

SYLLABUS
Fall semester 2024-2025 academic year
Educational program "6B07201-Technology Pharmaceutical Production"

ID and name of course	Independent work of the student (IWS)	Number of credits			General number of credits	Independent work of the student under the guidance of a teacher (IWST)
		Lectures (L)	Practical classes (PC)	Lab. classes (LC)		
91387 Methods of control and analysis of compounds	5	1.5	-	4.5	6	6

ACADEMIC INFORMATION ABOUT THE COURSE

Learning Format	Cycle, component	Lecture types	Types of practical classes	Form and platform final control
Offline	CD. University component	Oral presentation	Labs	Written (Univer)
Lecturer - (s)	Madi Abilev PhD, Associate professor			
e-mail :	madi.abilev@kaznu.edu.kz			
Phone :	8 (727) 221-15-07			
Assistant - (s)	-			
e-mail :	-			
Phone :	-			

ACADEMIC COURSE PRESENTATION

Purpose of the course	Expected Learning Outcomes (LO) * As a result of studying the discipline the student will be able to:	Indicators of LO achievement (ID)
formation of the ability to justify the choice of the method of analytical control of materials based on analytical and metrological characteristics.	1. explain the principles and methods of analytical chemistry	1.1 The student can use terms in analytical chemistry
		1.2 The student can choose chemical glassware, tools and equipment
		1.3 The student can write an analytical reaction; is able to use the obtained information
	2. understand the basics of qualitative and quantitative analysis methods of inorganic and organic substances, including physical and chemical analysis methods	2.1 The student understands the basics of qualitative and quantitative analysis
		2.2 The student is able to determine equivalent by chemical reaction
		2.3 The student can prepare a solution based on calculations
		2.4 The student distinguishes the area of application of the analysis, can draw conclusions about the condition of the device based on operational indicators
	3. qualitative and quantitative analysis of chemicals, including medicines	3.1 The student can perform calculations for drug analysis, considering influence factors
		3.2 The student can choose the optimal condition of the studied component in the medicinal product
	4. implement the results of the analysis of various substances through statistical processing	4.1 The student can perform chemical processes;
		4.2 The student can identify correctly the analysis stages, apply the execution sequence;
		4.3 The student knows the statistical processing of the results

	5. present the obtained results in the form of summary reports and presentations	5.1 The student can eliminate the effect of extraneous components for a multicomponent system, perform analysis 5.2 The student can prove the correctness of the analysis result, is able to report
Prerequisites	General chemistry, Inorganic chemistry, Mathematics	
Postrequisites	Organic chemistry, Physical chemistry	
Learning Resources	<p>Literature:</p> <ol style="list-style-type: none"> 1. D. Muralidhara Rao, A. V. N. Swamy, D. Dharaneeswara Reddy. Instrumental Methods of Analysis. - CBS Publishers & Distributors, 2020. – 384 p. 2. Skoog Douglas A., West D.M., Holler F.J., Crouch S.R. Fundamentals of Analytical Chemistry, 10th edition. — Cengage Learning, 2021. — 1165 p. 3. Pandian P.S., Sridevi G., Indirani R., Surendran U. Analytical Chemistry: An Introduction. - New India Publishing Agency, 2021. — 169 p. 4. Goyal A., Kumar H. (ed.) Advanced Techniques of Analytical Chemistry: Volume 1. - Bentham Books, 2022. — 148 p. 5. Ritgen U. Analytical Chemistry I. - Springer-Verlag GmbH, 2023. — 307 p. <p>Research infrastructure</p> <ol style="list-style-type: none"> 1. Labs of the department of analytical, colloid chemistry and technology of rare elements <p>Professional scientific databases</p> <ol style="list-style-type: none"> 1. Web of Science 2. Scopus <p>Internet resources</p> <ol style="list-style-type: none"> 1. http://elibrary.kaznu.kz/ru 2. MOOC / video lectures. 3. https://www.twirpx.com/ 4. https://www.sciencedirect.com 	

Academic course policy	<p>The academic policy of the course is determined by <u>the Academic Policy and the Policy of Academic Integrity of Al-Farabi Kazakh National University</u>.</p> <p>Documents are available on the main page of IS Univer.</p> <p>Integration of science and education. The research work of students, undergraduates and doctoral students is a deepening of the educational process. It is organized directly at the departments, laboratories, scientific and design departments of the university, in student scientific and technical associations. Independent work of students at all levels of education is aimed at developing research skills and competencies based on obtaining new knowledge using modern research and information technologies. A research university teacher integrates the results of scientific activities into the topics of lectures and seminars (practical) classes, laboratory classes and into the tasks of the IWST, IWS, which are reflected in the syllabus and are responsible for the relevance of the topics of training sessions and assignments.</p> <p>Attendance. The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course. Failure to meet deadlines results in loss of points.</p> <p>Academic honesty. Practical/laboratory classes, IWS develop the student's independence, critical thinking, and creativity. Plagiarism, forgery, the use of cheat sheets, cheating at all stages of completing tasks are unacceptable.</p> <p>Compliance with academic honesty during the period of theoretical training and at exams, in addition to the main policies, is regulated by <u>the "Rules for the final control"</u>, <u>"Instructions for the final control of the autumn / spring semester of the current academic year"</u>, <u>"Regulations on checking students' text documents for borrowings"</u>.</p> <p>Documents are available on the main page of IS Univer.</p> <p>Basic principles of inclusive education. The educational environment of the university is conceived as a safe place where there is always support and equal attitude from the teacher to all students and students to each other, regardless of gender, race / ethnicity, religious beliefs, socio-economic status, physical health of the student, etc. All people need the support and friendship of peers and fellow students. For all students, progress is more about what they can do than what they can't. Diversity enhances all aspects of life. All students, especially those with disabilities, can receive counseling assistance by e-mail madi.abilev@kaznu.edu.kz.</p>
-------------------------------	---

	<p>Integration MOOC (massive open online course). In the case of integrating MOOC into the course, all students need to register for MOOC. The deadlines for passing MOOC modules must be strictly observed in accordance with the course study schedule.</p> <p>ATTENTION! The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course, as well as in the MOOC. Failure to meet deadlines results in loss of points.</p>
--	--

INFORMATION ABOUT TEACHING, LEARNING AND ASSESSMENT

Score-rating letter system of assessment of accounting for educational achievements				Assessment Methods	
Grade	Digital equivalent points	points, % content	Assessment according to the traditional system	<p>Criteria-based assessment is the process of correlating actual learning outcomes with expected learning outcomes based on clearly defined criteria. Based on formative and summative assessment.</p> <p>Formative assessment is a type of assessment that is carried out in the course of daily learning activities. It is the current measure of progress. Provides an operational relationship between the student and the teacher. It allows you to determine the capabilities of the student, identify difficulties, help achieve the best results, timely correct the educational process for the teacher. The performance of tasks, the activity of work in the classroom during lectures, seminars, practical exercises (discussions, quizzes, debates, round tables, laboratory work, etc.) are evaluated. Acquired knowledge and competencies are assessed.</p> <p>Summative assessment - type of assessment, which is carried out upon completion of the study of the section in accordance with the program of the course. Conducted 3-4 times per semester when performing IWS. This is the assessment of mastering the expected learning outcomes in relation to the descriptors. Allows you to determine and fix the level of mastering the course for a certain period. Learning outcomes are evaluated.</p>	
A-	3.67	90-94			
B+	3.33	85-89	Fine		
B	3.0	80-84			
B-	2.67	75-79			
C+	2.33	70-74	Satisfactorily		
C	2.0	65-69			
C-	1.67	60-64			
D+	1.33	55-59			
D	1.0	50-54	Unsatisfactory		
FX	0.5	25-49			
F	0	0-24			
				Formative and summative assessment	Points % content
				Work in labs	21
				Independent work	15
				Control works and Colloquium	24
				Final control (exam)	40
				TOTAL	100

Calendar (schedule) for the implementation of the content of the course. Methods of teaching and learning.

A week	Topic name	Number of hours	Max. points
MODULE 1. Chemical analysis			
1	Lec 1. The place of analytical chemistry in evaluating the composition and quality of substances (drugs, medicines). Classification of analytical chemistry methods. Law of interaction of masses. Equilibrium constants in homogeneous systems.	1	-
	Lab 1. The image of a specialist in a chemical laboratory, the rules of safety equipment, familiarization with the chemical glassware used in the analysis, the principles of washing and storage. Purity of chemical reagents. The importance of qualitative analysis. Ways to obtain analytical marks. Effects of ions on the human body	3	5
	IWST 1. Consultation on the implementation of IWS 1 and IWS 2	1	-
2	Lec 2. Acid-base balance. Brønsted-Lowry's protolithic theory. Ways to determine the pH of electrolytes of different nature.	1	-
	Lab 2. Qualitative analysis of cations	3	5
3	Lec 3. Determination of the pH of ampholytes, buffer solutions. Buffer capacity	1	-
	Lab 3. Qualitative analysis of anions	3	5
	IWS 1. A set of problems for determining the concentration constant, ionic strength, the amount of solution.	-	10
4	Lec 4. Titrimetric methods of analysis. Acid-base titration. Draw a titration curve and analyze it. Acid-base indicators.	1	-
	Lab 4. Standardization of hydrochloric acid by borax. Sodium carbonate titration	3	5
	IWST 2. Control work (ionic strength, concentration constant, pH of solutions)	1	20
5	Lec 5. Acid-base titration for organic compounds. Methods for determination of end point of titration. Theory of indicators. The place of acid-base titration in the assessment of the composition and quality of substances (drugs, medicines).	1	-
	Lab 5. Standardization of sodium hydroxide solution using standard oxalic acid. Determination of nicotinic acid.	3	5
6	Lec 6. Complex formation reactions, basic concepts. Equilibrium in complex compound solutions, influencing factors.	1	-
	Lab 6. Determination of calcium and magnesium by complexometric method	3	5
	IWS 2. A set of problems on complex compounds, solution preparation, mixing, dilution.	-	10

7	Lec 7. Complex compounds in solution. Complexometric titration. Metalindicators. The method of complexometry in determining the composition of drugs.	1	-
	Lab 7. Complexometric titration of aluminum by reverse titration method.	3	5
	IWST 3. Colloquium	1	25
Midterm control 1			100
8	Lec 8. Redox reactions, evaluation of redox ability, Nernst equation. Redox equilibrium constant, influencing factors.	1	-
	Lab 8. Determination of iron by dichromatometric method	3	5
	IWST 4. Consultation on the implementation of the IWS4	1	-
	IWS 3. A set of problems for complexometric calculations performed in the process of redox titration.	-	10
9	Lec 9. The place of redox reactions in titrimetric analysis. Nernst equation Ways to determine the final titration point in redox methods. Indicators of redox titration. Methods of permanganometry, dichromatometry.	1	-
	Lab 9. Determination of copper by iodometric method	3	5
10	Lec 10. Equilibrium constants in heterogeneous systems. Solubility product. Solubility. Gravimetric method of analysis, characteristics, types, conditions of sedimentation. Stages of the gravimetric method.	1	-
	Lab 10. Determination of moisture content of medicinal products	3	5
	IWST 5. Control work	1	15
MODULE 2. Physico-chemical methods of analysis			
11	Lec 11. Classification of physico-chemical methods. Methods of optical spectroscopy, their classification.	1	-
	Lab 11. Acquaintance with the construction of a photocolorimeter. Comparison of types, features, scope of photometric analysis (colorimetry, photocolorimetry and spectrophotometry; IR). Determination of the concentration of an unknown solution	3	5
12	Lec 12. Methods of photometric analysis. Bouguer-Lambert-Beer law. Methods for calculating the concentration by analytical signal.	1	-
	Lab 12. Determination of iron in the presence of sulfosalicylic acid by photocolorimetric method.	3	5
	IWS 4. Solving problems on spectroscopy	-	10
13	Lec 13. Electrochemical methods of analysis. The role of the method in determining the composition of drugs. Potentiometry.	1	-
	Lab 13. Measuring the acidity of chemical compounds of different nature using a pH-meter. Ionometry	3	5
	IWST 6. Consultation on the implementation of IWS5	1	-
	IWS 5. Solving problems on the methods of electrochemical determination	-	10
14	Lec 14. Electrochemical methods of analysis. Conductometry. Coulometry	1	-
	Lab 14. Potentiometric titration of acetic acid	3	5
15	Lec 15. Chromatography, method classification. Basic theory, chromatographic parameters. High performance liquid chromatography	1	-
	Lab 15. Colloquium (written)	3	20
Midterm control 2			100
Final control (exam)			100
TOTAL for course			100

Dean _____ A. Galejeva

Chair of the Academic Committee

on the Quality of Teaching and Learning _____ Bektemissova A.U.

Head of Department _____ A. Argimbayeva

Lecturer _____ M. Abilev

SUMMATIVE ASSESSMENT RUBRICATOR
CRITERIA FOR ASSESSMENT OF LEARNING OUTCOMES

IWS 1-5

Solving problems on the specific subject (15% out of 100%)

Criterion	"Very good" 13-15%	"Good" 10-12%	"Satisfactory" 5-9%	"Unsatisfactory" 0-4%
Formatting the problem inputs	All inputs are considered and designed correctly	Inputs are considered and designed with minor mistakes	Some inputs are missing	Inputs are used and designed improperly
Application of reaction equations and formulas	Reactions are used properly, formulas are correct	Some minor mistakes are present in reactions and/or formulas	Major mistakes in the reactions and/or formulas	Reactions are missing, formulas are used improperly
Calculations and obtaining the result	All calculations are correct, the result is right and designed properly considering significant figures	Some minor mistakes are present in calculations without the influence on the result	Major mistakes in the calculations influencing the results	Critical mistakes in the calculations, some data is missing, wrong result obtained