

SYLLABUS
Fall semester 2020-2021 academic years
on the educational program “Pharmaceutical production technology”

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)		
	Chemistry of natural polyphenols	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		
Online / Combined	Theoretical and practical	Problematic, analytical lecture	Solving problems and exercises, situational tasks	5			
Lecturer	Aliya Kipchakbayeva, PhD						
e-mail	aliya_k85@mail.ru						
Telephone number	+7-702-7558564						
Academic presentation of the course							
Aim of course	Expected Learning Outcomes (LO) <i>As a result of studying the discipline the undergraduate will be able to:</i>			Indicators of LO achievement (ID) (for each LO at least 2 indicators)			
To form a systematic knowledge of the relationship between the structure and chemical properties of biologically important classes of organic compounds, biopolymers and their structural components as a basis for understanding and understanding the essence of life processes at the molecular	1. Explain the classification, nomenclature, structure, and physical and chemical properties of biological molecules (biomolecules) that make up a living organism: carbohydrates, and polyphenols.			ID 1.1 – explains the principles of classification and nomenclature of polyphenols; ID 1.2 – sets the structure of polyphenols, their most favorable conformation and configuration; ID 1.3 – explains the characteristic physical and chemical properties of polyphenols.			
	2. Explain the technology of isolation of biomolecules from natural raw materials and using biotechnological methods, as well as their synthetic production.			ID 2.1 – describes the technology of isolation of polyphenols from natural raw materials and using biotechnological methods; ID 2.2 – explains the synthetic production of polyphenols.			
	3. Determine the structure, structure and properties of the most important bi-organic compounds, their components, methodological aspects of synthesis and structural analysis			ID 3.1 – to determine the structure, structure and properties of the most important bi-organic compounds, their components, methodological aspects of synthesis and structural analysis; ID 3.2 – identifies carbohydrates, polyphenols by hydrolysis,			

level.		qualitative analysis, and chromatography on paper (PC) with standard samples and chemical transformations; ID 3.3 – Identify the biological active substance underlying the processes of vital activity.
	4. Evaluate the presence of a chirality center and reaction centers in monomeric, oligo- and polymer biomolecules and, accordingly, evaluate their chemical and biological properties.	ID 4.1 – determines the structure, chirality centers of Monomeric biomolecules, their reactivity and biological activity; ID 4.2 – determines the structure and chirality centers of oligomeric biomolecules, their chemical and biological properties; ID 4.3 – analyzes the structure, chirality centers of polymer biomolecules, their chemical properties and physiological role in the body.
	5. Evaluate modern methods for studying biologically active compounds, theoretical information on groups of compounds, including their definitions, classification, physical and chemical properties, methods for identifying qualitative and quantitative determinations; to determine the patterns of chemical behavior at the molecular and cellular levels of biologically important molecules in correlation with their structure	ID 5.1-shows the relationship in the structure of polyphenols, their chemical and biological properties; ID 5.2-evaluates the relationship of polyphenols at the level; ID 5.3-evaluates the relationship of polyphenols at the level of their biosynthesis.
Prerequisites	Chemical Technology of Organic Substances Chemistry, Chemical Technology organic substances	
Post requisites	Chemistry and technology natural product, Biochemistry, Plant Chemistry, Chemical technology of dosage forms	
Information resources	<p><i>Literature:</i></p> <ol style="list-style-type: none"> 1. John McMurry, Mary E. Castellion, Mary E Castellion. <i>Fundamentals of General, Organic, and Biological Chemistry</i>, 4th Edition. – 2002. – 880 p. 2. Fromm, Herbert J., Hargrove, Mark. <i>Essentials of Biochemistry</i>. – Springer-Verlag Berlin Heidelberg, 2012. – 364 p. 3. Hunter, Graeme K. <i>Vital Forces: The Discovery of the Molecular Basis of Life</i>. Academic Press, 2000. – 364 p. 4. N.A. Tyukavkina, Y.I. Baukov. <i>Bioorganic Chemistry</i>. – 2014. – 416 p. [in Russian] 5. Y.A. Ovchinnikov. <i>Bioorganic Chemistry</i>. – 1987. – 815 p. [in Russian] 6. Francis Rouessac, Annick Rouessac. <i>Chemical analysis: modern instrumentation methods and techniques</i>. – John Wiley, 2007. – 574 p. 7. Jeffery G.H., Bassett J., Mendham J., Denney R.C. <i>Vogel's Textbook of Quantitative Chemical Analysis</i>. – Longman: John Wiley & Sons Inc.; 5th edition, 1989. – 980 p. <p><i>Internet resources:</i></p> <ol style="list-style-type: none"> 1. Reference list of medicines https://www.vidal.ru/; 2. American chemical society – https://www.acs.org; 	

	3. http://www.biochemistry.org/Publications.aspx
Academic policy of the course in the context of university moral and ethical values	<p>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.</p> <p>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.</p> <p>Academic values:</p> <ul style="list-style-type: none"> - 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 aliya_k85@mail.ru
Evaluation and attestation policy	<p>Criteria-based evaluation: assessment of learning outcomes in relation to descriptors (verification of the formation of competencies in midterm control and exams).</p> <p>Summative evaluation: assessment of work activity in an audience (at a webinar); assessment of the completed task.</p>

CALENDAR (SCHEDULE) THE IMPLEMENTATION OF THE COURSE CONTENT:

We eks	Topic name	LO	ID	A mo unt of ho urs	Max imu m scor e	Form of Know ledge Asses sment	The form of the lesson / platform
Module 1.							
1	Lecture 1 (L1). Main tasks of Chemistry of natural polyphenols. Classification of natural <i>polyphenols</i> , their chirality, configuration, isoelectric point, chemical and biological properties.	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	Practical training (PT). Safety precautions, equipment and utensils for obtaining biomolecules and studying their chemical properties, cleaning them and determining physicochemical constants.	LO 2 LO 3	ID 2.1 ID 2.2 ID 3.1 ID 3.2 ID 3.3	4	8	Anal y sis	Webinar in MS Teams
2	L2. Polyphenol compound and their classification. Flavonoids	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Chromatography of polyphenols by BC and TLC using standard samples.	LO 2 LO 3	ID 2.1 ID 2.2 ID 3.3 ID 4.1	4	7	Anal y sis	Webinar in MS Teams
	Tests				2	Anal y sis	
	IWSP 1. Consultation on the implementation of IWS 1				5		Webinar in MS Teams
3	L3. The key role of polyphenols, their classification, methods of isolation and identification.	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams

	PT. Comparative analysis of determination of polyphenols content in plant raw materials and in substances. Chemical properties of polyphenols.	LO 2 LO 3 LO 4	ID 2.1 ID 2.2 ID 3.3 ID 4.1	4	8	Analysis	Webinar in MS Teams
	IWS 1. Carbohydrates. Examination of monographs in the SP RK on pharmacopoeial samples of monosaccharides, disaccharides and polysaccharides.	LO 5	ID 5.1 ID 5.2 ID 5.3		18	Logic task	
4	L4. Phenols Acids. Aromatic carboxylic acids. Chemical properties of phenols and phenolic acids.	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Chromatography of polyphenols by BC using standard samples. 1M and 2M	LO 2 LO 3 LO 4	ID 2.1 ID 2.2 ID 3.1 ID 4.2 ID 4.3	4	6	Analysis	Webinar in MS Teams
	IWS 2. Carbohydrate mutarotation. Fisher Havers projection.				20	Analysis	
5	L5. Pirans. Catechins Classification, structure, physiological role.	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Extraction of catechins from tea.	LO 2 LO 3 LO 4	ID 2.1 ID 2.2 ID 3.1 ID 4.2 ID 4.3	4	8	Analysis	Webinar in MS Teams
	IWSP 2. Consultation on the implementation of IWS 2				5		Webinar in MS Teams
	Make a structural and logical diagram of the read material	LO 4 LO 5	ID 4.1 ID 4.2 ID 4.3 ID 5.1 ID 5.2 ID 5.3		10		
	MT 1				100		
Module 2.							
6	L6. γ - Pyrones or Coumarins. Chemical structure, properties and physiological role in the body	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Quantification of anthraquinones and coumarins	LO 2 LO 3 LO 4	ID 2.1 ID 2.2 ID 3.1 ID 4.2 ID 4.3	4	7	Analysis	Webinar in MS Teams
7	L7. Isocoumarins. Chemical structure, properties and physiological role	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Extraction of an unknown mixture. Extraction of an unknown mixture.	LO 2 LO 3	ID 2.1 ID 2.2	4	7	Analysis	Webinar in MS Teams

		LO 4	ID 3.3 ID 4.1				
	IWSP 3. Consultation on the implementation of IWS 3				5		Webinar in MS Teams
8	L8. γ - Pyrones or Chromones	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Extraction of a known mixture. Extraction of a known mixture. Continued	LO 2 LO 3 LO 4	ID 2.1 ID 2.2 ID 3.2 ID 4.1	4	7	Analysis	Webinar in MS Teams
	IWS 3. Submission of the task 3(Functional groups in biological molecules)	LO 5	ID 5.1 ID 5.2 ID 5.3		18	Logic task	
9	L9. Flavones, Flavonols, Flavones. Flavones, Flavonols, Flavones.	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Polyphenols of natural plants	LO 2 LO 3 LO 4	ID 2.1 ID 3.2 ID 4.2 ID 4.3	4	8	Analysis	Webinar in MS Teams
	Tests				3	Analysis	
	IWSP 4. Consultation on the implementation of IWS 4				5		Webinar in MS Teams
10	L10. Isoflavones, Dihydroflavanols, Anthocyanidins. Classification, structure, preparation, chemical properties, physiological role.	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Qualitative reactions to starch, pectin and cellulose, their hydrolysis.	LO 2 LO 3 LO 4	ID 2.1 ID 3.2 ID 4.1 ID 4.2 ID 4.3	4	8	Analysis	
	IWS 4. Submission of the task 4(Functional groups in biological molecules)	LO 5	ID 5.1 ID 5.2 ID 5.3		17	Problem task	
	IWSP 5. Consultation on the implementation of CW				5		Webinar in MS Teams
	CW	LO 4 LO 5	ID 4.1 ID 4.2 ID 4.3 ID 5.1 ID 5.2 ID 5.3		10		
	MT (Midterm Exam)				100		
11	L11. Separation, Identification and Analysis of Polyphenols	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Technological obtain polyphenols	LO 2	ID 2.1	4	8	Analysis	Webinar

		LO 3 LO 4	ID 2.2 ID 3.3 ID 4.1			sis	in MS Teams
	Tests				3	Analysis	
	IWSP 6. Consultation on the implementation of IWS 5				5		Webinar in MS Teams
12	L12. Extraction of polyphenols there are type.	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Vegetable polyphenols. Detection, isolation and hydrolysis. Qualitative reactions. Assessment of the degree of unsaturation of fats.	LO 2 LO 3 LO 4	ID 2.1 ID 2.2 ID 3.2 ID 4.1	4	8	Analysis	Webinar in MS Teams
	IWS 5. Biological Roles and Implications (Mainly on Antioxidant Activities)	LO 5	ID 5.1 ID 5.2 ID 5.3		20	Problem task	
13	L13. Clean up isolation of polyphenols	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Obtaining flavonoid glycoside and its qualitative reactions	LO 2 LO 3 LO 4	ID 2.1 ID 2.2 ID 3.3 ID 4.1	4	8	Analysis	Webinar in MS Teams
	Tests				3		Webinar in MS Teams
14	L14. Physico-chemical analysis of polyphenols.	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Obtaining flavonoid glycoside and its qualitative reactions. Communed	LO 2 LO 3 LO 4	ID 2.1 ID 2.2 ID 3.3 ID 4.1	4	8	Analysis	Webinar in MS Teams
	IWSP 7. Consultation on the implementation of CW				5		
15	L15. The biological role of natural polyphenols	LO 1	ID 1.1 ID 1.2 ID 1.3	1			Video lecture in MS Teams
	PT. Comparative analysis of the relationship between structures, chemical and biological properties of a number of obtained natural biologically active compounds.	LO 4 LO 5	ID 4.1 ID 4.2 ID 4.3 ID 5.1 ID 5.2 ID 5.3	4	8	Analysis	Webinar in MS Teams
	CW	LO 4 LO 5	ID 4.1 ID 4.2 ID 4.3		10		

			ID 5.1 ID 5.2 ID 5.3				
	Make a structural and logical diagram of the read material				14		
	MT 2				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.]

Dean

Kh.S. Tassibekov

Chairman of the Faculty Methodical Bureau

R.A. Mangazbayeva

Head of the Department

G.A. Mun

Lecturer

A.K.Kypchakbayeva