SYLLABUS
Fall semester 2021-2022 academic years
on the educational program "6B07202-Food chemistry and technology (NKU)": "Methods of control and analysis of compounds"

Discipline's code	Discipline's title	Independent work of students (IWS)	No. of hours per week			Number of credits	Independent work of student with teacher (IWST)
			Lectures (L)	Practical training (PT)	Laboratory (Lab)		
MKAV 1207	Methods of control and analysis of compounds	68	15	-	60	5	7

Academic course information					
Form of education	**Type of course**	**Types of lectures**	**Types of practical training**	**Number of IWS**	**Form of final control**
Combined (synchronously/ asynchronously/offline)	Mixed (theoretical / applied)	Informative, Video-lecture Lecture-discussion	Combined	68	Written exam in Moodle
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Academic presentation of the course

Aim of course	Expected Learning Outcomes (LO) As a result of studying the discipline the undergraduate will be able to:	Indicators of LO achievement (ID) (for each LO at least 2 indicators)
Aim of the course: to form the ability of designing and operating modern methods of control and analysis of chemical compounds l	1. 1. Explain the nature and essence of the phenomena and processes underlying chemical methods of identification and determination (quantification) of substances	1.1 to classify methods of chemical analysis 1.2 to describe the main stages of analysis 1.3 to form reaction equations that are the basis of chemical analysis methods
	2. demonstrate an understanding of the theoretical foundations of chemical analysis methods and their capabilities in relation to the analysis of real objects	2.1 to determine the equivalent and equivalence factor 2.2 to reasonably choose indicators when titrating 2.3 to analyze titration curves
	3. calculate the parameters of simple and complex equilibria in solutions to select optimal analysis conditions; calculate the results of chemical analysis	3.1 to work with reference literature 3.2 to carry out calculations when preparing the solutions 3.3 to calculate parameters of homogeneous and heterogeneous equilibria 3.4 to perform calculations when performing gravimetric and titrimetric analysis
	4. to understand the basic techniques of working in a chemical analytical laboratory	4.1 to use measuring dishware, basic equipment of the chemical laboratory 4.2 be able to weigh on analytical scales 4.3 to prepare solutions of technical and analytical concentration 4.4 to perform a titration 4.5 to perform gravimetric analysis operations: sedimentation, filtration, washing of sediment 4.6 to determine pH of the solution using a pH meter 4.7 to competently maintain a laboratory journal

	5. to be aware of the role of analytical chemistry in solving practical problems (control of technological processes and the quality of finished products, monitoring the state of the environment, etc.)	5.1 to solve situational tasks on the choice of analysis methods for solving specific problems 5.2 to make a description (prescription) of the experiment method 5.3 to properly formulate the formulation of the analytical problem
Prerequisites	Inorganic Chemistry	
Post requisites	Physical chemistry; chemical technology; Metrology, standardization, certification; special disciplines in analytical chemistry, educational and research work of students, execution of the diploma work	
Information resources	1. Harris D.C. Quantitative Chemical Analysis, 9th edition. – New York: W.H. Freeman, 2015. 2. Skoog D.A., West D.M., Holler F.J., Crouch S.R. Fundamentals of Analytical Chemistry, 9th edition. – Cengage Learning, 2013. 3. Pawliszyn J. Comprehensive Sampling and Sample Preparation: Analytical Techniques for Scientists. – Academic Press, 2012. 4. McNair H.M. Basic Gas Chromatography, 2nd edition. – Wiley-Interscience, 2009. 5. Greaves J., Roboz J. Mass Spectrometry for the Novice. – CRC Press, 2013. 6. Snyder L.R., Kirkland J.J., Dolan J.W. Introduction into modern LC. - New Jersey: Wiley Interscience, 2010. 7. Mitra S. Sample Preparation Techniques in Analytical Chemistry. – New Jersey: John Wiley and Sons, 2003. 8. R.S. Khandpur, Handbook of Analytical Instruments, Tata McGraw-Hill Education, India, 2016 9. "Ecology of Biosphere" laboratory. Interactive lectures. http://cfhma.kz/ecobio/en/interactive-lectures.html 10. https://teach-in.ru/course/analitchem 11. The course of analytical chemistry – http://chimactiv.agroparistech.fr/en/bases	

Academic policy of the course in the context of university moral and ethical values	**Academic Behavior Rules:** All students have to register at the MOOC. The deadlines for completing the modules of the online course must be strictly observed in accordance with the discipline study schedule. ATTENTION! Non-compliance with deadlines leads to loss of points! The deadline of each task is indicated in the calendar (schedule) of implementation of the content of the curriculum, as well as in the MOOC. **Academic values:** - Practical trainings/laboratories, IWS should be independent, creative. - Plagiarism, forgery, cheating at all stages of control are unacceptable. - Students with disabilities can receive counseling at e-mail Baimatova.nassiba@gmail.com.
Evaluation and attestation policy	**Criterion assessment:** the level of students' competence will be determined as the result of control works, midterm and final examinations. **Summative assessment:** during laboratory practice, the level of student's knowledge and understanding of topics as well as practical skills will be determined. Formula for calculating the final grade; Laboratory practice – 24%; Rating scale:

Rating according to the letter system	Digital equivalent	Points (%)	Rating according to the traditional system
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	Unsatisfactorily
F	0	0-24	

CALENDAR (SCHEDULE) THE IMPLEMENTATION OF THE COURSE CONTENT:

weeks	Topic name	LO	AI	Amount of hours	Maximum score	The form of knowledge assessment	The form of the lesson/ platform
1	**L.1** Role of analytical chemistry in the modern world. Classic methods of analytical chemistry and their analytical signals	LO 1	AI 1.1	1		Oral discussion	Webinar in MS Teams https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZjRjN2E4ZTctOWU1NC00OTZmLWJlOWUtMmJmZTRkYTA0Yjky%40thread.v2/0?context=%7b%22Tid%22%3a%22b0ab71a5-75b1-4d65-81f7-f479b4978d7b%22%2c%22Oid%22%3a%223226b52d-462d-4de0-b606-f7eddb8dddf2%22%7d
1	**PT 1** Determination of sodium chloride concentration in water solutions by density. Learning basic analytical laboratory glassware and equipment	LO 1	AI 1.1.	4	8	Lab report	Offline Lab 107
2	**L.2** Forms of analyte in liquid, gaseous and solid samples and equilibrium between them	LO 1	AI 1.2.	1		Oral discussion	Webinar in MS Teams
2	**PT 2** Analysis of gasoline using gas chromatography – mass spectrometry (GC-MS)	LO 1	AI 1.2.	4	8	Lab report	Offline
3	**L.3** Calculation of equilibrium concentrations	LO 1	AI 1.3.	1		Oral discussion	Webinar in MS Teams
3	**PT 3** Understanding homogeneous and heterogeneous equilibria	LO 1	AI 1.3.	4	8	Lab report	Offline
3	**IWSP 1 Consultation on the implementation of IWS1**	LO 1	AI 1.3.		5		Webinar in MS Teams
3	**IWS 1.** Solving computational tasks on equilibrium concentrations	LO 1	AI 1.1. AI 1.2.		25	Logic task	
4	**L.4** Techniques for preparation of liquid samples with a desired concentration of analyte	LO 3	AI 3.1.	1		Oral discussion	Webinar in MS Teams
4	**PT 4** Preparation of liquid samples with a desired concentration of analyte	LO 3	AI 3.1.	4	8	Lab report	Offline
5	**L.5** Uncertainties in preparing solutions	LO 4	AI 4.1.			Oral discussion	Webinar in MS Teams
5	**PT 5** Preparation of liquid samples with a desired concentration of analyte and its uncertainty	LO 4	AI 4.1.		8	Lab report	Offline
5	**IWSP 2 Consultation on the implementation of IWS2**	LO 4	AI 4.1.		5		Webinar in MS Teams
5	**IWS 2** Solving computational tasks on calculation uncertainties of prepared liquid samples	LO 4	AI 4.1.		20	Logic task	

5	**Make a structural and logical diagram of the read material**	LO 4	AI 4.1.		10		
5	**MT 1**	LO 4	AI 4.1.		100		
6	**L.6** Techniques for preparation of gaseous samples with a desired concentration of analyte	LO 1	AI 1.3.	2		Oral discussion	Webinar in MS Teams
6	**PT 6** Preparation of gaseous samples with a desired concentration of analyte and its uncertainty	LO 1	AI 1.2.	1	8	Lab report	Offline
7	**L.7** Techniques for preparation of solid samples with a desired concentration of analyte	LO 1	AI 1.1.			Oral discussion	Webinar in MS Teams
7	**PT 7** Preparation of solid samples with a desired concentration of analyte and its uncertainty	LO 1	AI 1.1.	1	8	Lab report	Offline
8	**L.8** Gravimetric methods of analysis	LO 1	AI 1.1.	2		Oral discussion	Webinar in MS Teams
8	**PT 8** Gravimetric determination of iron. Part 1: precipitation and filtration	LO 1	AI 1.1.		8	Lab report	Offline
8	**IWSP 3 Consultation on the implementation of IWS3**	LO 1	AI 1.1.		5		Webinar in MS Teams
8	**IWS 3** Solving computational tasks on gravimetric determination of analyte in sample.	LO 1	AI 1.1.		20	Logic task	
9	**L.9** Problems and optimization of gravimetric analysis	LO 1	AI 1.1.			Oral discussion	Webinar in MS Teams
9	**PT 9** Gravimetric determination of iron. Part 2: drying, measurement of mass, calculations and reporting	LO 1	AI 1.1.	2	8	Lab report	Offline
10	**L.10** Titrimetric analysis. Acid-base titration	LO 1	AI 1.1.	2		Oral discussion	Webinar in MS Teams
10	**PT 10** Determination of water hardness	LO 1	AI 1.1.		8	Lab report	Offline
10	**IWSP 4 Consultation on the implementation of IWS4**	LO 1	AI 1.1.		5		Webinar in MS Teams
10	**IWS 4** Solving of tasks on titrimetric determination of analyte in sample	LO 1	AI 1.1.		20	Problem task	
10	**IWSP 5 Make a structural and logical diagram of the read material**	LO 1	AI 1.1.		10		
10	**MT (Midterm Exam)**	LO 1	AI 1.1.		100		
11	**L.11** Titrimetry based on reactions of complexation and precipitation	LO 1	AI 1.1.			Oral discussion	Webinar in MS Teams
11	**PT 11** Complexometric determination of calcium and magnesium ions	LO 1	AI 1.1.	1	8	Lab report	Offline
12	**L.12** Redox titrations	LO 1	AI 1.1.	1		Oral discussion	Webinar in MS Teams
12	**PT 12** Bichromatometric determination of iron	LO 1	AI 1.1.	1	8	Lab report	Offline
12	**IWSP 6 Consultation on the implementation of IWS5**	LO 1	AI 1.1.		5		Webinar in MS Teams
12	**IWS 5** Solving of tasks based on redox titrations	LO 1	AI 1.1.		20	Problem task	
13	**L.13** General principles of a qualitative chemical analysis. Identification of inorganic cations	LO 1	AI 1.1.	1		Oral discussion	Webinar in MS Teams
13	**PT 13** Identification of inorganic anions	LO 1	AI 5.1.	1	8	Lab report	Offline
14	**L.14** Identification of inorganic anions	LO 1	AI 5.2.	1		Oral discussion	Webinar in MS Teams
14	**PT 14** Classic and advanced methods of analytical chemistry	LO 1	AI 5.3.	1	8	Lab report	Offline
14	**IWS 6 Solution of tasks on separation and detection of inorganic cations and anions**						
15	**L.15** Identification of organic compounds	LO 1	AI 5.3.	1		Oral discussion	Webinar in MS Teams

15	**PT 15** Qualitative analysis of a sample having unknown composition	LO 1	AI 5.3.	1	8	Lab report	Offline
15	**IWSP 7 Consultation on the implementation of IWS7**	LO 5	AI 5.3.		5		Webinar in MS Teams
15	**IWS 7 Solution of tasks on identification of inorganic and organic compounds in unknown samples**	LO 5	AI 5.2. AI 5.3.		20	Analysis	
	MT 2	LO 5	AI 5.2. AI 5.3.		100		

[Abbreviations: QS - questions for self-examination; TK - typical tasks; IT - individual tasks; CW - control work; MT - midterm.

Comments:

- Form of L and PT: webinar in MS Teams / Zoom (presentation of video materials for 10-15 minutes, then its discussion / consolidation in the form of a discussion / problem solving / ...)
- Form of carrying out the CW: webinar (at the end of the course, the students pass screenshots of the work to the monitor, he/she sends them to the teacher) / test in the Moodle DLS.
- All course materials (L, QS, TK, IT, etc.) see here (see Literature and Resources, p. 6).
- Tasks for the next week open after each deadline.
- CW assignments are given by the teacher at the beginning of the webinar.]

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