSoft Inc, США), Microsoft Office Excel, «ChemStation 3D»

11.4	Journals (electronic journals): journals “Pharmacy”, “Chemical-Pharmaceutical Journal”, “Pharmacy of Kazakhstan”, etc.
11.5	**Literature** **main:** **in Russian language** Анализ лекарственных препаратов, производных ароматических соединений: Ордабаева С.К.-Шымкент: Типография «Әлем».- 2012.-270 с. Асильбекова, А. Д. Промышленные методы получения лекарственных средств: лабораторный практикум / А. Д. Асильбекова, С. К. Ордабаева. - Алматы : New book, 2022.-212 с. Государственная фармакопея Республики Казахстан.-Алматы: Издательский дом «Жибек жолы».-2008.-Том 1.-592 с. Государственная фармакопея Республики Казахстан.- Алматы: Издательский дом «Жибек жолы».-2009.-Том 2.-804 с. Государственная фармакопея Республики Казахстан.-Алматы: Издательский дом «Жибек жолы».-2014.-Том 3.-864 с. Государственная Фармакопея Республики Казахстан. Т.1. – Алматы: Издательский дом «Жибек жолы», 2015. – 720 с. Руководство по инструментальным методам исследований при разработке и экспертизе качества лекарственных препаратов./– М. Изд-во Перо, 2014. – 656с. Харитонов, Ю. Я. Аналитическая химия. Количественный анализ, физико-химические методы анализа: практикум: учеб. пособие -М.:ГЭОТАР - Медиа, 2012. - 368с. Харитонов, Ю. Я. Аналитическая химия. Аналитика 2. Количественный анализ. Физико-химические (инструментальные) методы анализа: учебник - М: ГЭОТАР - Медиа, 2014. - 656 с. . Адиходжаева, Б. Б. Аналитическая химия: учебное пособие / -Алматы: ЭСПИ, 2023.- 220с. . Бошкаева, А. К. Структурные исследования лекарственных веществ методами физико-химического анализа: учеб. пособие/ - Алматы : New book, 2022. - 276 с. . Халиуллин, Ф. А. Инфракрасная спектроскопия в фармацевтическом анализе: учебное пособие / - М.: ГЭОТАР - Медиа, 2017. - 160 с . Сейтембетова, А. Ж. Аналитическая химия: учебное пособие / - Алматы : New book, 2022. -124с. . Тюкавкина, Н. А. Биоорганикалық химия: оқулық / Қаз. тілінен ауд. жауапты ред. Т. С. Сейтембетов. - М. : ГЭОТАР - Медиа, 2014. - 400 бет. +эл. опт. диск (CD-ROM) . Тюкавкина, Н. А. Биоорганическая химия: учебник /- М.: ГЭОТАР -Медиа, 2011. - 416с. **in Kazakh language** Дәріс кешені- Фармацевтикалық талдаудың әдістері мен құралдары пәні бойынша : дәріс кешені / фармацевтикалық және токсикологиялық химия кафедрасы. - Шымкент : ОҚМФА, 2016. - 92 бет

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Қазақстан Республикасының Мемлекеттік фармакопеясы. Т. 1. – Алматы: «Жібек жолы» баспа үйі, 2015. – 720 бет

additional:

Арзамасцев, А. П. Фармацевтическая химия: учеб. пособие/-3-е изд., испр. . - М. : ГЭОТАР - Медиа, 2008. - 640 с
Арзамасцев, А. П. Руководство к лабораторным занятиям по фармацевтической химии: учебное пособие / М.: Медицина, 2004. - 384 с. - (Учеб. лит. для студ. фарм. вузов и фак.).
Беликов, В. Г. Фармацевтическая химия : учебное пособие/- 2-е изд. - М. : Медпресс-информ, 2008. - 616 с.
Практикум по физико-химическим методам анализа, под ред. О.М. Петрухина.-М., 1987.-248 с.

12	**Course policy**

Requirements for students, attendance, behavior, grading policies, penalties, incentives, etc.

Students need:

possess theoretical knowledge and practical skills in basic chemical disciplines (inorganic, organic, physical chemistry) and be able to apply them to chemical technological processes;

be prepared to perform laboratory work in the field of chemical production individually, in pairs, in small groups;

carry out SIW according to schedule;

attend SIW classes, attendance of which is recorded weekly in the journal; if the SIW is absent from classes, penalties are prescribed;

have an idea of the topic of the upcoming lecture, be prepared for feedback during the lecture;

be able to work in a team;

observe safety precautions in the chemical laboratory;

treat laboratory glassware, supplies, and equipment with care;

keep the workplace clean.

the penalty point for missing one lecture class without a good reason is 1 point, which is deducted from the MC's grades; if you miss one SIW lesson - 2 points from the AAR (excluding 60% of current control);

assessment of the admission rating (AAR) for the final control in the discipline consists of average scores for the laboratory lesson, SIW, midterm control and lecture attendance;

✓ AAR for the final control in discipline must be at least 30 points (50%).

13	**Academic policy based on the moral and ethical values of the academy**
	МиссияMission

	Training of highly qualified competitive medical and pharmaceutical specialists for the Southern region and the country as a whole based on the achievements of modern science and practice, ready to adapt to rapidly changing conditions in the medical and pharmaceutical industry through continuous improvement of competence and development of creative initiative.
	Vision An effective system of medical and pharmaceutical education, based on a competency-based approach and the needs of practical healthcare and the pharmaceutical industry, focused on training specialists who meet international quality and safety standards. **Basic ethical principles** on which SKMA relies to implement its mission: **The principle of high professionalism of SKMA teaching staff** is the constant improvement of their knowledge and skills, ensuring the provision of high-quality educational services to students at all levels of training. **The principle of quality in SKMA** is the implementation of the concept of modernization of Kazakhstani education, the main direction of which is to ensure modern quality of education based on maintaining its fundamentality and compliance with the current and future needs of the individual, society and the state, which is ensured by the use in the educational process, research activities and advisory - diagnostic work of innovative technologies and new achievements of science and practice. **The principle of learning orientation** is the implementation of a student-centered educational process along flexible trajectories of educational programs, taking into account rapidly changing economic conditions and current trends in the labor market, creating the most effective conditions for students for their professional growth, developing motivation and monitoring learning outcomes, continuous updating of educational programs, expanding the scope of knowledge and competencies necessary for effective professional activities.
14	**Agreement, approval and revision**

Date of agreement with BIC	Protocol	Full name of the head of BIC	Signature
14.06.2024	№ 9	Darbicheva R.I., head of BIC	
Date of approval by the department	Protocol	Full name of the head	Signature
10.06.2024	№ 21	Ordabaeva S.K., pharm s.d., professor	
Date of review by the AC of EP	Protocol	Full name of chairman of the EPC in PMT	Signature
14.06.2024	№ 10	Torlanova B.O., C. of Pharm. s., ass. Prof.	
Date of revision at the department	Protocol	Full name of the head	Signature

		Ordabaeva S.K., pharm s.d., professor	
Date of review by the AC of EP	Protocol	Full name of chairman of the EPC in PMT	Signature
		Torlanova B.O., C. of Pharm. s., ass. Prof.	